

**PAIN AND PAIN MANAGEMENT STRATEGIES  
IN PATIENTS WITH BRACHIAL PLEXUS INJURY  
POST-RECONSTRUCTIVE SURGERY**

**PORNTIP SAREESO**

**A THESIS SUBMITTED IN PARTIAL FULFILLMENT  
OF THE REQUIREMENTS FOR  
THE DEGREE OF MASTER OF NURSING SCIENCE  
(ADULT NURSING)  
FACULTY OF GRADUATE STUDIES  
MAHIDOL UNIVERSITY  
2009**

**COPYRIGHT OF MAHIDOL UNIVERSITY**

Thesis  
Entitled  
**PAIN AND PAIN MANAGEMENT STRATEGIES  
IN PATIENTS WITH BRACHIAL PLEXUS INJURY  
POST-RECONSTRUCTIVE SURGERY**

.....  
Miss Porntip Sareeso  
Candidate

.....  
Assist. Prof. Ketsarin Utriyaprasit,  
Ph.D. (Nursing)  
Major-Adviser

.....  
Assoc. Prof. Siriorn Sindhu,  
D.N.Sc.  
Co-Adviser

.....  
Prof. Panupan Songcharoen, M.D.,  
Certificate in Orthopedic Surgery  
(Oxford)  
Co-Adviser

.....  
Prof. Banchong Mahaisavariya,  
M.D.,  
Dean  
Faculty of Graduate Studies

.....  
Assoc. Prof. Yajai Sitthimongkol,  
Ph.D. (Nursing)  
Chair  
Master of Nursing Science  
Faculty of Nursing

Thesis  
Entitled  
**PAIN AND PAIN MANAGEMENT STRATEGIES  
IN PATIENTS WITH BRACHIAL PLEXUS INJURY  
POST-RECONSTRUCTIVE SURGERY**

was submitted to the Faculty of Graduate Studies, Mahidol University  
for the Degree of Master of Nursing Science (Adult Nursing)

on  
January 19, 2009

.....  
Miss Porn-tip Sareeso  
Candidate

.....  
Assoc. Prof. Pornsri Sriussadaporn,  
M.Ed. (Education Research)  
Chair

.....  
Col. Sunya Prachaporn, M.D.,  
Certificate in Orthopedic  
Member

.....  
Assist. Prof. Ketsarin Utriyaprasit,  
Ph.D. (Nursing)  
Member

.....  
Prof. Panupan Songcharoen, M.D.,  
Certificate in Orthopedic Surgery  
(Oxford)  
Member

.....  
Assoc. Prof. Siriorn Sindhu,  
D.N.Sc.  
Member

.....  
Prof. Banchong Mahaisavariya,  
M.D.,  
Dean  
Faculty of Graduate Studies  
Mahidol University

.....  
Assoc. Prof. Fongcum Tilokskulchai,  
Ph. D. (Nursing)  
Dean  
Faculty of Nursing  
Mahidol University

## **ACKNOWLEDGEMENTS**

The success of this thesis can be attributed to the extensive support and assistance from my major advisor, Assist. Prof. Dr. Ketsarin Utriyaprasit and my co-advisor, Assoc. Prof. Dr. Siriorn Sindhu and Prof. Panupan Songcharoen. I deeply thank them for their valuable advice, guidance and encouragement in this research.

I would like to express very grateful appreciation to Assist. Prof. Col. Sunya Prachaporn and Assoc. Prof. Pornsri Sriussadaporn, the thesis committee members, for their constructive comments and valuable recommendations for this thesis. I wish to extend my sincere thanks and greatest appreciation to all of the experts involve in the validity assessment of the instruments as well as heir valuable guidance and suggestions.

The valuable database was colleted at the Orthopedic Follow-up Clinic on the 1<sup>st</sup> floor of Syamindra Building, Siriraj Hospital. I am also thankful to the doctors, head nurse, and staff for their warm welcome, co-operation and generous assistance. Most important and most valuable part of this thesis is contributed by brachial plexus injury patients who willingly to participated in this study.

Finally, I would like to thank Siriraj Routine to Research Management Fund (R2R) of Faculty of Medicine Siriraj Hospital, Mahidol University, for financial support in this study. I am also thankful to my family members for their constant support and encouragement for accomplishing this success.

Porntip Sareeso

**PAIN AND PAIN MANAGEMENT STRATEGIES IN PATIENTS WITH BRACHIAL PLEXUS INJURY POST-RECONSTRUCTIVE SURGERY**

PORNTIP SAREESO 4837403 NSAN/M

M.N.S. (ADULT NURSING)

**THESIS ADVISORS: KETSARIN UTRIYAPRASIT, Ph.D. (Nursing), SIRIORN SINDHU, D.N.Sc., PANUPAN SONGCHAROEN, M.D., Certificate in Orthopedic Surgery (Oxford)****ABSTRACT**

This study was descriptive research aiming to evaluate pain and other symptoms experienced and the management strategies used and effectiveness of each strategy in patients with brachial plexus injury post-reconstructive surgery. The research framework was based on the symptom management model of Dodd et al. (2001). The sample was composed of 107 patients who were receiving follow-up treatments at the orthopedic follow-up clinic, at a major university hospital in Bangkok, Thailand, from June to October 2007. The research data was obtained through questionnaires on demographic and clinical information and interviews and questionnaires on pain and pain management strategies and on other symptoms and their management strategies. Data was analyzed by frequency, percentage, mean and standard deviation. The opened-end questionnaires were analyzed by using content analysis.

Most of the patients were male (91.6%). The mean $\pm$ SD of age was 30.40 $\pm$ 9.10 years. The major cause of injury was motorcycle accidents at 95.3%; 74.8% were total arm type patients. Most of the patients had pain experience (91.6%) and the mean score level of pain severity of the time of the data collection was mild. The majority of patients perceived the pain in the whole arm (57.1%). Patients reported characteristics of pain as crushing pain, electrical-like pain and numbing pain (23.5%, 22.4% and 19.4%, respectively) and 63.7% described the pattern of their pain as continuous. For 60.2% of the patients perceived pain before surgery. Cold weather and cold water were cited as the cause of pain in 38.8% of cases, 36.7% of patients said that there was no particular primary cause of pain or that inactivity was the cause. The mean score level of pain interference was mild to moderate in all areas of activities of daily living. Nearly half of the patients did not try to manage their pain (46.9%). The first strategy used by the other patients was massage (23.5%) and this was also the most effective strategy (20.4%). Other symptoms experienced were loss of motor power, numbness and stress (74.4%, 32.2% and 13.3%, respectively).

These findings will be used to create and tailor additional nursing interventions aimed at preparing patients and families when they are discharged from the hospital and they will be used as basic data for further research on patients with brachial plexus injury.

**KEY WORDS: SYMPTOM MANAGEMENT / CHRONIC PAIN/ PAIN MANAGEMENT/ BRACHIAL PLEXUS INJURY/ RECONSTRUCTIVE SURGERY**

113 pp.

อาการปวดและวิธีการจัดการกับอาการปวดในผู้ป่วยที่ได้รับบาดเจ็บข้อประสาทส่วนแขนภายหลังการผ่าตัด  
(PAIN AND PAIN MANAGEMENT STRATEGIES IN PATIENTS WITH BRACHIAL PLEXUS INJURY  
POST-RECONSTRUCTIVE SURGERY)

พรทิพย์ สาริโต 4837403 NSAN/M

พย.ม. (การพยาบาลผู้ใหญ่)

คณะกรรมการควบคุมวิทยานิพนธ์: เกศรินทร์ อุทธิยะประสิทธิ์, Ph.D. (Nursing), ศิริอร ลินฐุ, D.N.Sc.,  
กานุพันธ์ ทรงเจริญ, พ.บ., Certificate in Orthopedic Surgery (Oxford)

บทคัดย่อ

การศึกษานี้เป็นการวิจัยเชิงพรรณนา เพื่อศึกษาอาการปวดและอาการอื่น ๆ ที่นอกเหนือจากอาการปวดรวมถึงวิธีการจัดการกับอาการดังกล่าวและประสิทธิภาพของแต่ละวิธีในผู้ป่วยที่ได้รับบาดเจ็บข้อประสาทส่วนแขนภายหลังการผ่าตัด โดยใช้กรอบแนวคิดการจัดการกับอาการของคอคอดและคณะปี 2001 เป็นกรอบแนวคิด กลุ่มตัวอย่างคือผู้ป่วยที่มาติดตามการรักษาที่หน่วยตรวจและติดตามผลการรักษาออร์โธปิดิกส์โรงพยาบาลมหาวิทยาลัย ระหว่างเดือนมิถุนายน-ตุลาคม พ.ศ. 2550 จำนวนทั้งสิ้น 107 ราย เก็บข้อมูลโดยการสัมภาษณ์ เครื่องมือที่ใช้ในการวิจัยได้แก่ แบบบันทึกข้อมูลทั่วไป แบบสัมภาษณ์อาการปวดและวิธีการจัดการอาการปวดและแบบสัมภาษณ์อาการและวิธีการจัดการกับอาการอื่น ๆ ที่นอกเหนือจากอาการปวด วิเคราะห์ข้อมูลโดยใช้การแจกแจงความถี่ ร้อยละ ค่าเฉลี่ย ส่วนเบี่ยงเบนมาตรฐาน วิเคราะห์ข้อมูลคุณภาพโดยใช้การวิเคราะห์เชิงเนื้อหา

ผลการศึกษาพบว่าผู้ป่วยส่วนใหญ่เป็นเพศชาย (91.6%) อายุเฉลี่ยเท่ากับ  $30.40 \pm 9.10$  ปี ส่วนใหญ่ได้รับบาดเจ็บจากอุบัติเหตุรถจักรยานยนต์ (95.3%) ส่วนใหญ่ได้รับบาดเจ็บชนิดอัมพาตทั้งแขน (74.8%) ผู้ป่วยส่วนใหญ่รับรู้ว่ามีอาการปวด (91.6%) และประเมินระดับความรุนแรงของอาการปวด ณ ปัจจุบันอยู่ในระดับเล็กน้อย ตำแหน่งที่ผู้ป่วยรับรู้ว่ามีอาการปวดมากที่สุดคือทั้งแขน (57.1%) ลักษณะอาการปวดที่พบมากที่สุดคือปวดเหมือนถูกบีบรัดรองลงมาคือปวดเหมือนถูกไฟฟ้าช็อตและปวดเหมือนเหน็บชา (23.5%, 22.4% และ 19.4% ตามลำดับ) ส่วนใหญ่บรรยายว่าอาการปวดเกิดขึ้นตลอดเวลา (63.7%) และรับรู้ว่ามีอาการปวดตั้งแต่มีก่อนผ่าตัด (60.2%) สาเหตุที่ทำให้เกิดอาการปวดส่วนใหญ่คืออากาศเย็น/น้ำเย็น รองลงมาคือไม่มีสาเหตุ (38.8% และ 36.7% ตามลำดับ) อาการปวดมีผลกระทบต่อดำเนินชีวิตประจำวันของผู้ป่วยในด้านต่างๆ ในระดับเล็กน้อยถึงปานกลาง ส่วนใหญ่ผู้ป่วยไม่ได้จัดการอาการปวดที่เกิดขึ้น (46.9%) วิธีจัดการอาการปวดที่ผู้ป่วยเลือกใช้มากที่สุดคือการนวด (23.5%) ซึ่งเป็นวิธีที่ผู้ป่วยรับรู้ว่าเป็นวิธีที่ดีที่สุด (20.4%) อาการอื่น ๆ ที่นอกเหนือจากอาการปวดพบว่ามีผู้ป่วยส่วนใหญ่รับรู้คือมีการสูญเสียกำลังกล้ามเนื้อมากที่สุดรองลงมาคืออาการชาและเกร็ง (74.4%, 32.2% และ 13.3% ตามลำดับ)

จากผลการวิจัยครั้งนี้สามารถนำไปใช้ในการพัฒนาแนวทางการปฏิบัติการพยาบาลเพื่อการดูแลผู้ป่วยที่ได้รับบาดเจ็บข้อประสาทส่วนแขนเมื่อกลับไปอยู่ที่บ้านให้มีประสิทธิภาพและเหมาะสมกับความต้องการของผู้ป่วย และเป็นข้อมูลพื้นฐานเพื่อการพัฒนางานวิจัยที่เกี่ยวข้องต่อไป

# CONTENTS

	<b>Page</b>
<b>ACKNOWLEDGEMENTS</b>	iii
<b>ABSTRACT (English)</b>	iv
<b>ABSTRACT (Thai)</b>	v
<b>LIST OF TABLES</b>	ix
<b>CHAPTER</b>	
<b>I. INTRODUCTION</b>	1
1. Background and significance of the study	
2. Research questions	
3. Objectives of the study	
4. Conceptual framework	
5. Scope of the study	
6. Definition of terms	
7. Expected benefits of the study	
<b>II. LITERATURE REVIEW</b>	12
1. Incidence of brachial plexus injury	
1.1 Epidemiology and etiology of brachial plexus injury	
1.2 The degeneration of nerve fibers after brachial plexus injury	
1.3 Health problems in patients with brachial plexus injury post- reconstructive surgery	
2. Post-reconstructive surgery conditions in patients with after brachial plexus injury post-reconstructive surgery	
2.1 Plans of treatment	
2.2 Outcomes of treatment	
3. Symptom management model (Dodd et al., 2001)	
4. Pain and other symptoms in patients with brachial plexus injury post-reconstructive surgery	

## CONTENTS (cont.)

	<b>Page</b>
4.1 Pathology of pain and other symptoms in patients with brachial plexus injury post-reconstructive surgery	
4.2 Physical, psychological, and socio-cultural impacts on pain in patients with brachial plexus injury post-reconstructive surgery	
5. Management strategies of pain and other symptoms in patients with brachial plexus injury post-reconstructive surgery	
6. Analysis of pain and other symptoms management in patients with brachial plexus injury post- reconstructive surgery in Thailand	
7. Gap in the existing body of knowledge regarding treatment for patients with brachial plexus injury post-reconstructive surgery in Thailand	
<b>III. METHODOLOGY</b>	<b>40</b>
1. Research design	
2. Population and sampling	
3. Research settings	
4. Research instruments	
5. Quality of the instruments	
6. Protection of the human rights	
7. Collection of data	
8. Data analysis	
<b>IV. RESULT</b>	<b>50</b>
1. The demographic and clinical information	
2. Pain experienced	
3. Other symptoms experienced	

**CONTENTS (cont.)**

	<b>Page</b>
<b>V. DISCUSSION</b>	75
1. Pain experienced	
2. Pain management strategies	
3. Other symptoms experienced	
4. Other symptoms management strategies	
<b>VI. CONCLUSION</b>	86
1. The summary of the study	
2. Implications of research findings on nursing practice	
3. Implications of research findings on further research	
4. Recommendations	
<b>REFERENCES</b>	92
<b>APPENDIX</b>	100
Appendix A List of experts	
Appendix B Information consent form	
Appendix C Permission letters for data collecting	
Appendix D Data collection instruments	
<b>BIOGRAPHY</b>	113

## LIST OF TABLES

<b>Table</b>	<b>Page</b>
1. Frequency and percentage of patients with brachial plexus injury post-reconstructive surgery classified by demographic characteristic	51
2. Mean and standard deviation of patients with brachial plexus injury post-reconstructive surgery classified by clinical characteristic	52
3. Frequency and percentage of patients with brachial plexus injury post-reconstructive surgery classified by employment before injury and after injury	53
4. Frequency and percentage of patients with brachial plexus injury post-reconstructive surgery classified by financial status, age and employment after injury	54
5. Frequency and percentage of patients with brachial plexus injury post-reconstructive surgery classified by type of injury and motor power	55
6. Frequency and percentage of patients with brachial plexus injury post-reconstructive surgery classified by performance to the medical plan, type of injury and duration of post-surgery	56
7. Frequency and percentage of patient with brachial plexus injury post-reconstructive surgery classified by pain perception, age and type of injury	57
8. Frequency and percentage of patients with brachial plexus injury post-reconstructive surgery classified by characteristics of pain and pattern of pain	58
9. Frequency and percentage of patient with brachial plexus injury post-reconstructive surgery classified by location of pain and type of injury	59
10. Mean and standard deviation of patient with brachial plexus injury post-reconstructive surgery classified by pain severity and age	59
11. Mean and standard deviation of patient with brachial plexus injury post-reconstructive surgery classified by pain severity, type of injury and motor power of biceps	60

## LIST OF TABLES (cont.)

<b>Table</b>	<b>Page</b>
12. Frequency and percentage of patient with brachial plexus injury post-reconstructive surgery classified by perceived cause of pain	61
13. Mean and standard deviation of patients with brachial plexus injury post-reconstructive surgery classified by pain interferes ADLs and age	62
14. Mean and standard deviation of patients with brachial plexus injury post-reconstructive surgery classified by pain interferes ADLs and the duration of illness	63
15. Frequency and percentage of patient with brachial plexus injury post-reconstructive surgery classified by type of pain management strategies and age	64
16. Frequency and percentage of patient with brachial plexus injury post-reconstructive surgery classified by type of pain management strategies, assistant personnel and perceive level of effectiveness	65
17. Frequency and percentage of patient with brachial plexus injury post-reconstructive surgery classified by perception of symptoms and duration of post-surgery	67
18. Frequency and percentage of patient with brachial plexus injury post-reconstructive surgery classified by other symptoms and perceived cause of symptoms	68
19. Frequency and percentage of patient with brachial plexus injury post-reconstructive surgery classified by the symptoms arise from motor end plate change interferes ADLs and duration of illness	69
20. Frequency and percentage of patient with brachial plexus injury post-reconstructive surgery classified by the symptoms arise from sensory receptor change interferes ADLs and duration of illness	70

## LIST OF TABLES (continued)

<b>Table</b>	<b>Page</b>
21. Frequency and percentage of patient with brachial plexus injury post-reconstructive surgery classified by type of physical symptoms management strategies	71
22. Frequency and percentage of patients with brachial plexus injury post-reconstructive surgery classified by type of psychological symptoms management strategies	72
23. Frequency and percentage of patient with brachial plexus injury post-reconstructive surgery classified by type of symptoms arise from motor end plate change management strategies, assistant personnel and perceived level of effectiveness	73
24. Frequency and percentage of patients with brachial plexus injury post-reconstructive surgery classified by type of symptoms arise from sensory receptor change management strategies, assistant personnel and perceived level of effectiveness	74

## **CHAPTER I**

### **INTRODUCTION**

#### **Background and significance of the study**

In many studies it is found that one of the major causes of brachial plexus injury is motorcycle accidents (Dubuisson & Kline, 2002; Songcharoen, 1995; Sungpet, Suphachatwong & Kawinwonggowit, 1999). This cause is more common in developing countries than developed countries (WHO, 2006). According to the medical records of Siriraj Hospital from October 1983 to October 1993, the number of patients with brachial plexus injury was 520, an average of 53 patients per year (Songcharoen, 1995). Nevertheless, during the year 2002 – 2006 the total number of patients with brachial plexus injury is found to be 361, thus it is evident that the incidences of injuries have increased to an average of 72 patients per year (Siriraj Hospital, 2006). This seems to be that the incidences of brachial plexus injury tend to increase and these injuries are significant public health problem (Songcharoen, 1995). Brachial plexus injury lead to dysfunction of the affected arm and cause sufferings from chronic pain in addition to other symptoms, including the loss of sensation or motor power in injured arm.

Chronic pain in patients with brachial plexus injury post-reconstructive surgery arises from the wallerian degeneration due to the injury of nerve ending. The damages of the axon and myelin sheath cause reduction in the size of nerves, inducing differences in the size and shape of fascicles, which contain motor, sensory, and sympathetic nerves. The fascicle endings are then incompatible and the nerves regenerate in the wrong direction (Songcharoen & Mahaisavariya, 1996). These pathological changes cause long-term damages in neuron functions in the spinal cord as the C-fiber. And the dorsal horn at the ganglion is continuously stimulated for a long time. Moreover, the inhibitory neuron functions and the level of gamma-aminobutyric acid (GABA) are decreased and the nerve fibers are rearranged leading to touch-evoked allodynia. These pathological changes contribute to the dysfunction of sensory neurons and may also cause neuropathic pain. Additionally, the damages of

nerve tissues may cause the neuron dysfunction; demyelination leading to inhibiting neurotransmission and causing hypersensitivity, ectopic activity, and axonal cross talk. in the peripheral and central nervous system resulting in chronic pain in the patients with brachial plexus injury (Chaudakshetrin, 2004).

In addition to chronic pain, patients with brachial plexus injury post-reconstructive surgery also suffer from acute pain due to the injury of connective tissues in the affected area (Songcharoen & Mahaisavariya, 1996). Acute pain may be present in the 1<sup>st</sup> to 3<sup>rd</sup> months after the injury. In response to injuries of the tissues, chemical substances including bradykinin, prostaglandins and peptides are released to the injured sites and the C and A delta nerve endings are stimulated resulting in transmission to the dorsal horn or the sensory nuclei before entering the cerebral cortex, causing the pain perception and response. However, when external wound is healed, the release of chemical substances is reduced whilst the sensory perception continues their functions; therefore, the nociceptive pain is reduced and only the pain from dysfunction of the central nervous system still remains (Chaudakshetrin, 2004). This pathology is the etiology of chronic pain in patients with brachial plexus injury post-reconstructive surgery.

Chronic pain which arises from brachial plexus injury is intractable (Berman et al., 1996; Berman et al., 1998; Kato et al., 2006). Wynn Parry (1980) conducted a study in 122 patients with brachial plexus injury who had preganglionic for 3 to 30 years and he found that 112 of them experienced severe pain and 48 of them had persistent pain for more than three years. In 28 patients the pain abated; in 15 patients within 12 months and in 11 patients within 12 – 36 months. Kato et al. (2006) found that the pain is most severe in the first three months after the injury.

The reconstructive surgery is a treatment for patients with brachial plexus injury. The aim of the procedure is to restore the injured limb (Songcharoen & Mahaisavariya, 1996; Spinner et al., 2005), though in post-reconstructive surgery period patients may still suffer from remaining disabilities of the arms and hands because only surgery cannot restore full functions of arms and hands. In addition, there is degeneration in the injured nerves that have effect on the functioning of arms and/or hands (Choi, Novak, Mackinson & Kline, 1997; Songcharoen & Mahaisavariya, 1996). A study in 32 patients with brachial plexus injury conducted by

Choi et al. (1997) found that 75% of the patients still suffer from pain after the reconstructive surgery. Dubuisson and Kline (2002) reported that 14 out of 100 patients still suffer from severe pain after the surgery; only 3 patients reported that the pain later subsided; 5 patients reported less pain; and 6 patients still had severe pain.

Patients with brachial plexus injury post-reconstructive surgery describe the nature of their pain as continuous and it does not subside within minutes. It does not stop even for a minute either day or night and is usually severe. In general, they may experience burning pain or crushing pain in their arms or wrists periodically several times a day. However, the pain is usually decreased when the patients recover motor power. The patients feel the pain in the affected arms or hands and the symptom may occur simultaneously with the weakness of arm. The pain may be autonomic or may be caused by the movements of hands or arms (Berman et al., 1998; Kato et al., 2006).

Pain in patients with brachial plexus injury post-reconstructive surgery is a major problem because of its severity. Most patients greatly suffer from the pain. They may have to sit pressing their arms and keep their heads down most of the time. This pain is a cause of disability and it usually covers the whole paralyzed arm. Even the amputation of the affected arm does not relieve the pain (Wilkinson, Birch, & Bonney, 1993). The pain also has an impact on physical, psychological, and socio-cultural aspect of the patients as it obstructs patients' rehabilitation, leading to increased severity and disability after the surgery. The patients cannot perform activities of daily living and this decreases quality of life. It also interferes with their work as well as leisure activities (Berman et al., 1996; Kato et al., 2006).

In addition to pain, patients with brachial plexus injury also suffer from the loss of sensory perception in the injured arm due to dysfunction and aberrant regeneration of the nerve which affects the autonomic disturbance. Thus, the patients are unable to feel cold or heat and they may complain of paresthesias, numbness, and cold sensitivity (Collins, Novak, Mackinson & Weisenborn, 1996). Paralysis of the shoulder, arm and hand results from the atrophy of motor end plate and sensory receptors which are the peripheral nerve endings and they are replaced by fibrosis. As a result the muscle becomes atrophied and the nerve cells die. This pathology results in the patients' disabilities of the injured arms and hands (Kandenwein et al., 2005; Songcharoen & Mahaisavariya, 1996; Spinner et al., 2005). Nevertheless, the

reconstructive surgery has risks on the brachial plexus and may cause further damages to the connective tissues in the area of injury. It may reduce chances of spontaneous recovery due to post-operative scar affecting muscle contraction. Patients do not move their hands and the lack of the movement of hands and arms lead to joint-stiffness, which is a post-operative complication (Songcharoen & Mahaisavariya, 1996).

In addition to pain and other physical symptoms, brachial plexus injury also has psychological impact. It is found that most of the patients are men who are in their adolescents or in work-ages group (Dubison & Kline, 2002; Songcharoen & Mahaisavariya, 1996). They are concerned about their self-image and the injury may cause low self-esteem (Kim & Kang, 2003). They may also feel stress with their conditions. According to a report by Ramsey et al. (2004) patients who have visible disfigurement have high levels of psychological distress. In some patient uncertainty about hand functions in the future is a contributing factor to their stress (Gustafsson, Persson & Amilon, 2000).

For the strategies of pain management in patients with brachial plexus injury post-reconstructive surgery, Chaudakshetrin (2006) found that most patients with neuropathic pain, including patients with brachial plexus injury post-reconstructive surgery, received pharmacotherapy for the relief of their pain and took medication for at least six consecutive months. The use of marijuana is also reported for pain relief (Choi et al., 1997; Dubuison & Kline, 2002; Kato et al., 2006). Even though patients with brachial plexus injury receive sympathetic nerve blocking for pain relief, they are usually unsatisfied with outcomes of treatment (Stanton-Hick, Baron, Bous, et al., 1998). The reconstructive surgery such as intercostals nerve transfer can also reduce pain within 18 months after the surgery and close relationship between the relief from pain and return of muscle power is found (Berman et al., 1996; Berman et al., 1998). Distraction is another strategy that can help the patients to relive their pain (Kato et al., 2006). Pain with brachial plexus injury is complicated and intractable thus the management strategies require eclectic approach. Healthcare providers have to work as a team for managing the symptoms of their pain. Nevertheless, patients always look for a variety of strategies for relief of pain, other than their medical regimens depending on their experience, recommendations, announcements, advertisements, and

individual's belief (Chaudakshetrin, 2004), which may not alleviate the pain or which may even intensify the pain while incurring more medical expenses.

Nowadays, patients with brachial plexus injury post-reconstructive surgery at Siriraj Hospital receive medical care as outpatients. They stay in the hospital for only one night and they are discharged on the following day and receive a follow-up appointment at two weeks after the surgery. During the first follow-up visit, the physicians to remove the arm support from shoulder immobilizing to arm sling. The patients receive physical therapy and electrical muscular stimulation at four weeks after the surgery until they have recovered their motor power. The follow-up appointments are set up once every two weeks, until the recovery is satisfactory then the follow-ups are scheduled to every 2<sup>nd</sup> months (Songcharoen & Mahaisavariya, 1996). In general, treatment of brachial plexus injury need to be carried out and assessed for 4-5 years before final outcomes of the treatment can be determined (Songcharoen, 1987). According to the experience of researcher in providing care to patients with brachial plexus injury post-reconstructive surgery, they are treated as outpatients and examined by the surgeons who perform the surgery. They also evaluate the outcomes of treatment and provide information and advice during a brief period of time. Rarely any other healthcare providers play any role in providing care to them. For instance, nurse's role is to make appointments for the following follow-up visits, thus there may be a lack of care referral after the patients are examined by specialists.

There is an evidence that when the patients with brachial plexus injury post-reconstructive surgery are discharged from the hospital; they are likely to suffer from pain and other symptoms. Nevertheless, they may have to deal with the symptoms by themselves, or with the family members. Other symptoms such the loss of motor power and loss of sensory perception which arise from the atrophy nerve ending such as the motor end plate and sensory receptor may also occur. The loss of sensory perception may cause injuries due to excess of heat or cold. Moreover, their pain may obstruct patients' rehabilitation as muscle contracture from the post-operative scar may cause difficulties in the movement of arms and hands. As a result, the affected arms and hands may become disabled, causing psychological and socio-cultural impact on the patients due to the loss of body-image and the loss of ability to use arms

and hands. The patients may have low self-esteem and consequently leading to social isolation.

At present, most patients with brachial plexus injury post-reconstructive surgery do not receive much support from related health organizations, and most of the support they receive is prescription of medications to be taken at home but there is not any definite medical plan for the treatment of pain and rehabilitation of arms and hands function. Therefore, when patients are confronted with physical, psychological, and socio-cultural problems, they have to adjust and seek ways to eliminate or relieve such symptoms by themselves. They may also rely on advice from close people such as family members, peers, or well-wishers. This may yield positive or negative outcomes. Thus, the symptoms may be relieved, or they may also become worse. One problem is that the preparation for managing the pain and other symptoms in patients for post-operative care by healthcare providers before hospital discharge may be not sufficient. In addition, the healthcare providers may not provide information relevance to the patients experienced. This information may be necessary to help them to deal with their symptoms and solve both physical and psychological problems.

Besides, in Thailand, there is no any research which is carried out specifically to examine pain and other symptoms experienced by patients with brachial plexus injury post-reconstructive surgery or how to deal with such symptoms after being discharged from the hospital. Therefore, there is a lack of information that comes from direct experienced of patients with brachial plexus injury regarding their problems, symptoms, and strategies for the management of symptoms. For this reason, the researcher realizes the significance of a study to examine pain and other symptoms that have impact on physical, psychological, and socio-cultural aspects of the patients with brachial plexus injury post-reconstructive surgery and to study the strategies of symptom management used by these patients after they are discharged from the hospital. It is anticipated that data from this study would enable nurses and other healthcare providers to develop more insightful understanding of nature of illness and problems faced by patients with brachial plexus injury. It is also believed that learning from direct experience of patients is valuable; as such practical knowledge can be combined with scientific knowledge of healthcare providers to provide holistic care to patients with brachial plexus injury to better serve their needs. The findings of this

study would also be used as a guideline in developing a specific intervention that could be more effectively used as part of a care system for patients with brachial plexus injury in the future. Finally, findings of the study could also be used as a basis for further researches to establish a body of knowledge and understanding of the phenomenon of pain and other symptoms experienced by patients with brachial plexus injury post-reconstructive surgery as well as their symptom management strategies to a greater extent.

### **Research questions**

1. How do patients with brachial plexus injury post-reconstructive surgery perceive, evaluate, and respond to pain?
2. How do patients with brachial plexus injury post-reconstructive surgery manage symptoms of pain and how effective is each strategy?
3. How do patients with brachial plexus injury post-reconstructive surgery perceive, evaluate, and respond to other symptoms?
4. How do patients with brachial plexus injury post-reconstructive surgery manage other symptoms and how effective is each strategy?

### **Objectives of the study**

1. To evaluate the perception, evaluation, and response to pain in patients with brachial plexus injury post-reconstructive surgery
2. To examine the pain management strategies and effectiveness of each strategy in patients with brachial plexus injury post-reconstructive surgery
3. To evaluate the perception, evaluation, and response to other symptoms in patients with brachial plexus injury post-reconstructive surgery
4. To examine the other symptoms management strategies and effectiveness of each strategy in patients with brachial plexus injury post-reconstructive surgery

### **Conceptual framework**

This research is aimed to study patients' experiences of pain and other symptoms that have impact on physical, psychological and socio-cultural aspects of patients with brachial plexus injury post-reconstructive surgery. The study also

included patients' management strategies to relieve or eliminate their symptoms. The research framework is based on the symptom management model of Dodd et al. (2001). The model focuses on the patients' symptoms experiences which change the way they usually feel or behave. In general, it is an individual's perception of symptoms, evaluation of meaning of symptoms and response to symptoms. The strategies for symptom management - strategies to relieve or eliminate symptoms, vary from person to person; and each strategy may induce either positive or negative outcome.

This research investigates pain and other symptoms that patients with brachial plexus injury post-reconstructive surgery experience including their symptom management strategies and their effectiveness when they are discharged from the hospital.

The study of pain and other symptoms include the investigation of patients' perception, evaluation, and response. Perception of symptoms means patients perceived of pain and other unusual conditions relating to brachial plexus injury after they have undergone reconstructive surgery. Evaluation of symptoms means patients' consideration of the characteristics, locations, pattern, severity and cause of pain and other symptoms. Responses to symptoms comprised of the reaction to the pain and other symptoms in terms of physiological, psychological culture, socio-cultural and behavioural components. They can be considered based on the symptom's interference to activities of daily living including general activity, mood, mobility, study/work, relationship with other, rest/sleep and well-being in patients with brachial plexus injury post-reconstructive surgery. Besides, pain and other symptoms management strategies refer to management strategies applied by patients with brachial plexus injury post-reconstructive surgery including what they used to apply for managing their symptoms, who managed their symptoms and how effective each of the strategy was.

### **Scope of the study**

This study is a descriptive research designed conducted with a semi-structured interview. The aim of the study is to investigate pain and other symptoms and the management strategies used and effectiveness of each strategy in patients with

brachial plexus injury post-reconstructive surgery who are older than 15 years of age, either male or female, and who receiving follow-up treatments at the orthopedic follow-up clinic on the 1<sup>st</sup> floor of Syamindra Building, Siriraj Hospital, from June 2007 to October 2007.

### **Definition of terms**

**Pain** refers to each patients experienced of pain regarding perception, evaluation, and response, as detailed below (Dodd et al., 2001).

- Perception of pain refers to patients perceived the pain which they experienced (Dodd et al., 2001) post-reconstructive surgery.

- Evaluation of pain refers to patients' consideration and evaluation of characteristics, severity, location, pattern, and cause of pain (Dodd et al., 2001) post-reconstructive surgery.

- Response to pain refers to the physiological, psychological, socio-cultural and behavioral components of a reaction to a symptom (Dodd et al., 2001). This study can be regarded as based on the interference of pain to activities of daily living include general activity, mood, mobility, study/work, relationship with other, rest/sleep, and well-being in patients with brachial plexus injury post-reconstructive surgery.

**Pain management strategies** refers to the methods patients adopt with the perception that they will be effective at alleviating or eliminating their pain comprised of what was used to manage pain and when, where, why, and how pain was managed (Dodd et al., 2001). In this study, pain management strategies refers to the strategies particularly used by the patients with brachial plexus injury post-reconstructive surgery to relieve or eliminate pain post-reconstructive surgery including what they used to manage their symptoms, who managed their symptoms and how effective each of the strategy was.

This study investigates 3<sup>rd</sup> domains concerning pain experienced: perception of pain, evaluation of pain, and responses to pain. Data is collected with an interview questionnaire about pain, which is modified from the measure of pain in a study conducted by Khlongyant (2001). This measure is translated from the Brief Pain Inventory of the Pain Research Group at the Department of Neurology, University of Wisconsin-Medison (Cleeland, 1989). The measure of pain management strategies is

based on the conceptual framework of Dodd et al. (2001) and developed by the researcher.

**Other symptoms** refer to an individual symptom other than pain which comprised of patients perception, evaluation, and response (Dodd et al., 2001).

- Perception of other symptoms refers to patients' perception of symptoms other than pain which they experienced (Dodd et al., 2001) post-reconstructive surgery.

- Evaluation of other symptoms refers to patients' consideration of the severity and cause of symptoms other than pain (Dodd et al., 2001) post-reconstructive surgery.

- Responses to other symptoms refer to the physiological, psychological, socio-cultural and behavioral components of a reaction to a symptom (Dodd et al., 2001).

This study can be regarded as based on the symptoms other than pain. Interference to activities of daily living includes general activity, mood, mobility, study/work, relationship with other, rest/sleep, and well-being in patients with brachial plexus injury post-reconstructive surgery.

**Other symptoms management strategies** refers to the methods patients adopt with the perception that they would be effective at alleviating or eliminating their symptoms other than pain comprised of strategies which they used to manage their symptoms and when, where, why, and how their strategies were managed (Dodd et al., 2001). In this study, other symptoms management strategies refers to the strategies particularly used by the patients with brachial plexus injury post-reconstructive surgery to relieve or eliminate their symptom post-reconstructive surgery including strategies which they used to manage their symptoms, who managed their symptoms and how effective each of the strategy was.

For this research, all aspects of other symptoms experienced including perception of symptoms, evaluation of symptoms, and responses to symptoms are assessed using the other symptoms and their management questionnaire developed by the researcher and based on the conceptual model of Dodd et al. (2001).

### **Expected benefits of the study**

1. It is expected that the data will be used as baseline data in providing care to patients with brachial plexus injury post-reconstructive surgery. The findings of this

study might be used to solve problems about pain and other symptoms with relevance to patients' needs because data are collected from patients' direct experience of both symptoms and symptoms management strategies. Therefore, it provides the picture of patients as a whole and enhances the appropriateness and effectiveness of holistic approach in nursing practice.

2. It is expected that the data of this study can be used as guidelines for the improvement of nursing research quality and for the development of a new body of knowledge. The data from this study could be used as basic data for further research on patients with brachial plexus injury post-reconstructive surgery.

## **CHAPTER II**

### **LITERATURE REVIEW**

This study is descriptive research. The aim of the study is to investigate pain and other symptoms experienced and the management strategies used and effectiveness of each strategy in patients with brachial plexus injury post-reconstructive surgery. In this chapter, related literature is reviewed in the following topics:

1. Incidence of brachial plexus injury
  - 1.1 Epidemiology and etiology of brachial plexus injury
  - 1.2 The degeneration of nerve fibers after brachial plexus injury
  - 1.3 Health problems in patients with brachial plexus injury post- reconstructive surgery
2. Post-reconstructive surgery conditions in patients with brachial plexus injury post-reconstructive surgery
  - 2.1 Plans of treatment
  - 2.2 Outcomes of treatment
3. Symptom management model (Dodd et al., 2001)
4. Pain and other symptoms in patients with brachial plexus injury post-reconstructive surgery
  - 4.1 Pathology of pain and other symptoms in patients with brachial plexus injury post-reconstructive surgery
  - 4.2 Physical, psychological, and socio-cultural impacts on pain in patients with brachial plexus injury post-reconstructive surgery
5. Management strategies of pain and other symptoms in patients with brachial plexus injury post-reconstructive surgery
6. Analysis of pain and other symptoms management in patients with brachial plexus injury post- reconstructive surgery in Thailand
7. Gap in the existing body of knowledge regarding treatment for patients with brachial plexus injury post-reconstructive surgery in Thailand

## **1. Incidence of brachial plexus injury**

### **1.1 Epidemiology and etiology of brachial plexus injury**

Injuries caused by road accidents have become major public health problems in the world for decades due to high rate of incidences. They have become one of the leading 11<sup>th</sup> causes of deaths all over the world (Wook & Wolf, 2006). One of the most important causes of road accidents is an increase in the use of motorcycles. Approximately 90% of the mortality caused by road accidents occurs in developing countries where motorcycles are among the most significant means of transportation. In other words, the higher number of motorcycles results in a higher number of mortality caused by road accidents (WHO, 2006). In Thailand, the Royal Thai Police reported that the most important cause of road accidents is motorcycles, and the number of motorcycles involved in traffic accidents has increased from 41,215 in 2001 to 77,464 in 2004 (Royal Thai Police, 2005). In addition, according to traffic injury surveillance, the injuries of the extremities and pelvic bones first among different types of injuries are caused by traffic accidents (Department of Disease Control, 2006).

In addition to injuries of upper extremities which involve fracture of bones, damage of muscles and nerve can be occurred. One of the most commonly found injuries of the extremities involving nerve damage is a brachial plexus injury. Brachial plexus is a network of nerve fibers that arise from spinal nerves C5-C8 and T1. It originates from the cervical vertebrae and runs down to the shoulder, arm, hand, and fingers. When considering the causes of brachial plexus injury, it can be noted that for about a century ago and its cause was mostly obstetric. However, from 1930 until now, its major causes have become traffic accidents, especially motorcycle accidents which have been continuously increasing in numbers (Merrell & Wolfe, 2002). In particular, more than 80% of brachial plexus injury cases result from traffic accidents, especially motorcycles (Choi et al., 1997; Dubuisson & Kline, 2002; Kato et al., 2006; Sungpet et al., 1999; Songcharoen, 1995).

The evidences of increasing incidence are also found in other countries. In Lausanne, Switzerland, the number of patients with brachial plexus injury is found to be 57.6 cases per year on average (Songcharoen, 1987). Dubussion & Kline (2002) conducted a survey of 100 patients with brachial plexus injury who undergone the

surgery at a single service operation in Belgium between 1992 and 1995 and found that 27 patients had motorcycle accidents.

In Thailand, from October 1984 to October 1994, there were altogether 520 patients with brachial plexus injury, or 52 cases per year on average (Songcharoen, 1995). However, between 2002 and 2005, the number of patients with brachial plexus injury has increased to 361 cases, or 72 cases per year on average (Siriraj Hospital, 2006). Thus, it can be observed that the number of patients with brachial plexus injury tends to increase every year.

### **1.2 The degeneration in nerve fibers after brachial plexus injury**

Brachial plexus injury affect to all element of nerve, it is initially from the nerve cells to the distal for nerve fiber. The pathological effect to neuron is edema and the nucleus move to the outer part of the cells. It affects to the changes in the axonal transport system, as the neurotransmitter is decreased, but the substances related to the production of new axons are increased. If the site of injury is close to the cells body, this pathology is severer. These changes are clarify clearly approximately in 7<sup>th</sup> days follow the injury, and the death and the restoration of the neuron is visible around 4<sup>th</sup> - 6<sup>th</sup> weeks after the injury takes place, when the cells shrink and the nucleus removes to the center.

In addition, Schwann cells rapidly divide themselves. This division is highest on the 3<sup>rd</sup> day after the injury before gradually slowing down in the following week. If the reinnervation has not yet taken place, division of Schwann cells is increased once again when there is reinnervation. The lineups of the Schwann cells to be guide axon sprout to the distal stump and enable the synthesis of the trophic factor which helps nurture neuron and stimulates the generation of axons.

Moreover, the connective tissues of the distal stump changes in both characteristics and functions after the injury. The collagen regenerates at the outside of basal lamina of Schwann cells, causing the thickening of the endoneurial tube. The longer the reinnervation takes, the thicker the collagen and the narrower the endoneurial tube will become, hence a slower nerve impulse to the nerve endings. Furthermore, its effect to the proximal part of the injury associated with the degeneration of the nerves, while the distal area is afflicted with structural

deterioration of the axons, myelin sheaths, Schwann cells, and endoneurial collagen. Such pathology may affect nerve impulse to the injured nerve ending as well.

### **1.3 Health problems in patients with brachial plexus injury post reconstructive surgery**

Patients with brachial plexus injury suffer from pain due to injured nerves and related connective tissues in the area. The degeneration of injured nerves affect to neurotransmission which causes atrophy in the nerve ending such as the motor end plate and sensory receptor. It affects to the patient's loss of motor power and sensory perception, hence a limitation in arm and/or hand functions which obstructs to perform their activities of daily living. This can be temporary or permanent, depending on individual cases. Thus, some patients have to live with some physical disability after injuries.

Most of the patients with brachial plexus injury (more than 80%) are male, and they are adolescents or adults who are studying or working for developing the country (Dubuisson & Kline, 2002; Songcharoen & Mahaisavariya, 1996; Sungpet et al., 1999; Waikakul, Orapin, & Vanadurongwan, 1999). In particular, adolescents are different from adults in terms of perceived health status, which has an influence on coping with problems in life such as some adolescents may perceive that their injury has a mild effect on their lives, while others may perceive that their injury are life-threatening because they feel it affects to their self-image, hence suffering from fear, hopelessness, and unable to perform activities of daily living (Gofin, 1999). In other words, brachial plexus injury results in interfering studying, working, and social interaction. Besides, the government has burden of huge amount of medical expenses. When such injury takes place with a group of population who are key players in national development, the development of the country may be slowed down or disrupted. For this reason, brachial plexus injury has become a major public health problem in the country.

In short, brachial plexus injury mostly results from a motorcycle accident, and it generally afflicts adolescents and working males who are key players in national development. These injuries lead to degenerate in all elements of the nerves, including neuron, axons, myelin sheaths, Schwann cells, and endoneurial collagen. When such nerve gets injured, the neurotransmission to the nerve endings becomes slower, and the patients with brachial plexus injury may suffer from either temporary or permanent

disabilities. If the patients lack the opportunity to rehabilitate their arm and hand functions, they may have limitations in performing activities of daily living, hence it has effect on the patients' study, work, socialization and they may have health problems consequently.

## **2. Post-reconstructive surgery conditions in patients with brachial plexus injury**

### **post- reconstructive surgery**

#### **2.1 Plans of treatment**

For centuries, physicians have been well aware that the treatment of brachial plexus injury is difficult and complicated. Even with today's advanced technology, it is considered a major challenge for surgeons. The first attempt is recorded in 1896 by a British surgeon named William Thorburn (Songcharoen & Mahaisavariya, 1996). However, during the initial periods, the outcomes of the surgery were not consistent, so they were not well accepted. In the last decades, surgeons have tried to improve the outcomes, and it has now been accepted that reconstructive surgery is beneficial for the patients (Wynn Parry, 1980). This is partly due to advances in microsurgery which have taken place in the past two decades (Songcharoen & Mahaisavariya, 1996). At present, the type of reconstructive surgery depending on severity and the injured nerve mechanisms. It can be divided as follows:

##### **2.1.1 Open injuries**

In cases when injured artery is not involved, the surgery should be done as soon as the patients are ready and the healthcare teams responsible for surgery, such as cardiovascular surgeons, orthopedic surgeons are ready and they able to carry out the surgery. An emergency surgery is not necessary in such cases. However, if the brachial plexus injury involve injured artery, the urgent surgery to repair the artery is needed, and the reconstructive surgery should be done at the same time, if the healthcare team is available, due to the reconstructive surgery after the operation of the artery is more difficult and likely to damage the repaired artery. In the cases in which the injury is caused by gunshots or explosives with slow velocity, the nerve damage tends to result from contusion rather than tear, and surgery is not necessary, as the prognosis for spontaneous recovery for 3<sup>rd</sup>- 4<sup>th</sup> month after injury. Only when the

recovery does not take place or it is not sufficient to enable the patients to regain the use of their arms and hands the surgery is required.

### 2.1.2 Close injuries

The most common cause of close injury is road accident when the motorcyclists or passengers fall from a motorcycle and their head and shoulders hit the ground, the force separates the head from the shoulders; it is traction to different parts of the brachial plexus. If the injury is a stretch injury, the treatment involves examination of motor recovery and electro diagnostic examination to evaluate the reinnervation of the nerves, together with physiotherapy. A possible reason is the motor power can be spontaneous recovering without a surgery within 3<sup>rd</sup> -6<sup>th</sup> months. However, if reinnervation does not take place, reconstructive surgery is be needed (Kandenvein, Kretchmer, Engelhardt, & Antoniadis, 2005; Spinner et al., 2005).

Choi et al. (1997) reported that in 1997 there were 34 patients with brachial plexus injury undergone microsurgery with nerve grafting; 4 patients with shoulder arthrodesis, 4 patients with tendon transfer, 1 patient with wrist arthrodesis, and 2 required amputation. In case of rupture or avulsion of brachial plexus, reconstructive surgery should be done within 3<sup>rd</sup> months to ensure effectiveness of the procedure because after one year, muscle atrophy may occur, the motor end plate is degenerated, and the injured nerves is dead and unable to be restored (Songcharoen & Mahaisavariya, 1996; Spinner et al., 2005).

The aim of the reconstructive surgery is to restore the injured limb. The highest priority is elbow flexion, followed by stability and abduction, wrist extension/finger flexion and wrist flexion/finger extension follow next, intrinsic hand function is the last priority. The reconstructive surgery currently used to treat brachial plexus injury includes the following:

1. Neurohaphy is a repair of the damaged nerve caused by a sharp object, mostly conducted after the immediate exploration after the injury shows that the cut nerve is smooth and requires little cutting, if any, of the tissues, and the stitching can be done with very little or no tension. In general, brachial plexus injury which can be treated with neurohaphy are rather rare.

2. Neurolysis is a separation of the scarred from the nerve tissue uninjured which is done when the injury is with lesion in continuity. Neurolysis is the first step

to be taken after the exploration reveals that there is lesion in continuity. However, if the neurolysis is conducted and the surgeon finds that there are not enough uninjured nerves, other types of surgery are considered. The disadvantage of this type of surgery is that when patients have incomplete lesion, they may experience more loss of nerve functions after the surgery.

3. Nerve grafting is the use of nerve graft to connect the injured or torn nerves. It is carried out with the following indications:

- There is lesion in continuity, but after the neurolysis is conducted, it is found that the nerve damage is severe.

- There is loss of continuity, and the stump of the torn nerves is uneven and not suitable for direct stitching. In such cases, the uneven stump is completely removed until only the normal nerve tissues are left, leaving a gap between the two stumps of the torn nerve. If the gap is smaller, nerve graft is used to connect the gap based on the anatomy of the lost nerve. However, if the injury is extended with a considerable loss of nerves and a long gap between the stumps, nerve grafting according to the anatomy of the lost nerve may require too much nerve from the donor site, which may prove insufficient, hence making some stumps, especially those important for the functioning of arms, receive insufficient nerve supply. Thus, the operation outcomes may not be satisfactory.

4. Neurotization or nerve transfer, in these procedures a normal nerve with less important function is transferred to reinnervate a nerve which has an important function and has suffered irreparable damage. The nerves which are cut and transferred as the donor have to be similar to what the recipient organ needs and in a sufficient number.

## **2.2 Outcomes of treatment**

Even though patients with brachial plexus injury undergo the reconstructive surgery, however they suffer from remaining disability of the arms and hands after the surgery because the surgery is still unable to fully restore arm and hand functions (Choi et al., 1997; Songcharoen & Mahaisavariya, 1996). It may also have an effect on the innervated; because of the regeneration is slow process of approximately 1 mm/day or 1 inch/month (Songcharoen, 2006; Spinner et al., 2005). Kandenwein et al. (2005) reported on the outcomes of surgery in 134 patients with brachial plexus injury

who had the duration of post-reconstructive surgery about 6.3 months. As regards the types of surgery, neurolysis was performed with 27 patients with nerve lesion in continuity, nerve grafting was conducted with 149 patients with lesion in discontinuity, and neurotization was carried out with 67 patients with root avulsions. Moreover, the patients were followed up for at least 30 months to determine the outcome of treatment. It was found that before reconstructive surgery; only 2% of the patients had motor power grade 3 or more than according to the assessment criteria of Louisiana State University Health Sciences Center (LSUHS), and the percentage increased to 52% post-reconstructive surgery. The best outcome was bicep function as 57% of the patients had motor power at grades 3 to 5 according to the assessment criteria of the British Medical Research Council Grading System (MRC). In another study, the lung function was assessed after phrenic nerve transfer combines multiple intercostals nerve transfer. Result showed that there was permanent paralysis of the ipsilateral of upper extremities, and the lung capacity was decreased by 8%. However, after 6 months to 3 years post-reconstructive surgery, the lung capacity was increased by 11%, which improved the condition of dyspnea within 6 months post-reconstructive surgery (Ming-Lung, David, I-Feng, Janine, Jean, & Thomas, 2005). Finally, Berman et al. (1998) reported that 6/14 patients with brachial plexus injury had returning sensation during the treatment follow-up (mean 488 days), 2 patients experienced returning sensation within 6 months after the injury when shaving and the sensation was distributed along the dermatome.

In Thailand, there are evidences that the patients who undergo a nerve graft and neurolysis have good outcome (MRC grade 3) (82% and 69%, respectively), while neurotization yields good outcome in almost all patients (Songcharoen, 1995). A surgery with phrenic nerve transfer reduces the lung function within one year after the surgery, while intercostals nerve transfer can return lung function to normal within three months after the procedure. Also, the recovery of the biceps function in patients with intercostals nerve transfer is greater than those with phrenic nerve transfer (Chalidapong, Sanapanich, Kraissarin, & Bumroongkit, 2004). Waikakul et al. (1999) used the contralateral C7 to the median nerve to preserve hand functions, most of the patients experienced satisfactory recovery of the hand sensory function, but poor forearm and hand functions. It is also discovered that there is abnormality in lung

functions during the first 3<sup>rd</sup> to 6<sup>th</sup> months after the surgery. Only 29% of the patients have the motor power recovery at grade 3 in wrist and finger extensors, 48% regains sensation of the median nerve, 97% have temporary paresthesia at the median nerve which can be repaired within 2.8 months on average, and 3% have motor weakness of the donor limb (Songcharoen, Wongtrakul, Mahaisavariya, Spinner, & Rochester, 2001). Furthermore, Leechavengvong et al. (1998) reported on the use of nerve transfer in C5 and C6 avulsion which cause paralysis of the biceps, deltoid, and rotator cuff use of connecting part of the ulnar nerve to biceps motor branch spinal. It is found that the patients had bicep recovery at grade 4, are able to flex their elbow, and can lift about 0.5 to 7 kilograms of weight. The first clinical recovery is detected between the 2<sup>nd</sup> and 5<sup>th</sup> months post-reconstructive surgery, with the motor power at grade 3. Also, accessory nerves are connected to suprascapular nerves, part of ulnar nerves are connected to biceps motor branch, and long head of triceps is connected to anterior branch of the axillary nerves. It is found that all patients regained full elbow flexion. The first recovery of the biceps is detected within 3<sup>rd</sup> -6<sup>th</sup> months after the surgery, and the motor power reaches grade 3 within 5<sup>th</sup> to 11<sup>th</sup> months after the surgery. Also, the recovery of the deltoid is at either grade 3 or grade 4, and the shoulder abduction by 115 degrees (Leechavengvong et al., 2006). There is also a report on the recovery of supra spinatus muscles as detected with electromyography within 2 to 4 months post-reconstructive surgery (Sungpet, 2000).

In conclusion, we can say that nowadays the treatment in patients with brachial plexus injury depends on the severity and mechanism of the nerves injuries, including the reconstructive surgery, observation of spontaneous recovery, physiotherapy, and electrical muscular stimulation. The surgical treatment includes neurorrhaphy, neurolysis, nerve graft, and neurotization. Regarding outcome it can be observed that most of the reconstructive surgery yield only motor power grade 3, and the duration of muscle recovery and returning sensation varies depending on the types of surgery and the types of nerves used in the surgery (Songcharoen, Mahaisavariya & Jotikavanich, 1996; Spinner et al., 2005). At present, there is no any report on reconstructive surgery that results in the fully recovery of the intrinsic level of hand functions, so the ability to perform activities of daily living by the patients is limited (Songcharoen, 1987).

### **3. Symptom management model (Dodd et al., 2001)**

The symptom management model of Dodd et al. (2001) was developed from the symptom management model by Larson et al. (1999). Whether triggers are minor or severe they lead people to seek treatment. Symptom not only causes suffering, but also disturbs social functionality. Symptom management is the responsibility of patients and family members/caregivers. In addition, it is found that treatment regimens which focus on treating the cause of symptoms cannot effectively control the symptoms; therefore, concurrent symptom management is required.

According to the concept of symptom management, a symptom is defined as a subjective experience reflecting changes in biopsychosocial function, sensation or cognition of an individual. In contrast, a sign is defined as abnormality indicative of disease that is detectable by the individual or by others (Harver & Mahler, 1990 cited in Dodd et al., 2001). Both signs and symptoms are important cues that bring problems to the attention of patients and clinicians. Ideally, patients should be taught the importance of signs, which may have little relevance to the lay person until their meaning and relationship to an underlying cause is understood. The absence of signs or symptoms, however, does not necessarily imply the health and well-being of an individual. Experience of symptom is different depending on individual's perception, evaluation, and response to symptoms. In other words, symptoms are individual experiences, and observation of others may not be congruent with the patients' experiences (Larson et al., 1999). When symptoms occur, patients seek ways to deal with the symptoms to eliminate or relieve such symptoms, and this enables them to live with such symptoms and continue to live their life as normally as possible. The effectiveness of symptom management strategies depends on the accurate and precise appraisal of the symptoms based on the patients' medical history (Haworth & Dluhy, 2001 cited in Dodd et al., 2001).

The symptom management model of Dodd et al. (2001) consists of 3 main concepts; symptom experience, management strategies and outcomes. In addition, there are 3 additional domains which affect 3 main concepts: personal domain, health and illness domain, and environment domain. The symptom management model of Dodd et al. (2001) can be described as follows:

1. Symptom experience consists of: 1) Perception of symptom, refers to whether an individual notices a change from the way he or she usually feels or behaves. 2) Evaluation of symptom; people evaluate their symptoms by making judgments about the severity, cause, treatability and the effect of symptoms on their lives. 3) Response to symptom includes physiological, psychological, socio-cultural, and behavioral components.

2. Symptom management strategies refer to a dynamic process; often requiring changes in strategies overtime or in response to acceptance of the strategies devised. The goal of symptom management strategies is to avert or delay a negative outcome through biological, professional and self-care strategies. The symptom management strategies contain the specification of what (the nature of the strategy), when, where, why, how much (intervention does), to whom (recipient of intervention) and how (mode of delivery).

3. Outcomes emerge from symptom management strategies as well as from the symptom experience. The symptom outcomes dimension focuses on 8 factors; they are symptom status, functional status, self-care, cost, quality of life, emotional status, morbidity, co-morbidity and mortality.

4. Personal domain refers to personal characteristics such as occupation, gender, educational background, etc., as well as psychological characteristics, social characteristics, and physiological characteristics affect different responses to symptoms in each patient.

5. Health and illness domain risk factors, health status, morbidity, accident, disability or impairment which can affect symptoms directly and indirectly.

6. Environment domain includes: 1) Physical environment such as residence, workplace, and hospital, 2) Social environment such as social support resource and interpersonal relationship, and 3) Cultural environment such as beliefs, values, and ethics-specific, race-specific, or religion-specific practices. These environments influence on individuals' perception of illness and affect decision making to choose treatment.

Patients with brachial plexus injury post-reconstructive surgery may suffer from pain and other symptoms based on individual's experience. The symptoms may be dynamic all over time, making them live and cope with such symptoms. Symptom

management strategy is complex dynamic process, which interfere activities of daily living is part of self management, which is a process consisting of different methods depending on individuals' perception. Healthcare providers need to learn about patients' experiences of living with symptoms, especially pain which causes chronic sufferings and affects to patient's life after hospital discharge and without no or little support from healthcare team. Healthcare providers should help patients to understand the nature and effects of pain in their life so as to provide more holistic care. In this study, direct experience of patients who have suffering and their symptom management are explored. For this reason, the symptom management model of Dodd et al. (2001) is deemed appropriate.

In summary, we can say that as this study aims at collecting data directly from the patients experienced; the model of symptom management of Dodd et al. (2001) is used as a conceptual framework of the study. Symptoms and symptom management strategies of the patients are investigated including pain and other symptoms. Data regarding perception of symptom, evaluation of symptom, and response to symptom are collected, as well as symptom management strategies and their effectiveness. However, outcomes of symptom management are not included in this study.

#### **4. Pain and other symptoms in patients with brachial plexus injury post-reconstructive surgery**

##### **4.1 Pathology of pain and other symptoms in patients with brachial plexus injury post-reconstructive surgery**

Pain experienced in patients with brachial plexus injury post-reconstructive surgery may be acute and chronic, which cause the following physiological changes:

Chronic pain associated patients with brachial plexus injury results may be from the nerve root avulsion. When nerve rootlets are avulsed from the spinal cord, following traction injuries, there is degeneration of the central projections of cells in the dorsal root ganglion. Some avulsion injuries may involve damage to the spinal cord by itself, hence a loss of nerve impulse from the dorsal column to other organs. Thus, the nociception is deprivation, it affects to the loss of neurotransmission to the central nervous system. This causes de-afferentation pain. This pathology causes long-term changes in neuron functions in the spinal cord as the C-fiber and the dorsal horn

at the ganglion are continuously stimulated for a long time. Moreover, the inhibitory neuron functions and the level of gamma-aminobutyric acid (GABA) are decreased and the nerve fibers are rearranged leading to touch-evoked allodynia. This pathology contributes to the dysfunction of sensory neurons and may cause neuropathic pain. In addition, the damages of nerve tissues may cause the neuron dysfunction; demyelination thus inhibiting neurotransmission and causing hypersensitivity, ectopic activity, and axonal cross talk in the peripheral and central nervous system and patients with brachial plexus injury have chronic pain as a result. They may perceive the pain for months or years after injury (Chaudakshetrin, 2004; Privat, Allieu, Bonnel, & DeGodebout, 2001).

Acute pain in patients in brachial plexus injury post reconstructive surgery arises from the injury of connective tissue in the injured area; it may be present in the 1<sup>st</sup> to 3<sup>rd</sup> months after the injury (Chaudakshetrin, 2004). Brachial plexus injury, in addition to affecting the injured nerve, it also involves the connective tissue in injured area (Songcharoen & Mahaisavariya, 1996). In response to tissue injuries, chemical substances including bradykinin, prostaglandins and peptides are released to the injured sites and the C and A delta nerve endings are stimulated and transmitted to the dorsal horn or the sensory nuclei before entering to the cerebral cortex, causing the pain perception and response. However, when the external wound is healed, the release of chemical substances is decreased whilst the sensory perception continues their functions; therefore, the nociceptive pain is diminished and only the pain from dysfunction of the central nervous system still remains. So, the nature of neuropathic pain is chronic pain (Chaudakshetrin, 2006; Chaudakshetrin, 2004).

Pain in patients with brachial plexus injury post-reconstructive surgery varies on an individual basis. According to the patients' description their pain is continuous; it does not stop a minute either day or night. The pain is severe, and sometimes it can be felt intermittently. In general, patients may experience burning pain or crushing pain in their arms or wrists periodically several times a day, and it can take place automatically or when there is movement in the body. The pain becomes worse in cold water, cold weather. If patients have stress or concurrent illness, pain can become more severe (Kato et al., 2006). In Thailand, Chaudakshetrin (2006) conducted a retrospective study of 1,330 patients at the pain clinic of Siriraj Hospital using data

collected from medical records. Of these, 503 patients were with neuropathic pain and 46 patients were with brachial plexus injury and they described their characteristics of pain as radiating, electrical-shock like, burning, numbing and shooting.

The pain may occur immediately after injury, or within days, and is often intractable, lasting from months to the years, or even decades. Sometimes, patients may perceive the pain when the muscles or skin are pressed, or in an area unrelated to or far away from the injured organ (Chaudakshetrin, 2004; Htut, Misra, Anand, Brich, & Carlstedt, 2006). Wynn Parry (1980) conducted a study with 122 patients with pre-ganglionic brachial plexus injury from 3 to 30 years and found that 112 of them had experienced severe pain and in 48 of them it persisted for more than 3 years. In 28 patients the pain abated: 15 patients in within 12 months and 11 patients between 12 and 36 month.

In addition to, pain suffered by patients with brachial plexus injury post-reconstructive surgery, they may suffer from other symptoms which result from the wallerian degeneration of the injured nerve ending. The damages of the axon and myelin sheath cause decrease in the size of nerves, inducing differences in the size and shape of fascicles, which consist of motor, sensory, and sympathetic nerves. The fascicle endings are then incompatible and the nerves regenerate in a wrong direction, this pathology affects the regeneration, causing nerve gaps which result from the injuries, preparation of nerves for reconstructive surgery, delay in surgery after the nerves are damaged or prolonged tear of the nerves (Songcharoen & Mahaisavariya, 1996; Spinner et al., 2005). This pathology decreases the recovery of the motor and sensory due to degeneration, shrinkage, deformation of muscle fibers, or aberrant regeneration which leads to autonomic disturbance. Therefore, patients lose their sensation in the arms and hands, as well as experienced abnormality in temperature control, skin discoloring at fingertips, and dry skin (Addison, 1981 cited in Nantavinit, 2000). Besides, patients may have numbness in the distal of hand (Berman et al., 1998; Birch et al., 1998). Collins et al. (1996) carried out a study to follow up 50 patients with upper extremities peripheral nerve injuries and found that 38 of these patients suffered from persistent cold sensitivity, with 33 of them suffering from moderate to severe, these symptoms are specific conditions which generally take place within the first month after the injury. Dysfunctions of the nerves, hence a decrease in

sensation or numbness in the inner arm and palm. Likewise, Choi et al. (1997) reported that all patients lost sensation, but 22 out of 32 regained sensory perceptions within one year. Furthermore, 21 patients suffered from cold intolerance, while only 4 had normal sensory perceptions. Finally, 28 patients complained about tingling pain, and 25 had numbness.

The degeneration of the nerves after the injury may affect to motor end plates and sensory receptors which are the nerve ending, irreversible muscle atrophy due to the replaced with fascia or fat, motor end plate degeneration and neuronal death prevent meaningful reinnervation, causing loss of motor power and sensation (Kandenwein et al., 2005; Songcharoen & Mahaisavariya, 1996; Spinner et al., 2005).

In summary, we can say that patients with brachial plexus injury post-reconstructive surgery may suffer from acute pain and chronic pain, which arise from the nerve root avulsion and injury of connective tissues in the injured area and the nearby areas. In this study, only chronic pain is studied, together with other symptoms which may have been experienced by the patients such as loss of motor power and loss of sensation in the injured arm or hand, which may also cause pain.

#### **4.2 Physical, psychological, and socio-cultural impacts of pain in patients with brachial plexus injury post-reconstructive surgery**

Nerve injuries lead to the degeneration in all elements of the nerves, hence an effect on neurotransmission. In addition, the reconstructive surgery may also cause damage to connective tissues. As the surgery cannot improve and fully regain arm and/or hand functions, it may have physical, psychological, and socio-cultural impacts on patients as follows:

##### **4.2.1 Physical impacts**

Pain associated with brachial plexus injury can be severe, persistent, resistant to treatment, and intractable resulting in chronic pain (Berman et al., 1996; Berman et al., 1998; Kato et al., 2006). The affected arm tends to weakness, and the pain tends to be so severe that patients have to apply pressure on the arms, sitting with their head and face down and being unable to do activities of daily living (Wynn Parry, 1980). Most of the patients are unable to work, study, do leisure time, sleep and rest. Pain also makes them to discontinue activities and is an obstacle in rehabilitation, thus leading to further complications and more severe morbidity such as muscle

atrophy, stiff joints, disfigured joints, motor weakness and etc. (Berman et al., 1996; Kato et al., 2006). Although the functional loss of the arm is disability, pain is a major cause of disability. The involved limb is numb and paralyzed, and even amputation does not reduce the pain (Wilkinson, Birch, & Bonney, 1993).

In addition, loss of motor power affects the patients used of arms and hands. Choi et al. (1997) reported that 32 patients with brachial plexus injury suffered from complete or partial motor deficits in their fingers, wrists, elbows, and/or shoulders. Twenty-two out of these 32 patients improved movement within one year after the surgery, and 16 patients reached maximum function within four years of the initial injury. Furthermore, 11 patients reported continuing improvement even after four year, 25 of them had full of partial movement of both their shoulder and elbow at the time of study, 20 of 32 experienced full or partial return of both wrist and finger movement. Besides, the reconstructive surgery may risk the brachial plexus, and it may cause further damage, hence decrease a chance for spontaneous recovery due to scars and contracture caused by post-operative scar, which can be found in patients with brachial plexus injury post-reconstructive surgery. This can result in stiff joint, a post-operative complication making patients unable to move the arm (Songcharoen & Mahaisavariya, 1996). Gustafasson & Ahlstrom (1998) surveyed problems experienced of 91 patients with hand injury within one year and found that the problems experienced decreased during the first 3<sup>rd</sup> months but tended to remain unchanged during the rest of the year, the majority of the patients experienced slight or moderate functional limitations in the hand. Half of the patients who had returned to work reported a worse work situation and 16% were still on the sick list. One-third of all patients considered their whole life situation to be worse as a result of the injury. However, this study is carried out with patients with hand injury only, and none of the patients have brachial plexus injury. In general, patients with brachial plexus injury face with limitations in arm and hand functions as surgery is unable to help them regain functioning of the affected organs (Songcharoen, 1987). Because hands are important organs used to touch and hold objects and feel (Wattana, 1996)

#### 4.2.2 Psychological impacts

Physical impairment and morbidity may affect to psychological condition and personality of patients with brachial plexus injury post-reconstructive surgery,

resulting in negative body image (Bickenback, 1993; Chun, 1997). Patients may suffer from low self-esteem (Kim & Kang, 2003), high level of psychological distress and stress in the actual situation (Gustafsson et al., 2000; Rumsey et al., 2004). Their happiness and well-being in life also be affected. Sungpet et al. (1999) reported that, more than half of the patients (n=25) were unemployed, and near by half of them depended on their own money for medical expenses. Only 8% of them received reimbursement as the injuries occurred in private time. After the injury, the patient's private life was halted. The married patients did not have any child and the single patients remained unmarried. More than half of them lived for their functional recovery and there was no any time limit for treatment. Happy way of life was also changed. Watching television and listening to music were the common hobbies which they could have. Exercise and gardening markedly decreased due to their disabilities.

In addition, practical problems with activities of daily living and being depended on help from other for solving practical problems were stress factors in patients with hand injury. In the early stage were uncertainty about function in the future and pain were stress factors (Gustafsson et al., 2000). However this study was carried out with hand injury patients and none of the patients with brachial plexus injury. Choi et al. (1997) also reported that most patients suffered from a moderate level of stress both at home and at work. Dubinson & Kline (2002) who followed up 78 patients with brachial plexus injury after the surgery during the first three years after the surgery found that two patients committed suicide in the 12<sup>th</sup> and 14<sup>th</sup> months after the surgery. Finally, Kato et al. (2006) pointed out that psychological factors was correlation with pain relieved as patients were able to return to their work as normal tend to have a shorter duration of pain.

#### 4.2.3 Socio-cultural impacts

Socio-cultural symptoms are the patients' lack of self-confidence and low of self-esteem, which is likely when individuals experienced a decrease in ability to perform various activities and become dependent on others. Generally, patients are troubled that they may be separate from others due to the change in their body image, and their socialization skills will also be affected. Brachial plexus injuries are likely to afflict adolescents and young individuals in the working-age group (Dubuisson & Kline, 2002; Songcharoen & Mahaisavariya, 1996).

Adolescence is a period of physical, psychological and social changes that are more dramatic than at any other stage of human development. They develop the need for socialization and are eager to learn about others. They also need social acceptance (Henderson, 1999 cited in Kim & Kang, 2003). As a result, the injuries may affect their studies, works, and social interactions (Kim & Kang, 2003; Spinner et al., 2005). Choi et al. (1997) found that half of the patients with brachial plexus injury were college or university students, 31% were high school students, and 75% were working at the time of surgery. Only 54% of them were able to return to work after surgery, mostly within one year. However, 31% reported a change in jobs due to the injury and 44% were not working. Moreover, Kato et al. (2006) reported that 59.5% of the patients returned to work during the course of our study, while 40.5% did not. Choi et al. (1997) also found that 69% of the study patient felt that they were discriminated because of their injury. Of these, 82% experienced discrimination when looking for a job and had hindered career development and/or job advancement to some degree on the basis of their injury, and 73% experienced discrimination on their job. It has been reported that adolescent with physical disability gives meaning to their life when society accepts their existing problems and allows them to live a normal life by helping others as a friend or as a volunteer, creating opportunities to achieve their own goals in life. If the patients do not accept this other problems follow (Kim & Kang, 2003).

Besides, brachial plexus injury results in changes in visible disfigurement due to scars or muscle atrophy. Such abnormalities have more effects on adolescent who have great interest in their self-image, causing loss of sex appeal and anxiety (Danaidutsadeekul, 1999). This may cause patients inability to live their life in society (Spinner et al., 2005). Rumsey et al. (2004) studied psychological distress of 458 patients with visible disfigurement who sought treatment at 15 outpatient clinics. They found that the majority of difficulties are related to the problems experienced in social situation included social interactions, exposing the disfigurement to other's gaze, and displays of ignorance a negative outcome by others. However, the appearance of the hand is a minor problem before the first follow-up visit. Probably because of the hand is hidden in a bandage. However, some hand injured felt hand

discomfort in seeing the hand when the distress is changed at the first follow-up visit (Gustafsson et al., 2000).

These physical, psychological, and socio-cultural impacts may cause obstacles in rehabilitation and patients can not rehabilitate completely, hence causing further deformity in post-reconstructive surgery. The patients then suffer from disability to perform activities of daily living, decrease quality of life, disrupted work, and lack of leisure activities (Berman et al., 1996; Kato et al., 2006).

To conclude, patients with brachial plexus injury post-reconstructive surgery suffer from pain and other symptoms which may limit their abilities to perform activities of daily living, study, work, and socialize interaction. The psychological aspect of the patients may also be affected. Patients may try to find ways to manage their symptoms by themselves, but when their attempts are not successful, they may depend on others or seek help from healthcare providers.

## **5. Management strategies of pain and other symptoms in patients with brachial plexus injury post-reconstructive surgery**

### **5.1 The strategies for managing of pain and other symptoms in patients with brachial plexus injury post-reconstructive surgery**

Pain associated with brachial plexus injury is a chronic pain due to it's intractable and resistant to treatment (Berman et al., 1996; Berman et al., 1998; Kato et al. 2006). Pain management strategies in patients with brachial plexus injury are mostly scientific processes that are used by professionals. There is no specific research report on pain management strategies initiated by patients. In most of the strategies used to manage pain are pharmacological methods. Chaudakshetrin (2006) conducted a retrospective study of medical records of 1,330 patients at the pain clinic of Siriraj Hospital and found that of these 1,330 patients: 503 had neuropathic pain, and 46 were patients with brachial plexus injury. The findings showed that 79% of the patients used pharmacological to relieve their pain, and 93% of them used more than one type of medicines. The most commonly used medication was Tricyclic Anti-Depressant (TCA), followed by Gabapentin, Carbamazipine and Tramadol (77.1%, 35%, 34% and 24.3%). In addition, Berman et al. (1998) found that using opiate could relieve pain in 7 out of 11 patients. Of these, 5 patients used Carbamazipine, 2 used Amitryptyline,

with 1 experiencing side effects of the medicine, and 3 patients used marijuana, with 2 reporting that marijuana proved to be an effective pain reliever. Also, Kato et al. (2006) reported that 108 patients out of 148 patients took analgesic medication regularly for more than 6<sup>th</sup> months. These provided good relief in 16 patients, some relief in 55 patients, but were of no benefit in 37 patients. Cannabis was helpful in 30 patients (Choi et al., 1997; Dubuisson & Kline, 2002; Kato et al., 2006).

In addition to the pharmacological methods, there are other strategies to relieve pain in patients with brachial plexus injury such as sympathetic blockage which could relieve pain in patients but they were unsatisfied (Stanton-Hick, Baron, & Bous, 1998). Other strategies include motor cortex stimulation to reduce pain which was found to be successful; reduced pain in 10 out of 15 patients with peripheral nerve injuries (Saitoh et al., 2001). Transcutaneous nerve stimulation was performed on 80 patients and relieved pain to some extent in 22 of the patients. The remaining 68 patients did not have an opportunity to undergo this treatment or they refused it. Those who responded to medication were likely to find transcutaneous nerve stimulation effective (Kato et al., 2001) and spinal cord stimulation was found to be yielding satisfactory results to reduce pain in patients with brachial plexus injury (Piva, Shala, Saltari, & Gill, 2003).

The reconstructive surgery can reduce pain; patients who had surgical repaired brachial plexus had less pain than patients who did not undergo surgery (Htut et al., 2000). Berman et al. (1996) reported that in a group of 19 patients with persistent brachial plexus injury pain, surgery more than 18 months following injury, the pain was reduced in 84%. According to Kato et al. (2006), a shorter time interval between injury and nerve repair led to a greater improvement in neuropathic pain. Berman et al. (1998) found a close relationship between the relief from pain and return of muscle power (Berman et al., 1998; Kato et al., 2006). However, even though the condition is generally improved, patients still persistent some pain after the surgery. Choi et al. (1997) conducted a study and found that 75% of 32 patients with brachial plexus injury after the surgery suffered from persistent pain. Similar findings were reported by Dubuisson & Kline (2002) who found that 14 out of 100 patients with brachial plexus injury post-reconstructive surgery still suffered from severe pain. Of these,

three finally experienced no pain at all, five experienced a decrease in pain, and six continued to suffer from severe pain.

Previous study conducted aboard, reported the effects of the reconstructive surgery delay on the relief of pain after injury to brachial plexus. It was found that the most important mitigating factor was distraction, either by work, study, hobbies or conservation. Other helpful factors included warm weather and warm water. The consumption of alcohol sometimes helped and sometime increased pain (Kato et al., 2006). However, such management strategies are those used by western which may not be culturally or environmentally appropriate for those living in the eastern countries (Kitisomprayoonkul, Kladphajone, & Kovindha, 2006; Chaudakshetrin, 2006).

Pain resulting from brachial plexus injury is complicated and intractable. Thus, treatment and management of pain require combined strategies as well as cooperation of healthcare providers. However, as pain caused by brachial plexus injury is chronic pain, patients have to find various strategies to manage their pain after hospital discharge, either included in the medical regimen or not included depending on their experienced, advice, announcements, advertisements and individual's belief which may not alleviate the pain or which may even intensify it incurring more medical expenses (Chaudakshetrin, 2004).

Besides, there are other strategies that can be used to manage other symptoms which may arise from brachial plexus injury. Previous research has pointed out that most of these management strategies are administered by healthcare personnel using electrical muscular stimulation which can improve greater motor recovery than sensory return (Nicolaidis & Williams, 2001; William, 1996) and physiotherapy can improve motor atrophy (Spinner et al., 2005). Petroni, Marsavelski, Nicolic, & Cirovic (2003) investigated physical rehabilitation patients with brachial plexus injury after the surgery and found that the rehabilitative effects depend on the extent of the injury. Furthermore, the duration between the injury and the surgery has an effect on rehabilitation; that is, the shorter undergo nerve surgery, the greater the rehabilitative outcomes of the pathological arm.

In summary, we can say that pain management strategies and other symptoms management strategies are mostly administered by professional using surgery, spinal

cord stimulation, pharmacological, rehabilitation, and electrical muscular stimulation. However, these strategies may be difficult to used by the patients and may not be inappropriate for some patients. For this reason, an evaluation into patients' experience would enable healthcare providers to understand actual symptoms and problems faced by patients with brachial plexus injury post-reconstructive surgery so as to provide care to serve their needs more effectively.

## **5.2 Individuals who perform symptom management in the current healthcare system**

When brachial plexus injury take place, patients may be affected physically, psychologically, and socially, and this may affect their activities of daily living, study, work, social interaction, and quality of life. When experiencing symptoms, patients may have to deal with the symptoms by themselves, or they may seek advice from others to enable themselves to live normally with their illness (Thorne, Paterson, & Russell, 2003). The management can be explained as follows:

### **5.2.1 Self-management**

Bartholomew et al. (1993) defined self-management as behavior or action of patients and family members to reduce the effects of a chronic illness. Barlow et al. (2002) pointed out that self-management is individuals' ability to manage symptoms, treatment, and following outcomes, physically and psychologically, as well as ability to change ways of living which have become inseparable from chronic condition. The effectiveness of self-management consists of the ability to monitor the occurring condition and effects on perception, behavior, and emotion to respond to such conditions to maintain quality of life. When there is illness, individuals learn about responses to the illness, and they gain daily experience with trials and errors. They also construct a new composition of ways of living and identity based on their search for limitations or constraints of the illness to enable themselves to live normally with the illness. Generally, self-management is individuals' action to control and establish self-discipline (Kralik, Koch, Price, & Howard, 2004). Patients tend to perceive that self-care management is more complex than what is specified in the healthcare textbooks recommended by the professional. In fact, self-care management can be developed by patients when they have to live constantly with their illness. Management of a chronic condition enables individuals to develop confidence in their

knowledge and skills to manage the disease specifically in their own context rather than relying on standardized knowledge (Thorne et al., 2003). In other words self-management is one technique to manage chronic pain, and patients need to learn to control their pain by themselves rather than solely relying on the treatment provided by the professionals (Seltzer & Devor, cited in Chaudakshetrin, 2004).

### 5.2.2 Lay management

Lay management of lay persons refers to management of symptoms conducted by individuals who lack knowledge or skills related to symptoms but who are able to convince or influence patients' decision in both initial stages of illness and long-term care. In addition, lay persons have the competencies to play a role in self-management of patients. Individuals who are lay persons may be family members, relatives, monks, or respectable persons (Bartlome et al., 1992 cited in Duangjai, 1999).

Close persons of patients have a significant influence on management of symptoms or health problems. Sawatsing (2003) investigated the reasons for the use of traditional healers in rural areas in Thailand and found that traditional healers still play a major role in providing care and treatment because their treatment is simple and less complicated. In addition, they have insights into the causes of the illness, and they have assessment similar to that of the service receivers. Besides, the service receivers choose to seek care from traditional healers because they have positive experience and satisfaction with the care and treatment. It is also convenient to gain access to the traditional healer, and they receive advice and recommendations about the traditional healer's efficiency and expertise from their parents, siblings, or relatives. As for patients with brachial plexus injury, some do not seek modern treatment immediately after the injury, and others may lack continuous treatment. Instead, they seek treatment from monks or traditional healers, who may not provide the quality of care, so they lose a chance to regain functionality of the arms and/or hands (Songcharoen, 1987).

### 5.2.3 Professional management

Provider's perception is the illness resulting from dysfunction or impairment of the physical (Kleinman, 1978). The treatment provided by professional tends to emphasize medical diagnoses. For example, if the diagnosis indicates that

there is dysfunctioning, the treatment may be focused on that particular organ. In general, the modern treatment can be divided into pharmacological therapy and physical therapy (Deeviset, 1996).

Professional management is a scientific process which aims at effectively solving the symptoms that are experienced by patients. When person lives with a chronic condition, participation of professional who provide education and promote patients' clinical monitoring enables patients to have a better self-management (Holman & Legig, 2000). However, some patients are unable to perform necessary self-management continuously; they feel that the advice of provider is not practical in daily living (Thorne et al., 2003). Some patients define professional management as structured education only (Kline et al., 2004). However, the provision of quality of healthcare may be jeopardized when the evaluation of a patient's symptom by the provider or family member does not match the perception and interpretation of that symptom by the patient (Fagerhaugh & Strauss, 1997).

To sum up, pain management strategies and other symptoms management strategies consist of self-management, lay management, and professional management. A symptom management strategy depends on individuals' perception of symptoms which may affect the effectiveness of each strategy. In order to patients to develop self-management to live normally with their chronic condition, they need to understand their own specific conditions. Therefore, if provider has an understanding of patients' perception of symptoms and symptom management strategies based on symptom experienced, they would be better able to help promote symptom monitoring and enable patients to manage their symptoms more effectively.

## **6. Analysis of pain and other symptoms management in patients with brachial plexus injury post-reconstructive surgery in Thailand**

Chronic pain and other symptoms arise from brachial plexus injury are complex, and they require combining strategies. Healthcare providers have to work as a team. In addition, the treatment and care to rehabilitate the patients with brachial plexus injury post-reconstructive surgery requires various strategies and cooperation from the multidisciplinary team equipped with knowledge, skills, and expertise including surgeons, physical therapists, occupational therapists, social workers, psycho-

therapists, and nurses (Chaudakshetrin, 2004; Spinner et al., 2005). Pain and other symptoms management strategies are mostly administered by professionals who apply scientific knowledge to help patients, but this may be perceived as difficult or impractical in patients' daily life. Moreover, these strategies may involve high medical expenses and require continuity of practice. If patients do not realize the significance of the strategies and feel that they are difficult to follow, they may not be as cooperative as they should, thus rendering the treatment ineffective. Thus, cooperation between patients and professionals and recognition that patients are experts in symptom management to reduce disturbing symptoms are deemed very significant.

An analysis of care situations of patients with brachial plexus injury post-reconstructive surgery has revealed that these patients may lack immediate access to treatment and care as soon as the injuries take place. Some patients do not seek medical treatment or lack continuity of care, and they seek treatment from monks or traditional healers who are unable to offer effective treatment and care, hence causing an unnecessary permanent disability (Songcharoen, 1987). Moreover, most of the patients live in the vicinity of Bangkok or rural areas, and when they are injured, they seek medical treatment from the nearest hospital, which may lack specialists and appropriate medical equipments. It is likely the case that physicians aim at treating their musculoskeletal systems, and when such treatment is completed and the patients are unable to regain the use of their arms and hands, brachial plexus injury is finally be diagnosed. After that, patients are referred to hospitals with specialists in brachial plexus injury, which are mostly university hospitals. Such a delay in necessary treatment of brachial plexus injury may have adverse effect the effectiveness of outcome in surgery the patients finally receive.

At present, patients with brachial plexus injury post-reconstructive surgery are treated as outpatients, and they are hospitalized for only one day after the surgery and before discharge from hospital. Physicians make an appointment for a follow-up two weeks. After that, and shoulder immobilizing removes to an arm sling. Four weeks after the surgery, patients should be receiving electrical muscular stimulation and physiotherapy to rehabilitate muscles. The follow-up appointments are set up once every two weeks, until the recovery is satisfactory, when the follow-up are scheduled every two months (Songcharoen & Mahaisavariya, 1996). In general, treatment of

patients with brachial plexus injury post-reconstructive surgery need to be carried out and assessed for four to five years before final treatment outcomes can be determined (Songcharoen, 1987). According to the researcher's experience of providing care to patients with brachial plexus injury post-reconstructive surgery, it is found that they are treated as outpatients and examined by the surgeons who perform the surgical treatment, who also assess the treatment outcomes and provide information and advice during a brief period of time. Other providers play a rare role in providing care to the patients. For instance, nurses' role is to set up appointments for the following follow-up visits. Thus there may be a lack of care referral after the patients are examined by specialists.

It is worth noting that there is only one nursing research conducted with patients with brachial plexus injury post-reconstructive surgery by Nantavinit (2000) who investigated the effectiveness of a group teaching program to provide advice to patients and found that the patients showed improvement in adaptation. However, the result from this study did not apply to patients who come to the hospital for treatment or follow-ups. The reason may be patients are treated as outpatients and there is limitation in time during which patients and healthcare providers can share problems and experiences. As patients spend most of their time at home, they and their family members have to be responsible for health problems and symptoms they may face, with very little support from health organizations or healthcare team. As such, quality of care provided to this group of patients may be not considered as effective as it should be.

In conclusion, the multidisciplinary team currently plays an insufficient role in the management of symptoms and health problems of patients with brachial plexus injury post-reconstructive surgery, making care system both pre and post surgery lacking in efficiency, which may adversely affect effectiveness of the treatment and care provided to patients with brachial plexus injury.

## **7. Gap in the existing body of knowledge regarding treatment for patients with brachial plexus injury post-reconstructive surgery in Thailand**

It can be seen that patients with brachial plexus injury post-reconstructive surgery, they may suffer from chronic pain and other symptoms such as loss of

sensation, hypersensitivity, loss of motor power, etc. Most of the times, patients and their family members have to deal with these problems by themselves, with very little support or intervention from healthcare personnel. Such symptoms can affect their study, work, or activities of daily living, resulting in reduction in quality of life. In fact, management strategies of pain and other symptoms caused by brachial plexus injury requires cooperation of the professional. Because the symptoms are complex and they can obstruct rehabilitation and recovery of patients due to contracture or post-operative scars which make it difficult to move their arms and hands, resulting in functional disability of the pathological arms and hands of patients. Such disability can also cause psychological and sociological problems to patients because of the loss of body-image, stress, low self-esteem, leading to social isolation. At present, most patients with brachial plexus injury do not receive much support from related health organizations, and most of the support they receive is prescription of medications to be taken at home. There is no clear planning for treatment or management of pain and other symptoms or functional rehabilitation of patients' arms and hands.

When patients with brachial plexus injury post-reconstructive surgery have to deal with physical, psychological, and socio-cultural problems, they have to adjust themselves and seek ways to eliminate or relieve such symptoms by themselves. They may also rely on advice from close persons such as family members, peer, or well-wishers, which may yield positive or negative outcomes. Thus, the symptoms may be relieved, or they may also become worsened. One problem is that the preparation of patients for post-operative care by healthcare providers before hospital discharge may be not sufficient or relevance with pain and other symptoms patients perceive by themselves.

Besides, in Thailand, there is no any study which is carried out specifically to evaluate pain and other symptoms experienced by patients with brachial plexus injury post-reconstructive surgery or how to manage such symptoms after patients have been discharged from the hospital. Therefore, there is a lack of information that comes from direct experience of patients regarding their problems, symptoms, and management strategies of symptoms. For this reason, the researcher realized the significance of a study to examine pain and other symptoms that have physical, psychological, and socio-cultural impacts on patients with brachial plexus injury post-reconstructive

surgery and been discharged from the hospital as well as management strategies used by these patients. It is anticipated that data from this study would enable nurses and other healthcare providers to develop more insightful understanding of nature of illness and problems faced by patients with brachial plexus injury post-reconstructive surgery. It is also believed that learning from direct experience of patients is valuable; as such practical knowledge can be combined with scientific knowledge of healthcare providers to provide holistic care to patients with brachial plexus injury post-reconstructive surgery to better serve their needs. The findings of this study would also be used as a guideline in developing a specific pattern of care that can be more effectively used to devise a care system for patients with brachial plexus injury in the future. Finally, findings of the study can also be used as a basis for further research to establish a body of knowledge and understanding of the phenomenon of pain and other symptoms experienced by patients with brachial plexus injury post-reconstructive surgery as well as their symptom management strategies to a greater extent.

## **CHAPTER III**

### **METHODOLOGY**

This study is descriptive research designed aimed at investigating experienced of pain and other symptoms and the management strategies used and effectiveness of each strategy in patients with brachial plexus injury post-reconstructive surgery. The research details are as follows:

#### **Population and Sample of the Study**

The population of this study consists of patients with brachial plexus injury post-reconstructive surgery, both males and females who are 15 years old or older and who receiving follow-up treatments at the orthopedic follow-up clinic on the 1<sup>st</sup> floor of Syamindra Building, Siriraj Hospital. Sample groups are patients who have the similar criteria as the population. The sample group is selected by purposive sampling according to the following criteria.

##### **Inclusion criteria:**

1. Patients with 3 months to 10 years post-reconstructive surgery; using neurotization technique
2. Patients must be in good consciousness
3. Patients must have the ability to communicate in Thai

##### **Exclusion criteria:**

Patients with medical history of pain caused by other additional illnesses such as gout, rheumatoid or fractured bones are excluded from this study.

#### **Sample size**

To estimate the need sample size for this study, guidelines suggested by Kanchanawasri, Pityanon & Srisukho (1997) were used. Given a confidence interval as 95%, the allowable error (E) as  $\pm 10\%$  and the population (N) as infinity

(∞), the sample size in this study at least 100 patients. The final sample consisted of 107 participants.

### **Research Setting**

The data is collected at the orthopedic follow-up clinic on the 1<sup>st</sup> floor of Syamindra Building, Siriraj Hospital. There are approximately 4 patients receiving reconstructive surgery per month. The patients with brachial plexus injury post-reconstructive surgery attended follow-up visit on Tuesdays and Wednesdays of each week. There are approximately 10-20 patients per week for follow-up.

### **Research Instruments**

The instrument in this study is a questionnaire which consists of 3 main parts: 1) The demographic and clinical information 2) The pain and pain management strategies interview questionnaire and 3) The other symptoms and their management strategies interview questionnaire (see appendix).

#### **Part 1: The demographic and clinical information consists of 2 sections:**

1. Demographic characteristics: consists of gender, age, marital status, education level, occupation before and after the surgery, income and financial status.
2. Clinical characteristics: consists of the diagnosis, cause of injury, types of the injury, type of the surgery, the duration between the injury and the surgery, the duration between the surgery and the time of the data collection, number of the reconstructive surgery and motor power of the injured arm.

#### **Part 2: The pain and pain management strategies interview questionnaire.**

This questionnaire is modified from Brief Pain Inventory (short form) by Khlongyant (2001) which was translated into Thai language with permission from the Pain Research Group, Department of Neurology, at the University of Wisconsin-Medison (Cleeland, 1994). This questionnaire is used to assess pain experienced in patients with brachial plexus injury post-reconstructive surgery in 3 dimensions: 1) pain perception 2) pain evaluation and 3) pain response. The researcher added one element about neuropathic pain in the questionnaire and the questions consists mainly of the characteristics, onset, pattern and the cause of pain. Regarding pain management strategies, it is assessed using the interview questionnaire developed by the researcher

based on the conceptual model of Dodd et al. (2001). It is comprised of 11 questions as follows:

1. Pain perception consists of only 1 question: (item 1) concerning patients perceived the pain, it is a closed question.

2. The evaluation of pain comprised of 8 questions: (items 1-9). In item 1, characteristics of pain, it is an open-ended question. For item 2, location of pain is shown on pictures that patients perceive pain in the body parts both the front and back of the body. Patients will then be asked to identify the location of their pain by marking 'x' on the body parts that patients perceive the most severe pain. Item 3-6 are the numeric rating scale which assesses the severity of the pain based on the rating scale from 0 (zero) to 10 with 0 signifying no pain felt whereas 10 signifies the most severe pain experienced. The researcher added items 7, 8 and 9 to the questionnaire in which the items enquired about the onset of the pain, pattern of pain and the cause of pain. The questions are open-ended and these questions are added in order to cover all the topics concerned in this study.

3. Response to pain is comprised of 1 question (item 11) with 7 sub-questions. The question is to assess the level of pain interfere to activities of daily living including the general activity, mood, mobility, work/study, relationship with others, rest/sleep, and well-being. This question is designed as numerical rating scale ranging from 0 to 10 with 0 signifies no interference and 10 signify severe interference due to pain.

4. Pain management strategies are comprised of 1 question (item 10) with 8 sub-questions which are open-ended questions. In order to cover all the issues to be studied in this study the researcher added issues about pain management strategies such as type of pain management strategies, assistant personnel, and perception of effectiveness. For the perception of effectiveness questions are designed as numerical rating scale from 0% to 100% in which 0% is interpreted as did not alleviate the pain at all whereas 100% is interpreted as highly effective in pain alleviation.

For the interpretation of the severity of pain and pain interference, the researcher divided it into 3 levels as suggested by Serlin et al. (1995). The scale used in the interpretation is as follows:

- 1-4 points denote mild pain and a mild level of interference from pain.

5-6 points denote moderate pain and a moderate level of interference from pain.

7-10 points denote severe pain and a severe level of interference from pain.

For the interpretation of the effectiveness of pain management strategies, the researcher followed Jansoontraporn (2005) pain level criteria to use in the study of pain management in 100 patients with osteoarthritis of the knee. This questionnaire is developed based on conceptual framework by Dodd et al. (2001). The effectiveness is classified into 4 levels:

0%	means	no effectiveness
10-30%	means	mild effectiveness
40-70%	means	moderate effectiveness
80-100%	means	very effectiveness

The Brief Pain Inventory has been used in many researches. The uses of the pain assessment on cancer patients has been reported in many countries such as Vietnam, Spain, Mexico, the Philippines, England, U.S.A., France and China (American Pain Society Quality of Care Committee, 1995; Foley, 1993b; Serlin et al., 1995). Serlin et al. (1995) also used the assessment questionnaire in studies on severity of pain in cancer patients in 4 countries; namely 1,106 patients in USA, 324 patients in France, 200 patients in China and 267 in Philippines. The Cronbach's Coefficient value was tested and the severity of pain level of the patients in the studied countries was found as 0.87, 0.86, 0.86 and 0.80 respectively. And the interference of pain was reported as 0.91, 0.90, 0.91 and 0.86 respectively. Zelman, Gore Duke, Tai & Brandenbug (2005) used it in 255 diabetic patients and the Cronbach's Coefficient value in the severity of pain level and the interference of pain were both reported at 0.94.

Additionally, it has been used in 125 multiple sclerosis patients and the Cronbach's Coefficient value in the severity of pain level and the interference of pain was at 0.96 and 0.93 respectively (Osborne, Raichle, Jenson, Ehde & Kraft, 2006). Raichle, Osborne, Jenson & Cardenas (2006) used this instrument in 127 spinal cord injury patients and the Cronbach's Coefficient value in the interference of pain was reported at 0.92. However, It has been used in the assessment of pain in brachial plexus injury patient but has not been clearly reported the Cronbach's Coefficient value (McDermott, Toelle, Rowboth, Schaefer & Dukes, 2006).

In Thailand, there were also researches in which the Brief Pain Inventory was used. Khlongyant (2001) translated and used it in elderly patients in hospital and found that the Cronbach's Coefficient value in the severity of pain level and the interference of pain was at 0.82 and 0.92 respectively. Moreover, Ratthanathai (1997) modified and then tested for its reliability and validity in cancer patients. The Cronbach's Coefficient value in the severity of pain level and the interference of pain was at 0.72 and 0.81 respectively.

### **Part 3: The other symptoms and their management strategies interview questionnaire**

This questionnaire is to assess other symptoms experience in patients with brachial plexus injury post-reconstructive surgery which comprises the perception, evaluation, response of their symptoms and other symptoms management strategies. The interview questionnaire which is developed by the researcher is opened-end semi-structural and is based on the conceptual model of Dodd et al. (2001). It consists of 6 items as follow:

Concept	Sub-concept	Item list
Symptom experienced	perception of symptom	1
	evaluation of symptom	2
	response to symptom	3
Symptom management- Strategies	what, how, when, why, where	4
	who, strategies effectiveness	

The details of each question items are as follows:

1. The perception of other symptoms in patients with brachial plexus injury post-reconstructive surgery
  - After 1 months' operation do you have any symptom apart from pain? What are the symptoms?
  - What are the characteristics of symptoms?
2. The evaluation of other symptoms in patients with brachial plexus injury post-reconstructive surgery
  - How often do the symptoms occur?
  - What do you think about the cause of symptoms?

3. The response of other symptoms in patients with brachial plexus injury post-reconstructive surgery
  - Do the symptoms affect your activities of daily living such as washing, brushing, wearing clothes, taking bath, having meals? How do they affect you?
  - Do the symptoms affect your mood? How?
  - Do the symptoms affect your mobility such as commuting on public transportation? How?
  - Do the symptoms affect your study/ work/ business? How?
  - Do the symptoms affect your relationship with others? How?
  - Do the symptoms affect your sleeping pattern? How?
  - Do the symptoms affect your happiness in life? How?
4. The other symptoms management strategies in patients with brachial plexus injury post-reconstructive surgery
  - When you have the symptoms (.....), what strategies do you use in the managing that symptom? How?
  - Where the strategy and procedures did take place?
  - Who assisted you with the strategies used?
  - How often do you use those strategies?
  - Why do you use those strategies?
  - How effective are those strategies?

## **Quality of the Instruments**

### **1. Validity**

The interview questionnaires were submitted to a panel of 3 experts to comment on its content validity. The panel of experts consists of one physician specialist in patients with brachial plexus injury, a nurse lecturer expert in providing care to patients with brachial plexus injury, and a nurse specialized in providing care to patients with brachial plexus injury. The experts were validating the contents, the clarity and appropriateness of language used in the questionnaire. After the experts

were have commented, the questionnaire was then corrected in conjunction with the supervisor's suggestions.

## **2. Objectivity**

The researcher was try out the questionnaire with a sample group of 3-5 people who have similar criteria and characteristics as that of the sample group in this study. The try out was done to find out the patients' understanding and clarity of the question items, including the duration taken in answering the interview questions.

## **Protection of Human Rights**

In this study, the researcher was submitted this research proposal to ethical committee and for data collection approval to the human ethical committee at the Faculty of Medicine, Siriraj hospital. When the ethical and the approval of data collection were granted, the researcher was then proceeded with data collection at the orthopedic follow-up clinic on the 1<sup>st</sup> floor of Syamindra Building, Siriraj Hospital.

The researcher was give highest importance to the principles of individuality, benefits and risk factor. Therefore, the researcher was approach and introduces herself to the patients on an individual basis. The researcher was inform the patients of the purpose in conducting this research so that the sample group had full understanding of the research and also understands that participants in this research can freely give consent or withdraws from the study on their was. Participants were also being informed that withdrawing from the study was not affect their ongoing treatment at the hospital. If the sample group was agreed to participate in the study, they was has to sign in consent form. In the case of participants who are 15 years old or younger, the researcher asked for permission from their guardians who can give consents such as mother and /or father and/or guardian. When the sample group had problems understanding the questionnaire, the researcher was available to clarify the items in question. The researcher was taking taken permission in taking notes and recording while interviewing for the completeness of the content and to prevent the loss of data. The data obtained from this research was regarded as confidential and was only accessible by the project team leader whose access via password only. Participants' names were not entered in any interview questionnaires but only the code of the interview questionnaires was entered.

After that, the researcher was explaining the benefits and risks that might occur during the duration of the research. This research, however, was not causing any harm or risks to the participants apart from the duration of the interview. With regards to benefits, the sample group may not have direct benefit from this research but the participation of the sample group may have a benefit to the patients with similar illness to the participants. The data gathered used in rendering appropriate care to future brachial plexus patients. The findings of this study were presented as a whole and not on an individual basis in order to prevent any impact that might occur to the sample group.

### **Collection of Data**

In the data collection process, the researcher was conducted the data collection by the researcher. The interview was used. The procedures are as follows:

1. An introduction and permission for data collection letter issued by the dean of the Faculty of Graduate Studies, Mahidol University, was submitted to the director of Siriraj hospital for approval to conduct research. When ethical committee was grant from Siriraj Hospital, the researcher then introduced herself and submitted the letter to the head nurse at the orthopedic follow-up clinic on the 1<sup>st</sup> floor of Syamindra Building, Siriraj Hospital.

2. The researcher then informed the details in data collection and ask for assistance in the selection of the patients according to the criteria set out.

3. The researcher was studying the medical record of each patient and seek for patients with the criteria as set out in the population and sample group.

4. Then the researcher was introducing herself to the sample group who was waiting for their appointment with physician or who had just come out of the examining room. The researcher was then explain the purpose of the study, benefits and risks that may occur during the study, process and procedures in participating as sample group including informing about the patients' rights in participation. Patients were informed that they may withdraw from the study on their was and that was not affect the ongoing treatment at the hospital and the withdrawn can be done during the interview. The researcher was asked for permission to record the interview so as to prevent the data from getting lost. When the protection rights of the patients have been

informed, the patients was be then asked if they agree to volunteer in the study. If the patients agreed then they was be asked to give written consent by signing the consent form.

5. When the patients agreed to participate in the study, then researcher was set out to interview patients according to the following procedures:

5.1 The researcher was build up the relationships with patients with small talks or conversation on general topics with friendly manners, pay attention to patients so as to build trust and respect.

5.2 The researcher interviewed the patients in accordance to the interview questionnaires in the following order: the demographic and clinical information, the pain and pain management interview questionnaire and the other symptoms and their management strategies interview questionnaire. This process was approximately 60 minutes per one patient. Apart from recording, notes were also being taken.

5.3 After each interview, the researcher was checked if the patients showed any symptom and how the symptoms management. If the symptom are severe such as severe pain and happens frequently, or the patient is stressed out then the researcher was refer the patients to physician for further treatment. Moreover, the researcher was provided opportunities for patients to ask questions.

5.4 The researcher was deeply thank the patients for participating in the interview and was inform the patients of the end of the interview.

### **Data Analysis**

The data was statistically analyzed by the researcher as follows:

1. Frequency and percentage of gender, marital status, occupation before and after surgery, education level, financial status, income, disease diagnosis, cause of injury and type of injury was calculated.

2. Mean and standard deviation of age, the duration between the injury and the surgery, the duration between the surgery and the time of the data collection, the duration between the injury and the time of the data collection and motor power of injured arm was calculated.

3. Frequency and percentage of pain perception was calculated.

4. Mean and standard deviation of pain severity, interference of pain on

activities of daily living and effectiveness of each pain management strategy was calculated.

5. The opened-end questions including characteristics of pain, onset of pain, location of pain, cause of pain, type of pain management strategies, other symptoms and their management strategies were analyzed by using content analysis according to the following procedures (Jirawattanakul, 2005):

- 5.1 Interview data was transcribed (word by word).
- 5.2 The data was categorized according to the pattern that exists in the data.
- 5.3 Interview data was coded according to the concepts and framework in each open-ended question.
- 5.4 The data was then interpreted, categorized and re-labeled so as to cover all the concepts as revealed through the interview.
- 5.5 The categorized data was then being statistically calculated using frequency and percentage.

## **CHAPTER IV**

### **RESULTS**

This study is a descriptive research design that aim to investigate pain and other symptoms experienced and the management strategies used and effectiveness of each strategy in patients with brachial plexus injury post-reconstructive surgery who receiving follow-up treatments at the orthopedic follow-up clinic on the 1<sup>st</sup> floor of Syamindra Building, Siriraj Hospital, from June to October 2007. One hundred and eleven patients who met the inclusion criteria were approached and four patients refused to participate in study because they were not convenient about the period of time of interview. The total sample was composed of 107 patients with brachial plexus injury post-reconstructive surgery. The results are presented in 3 parts as follows:

**Part 1: The demographic and clinical information (Table 1-6)**

**Part 2: Pain experienced (Table 7-16)**

- 2.1 Perception of pain
- 2.2 Evaluation of pain; characteristics, location, pattern, onset, cause and severity of the pain
- 2.3 Responses to pain; pain interferes activities of daily living (ADLs)
- 2.4 Pain management strategies; the strategies that were used for eliminating their pain by the patients, assistant personnel and effectiveness of each strategy

**Part 3: Other Symptoms experience (Table 17-24)**

- 3.1 Perception of other symptoms
- 3.2 Evaluation of other symptoms; perception of cause of symptoms
- 3.3 Responses to other symptoms; other symptoms interferes activities of daily living (ADLs)
- 3.4 Other symptoms management strategies; the strategies that were used for eliminating their symptoms by the patients, assistant personnel and their effectiveness of each strategy

**Part 1: The demographic and clinical information****Table 1:** Frequency and percentage of patients with brachial plexus injury post-reconstructive surgery classified by demographic and clinical characteristic (n=107)

Demographic and Clinical Characteristic	f(%)
<b>Gender</b>	
Male	98(91.6)
Female	9(8.4)
<b>Marital status</b>	
Single	70(65.4)
Married	31(29.0)
Widowed/separated	5(5.6)
<b>Age (years old)</b>	
≤ 20	13(12.1)
21-25	24(2.4)
26-49	65(60.7)
≥ 50	5(4.7)
(Min = 17, Max = 60, Mean±S.D = 30.40±9.10)	
<b>Education level</b>	
Primary	15(14.0)
Secondary	50(46.8)
Diploma or equivalent	22(20.6)
Bachelor	20(18.7)
<b>Cause of injury</b>	
Motorcycle accidents	102(95.3)
Car accidents	5(4.7)

The demographic characteristics of patients are presented in table 1. It reveals that the majority of patient was male (91.6%). The mean±SD of age was 30.40±9.10 years, most of them aged between 26 and 49 years followed by 21 and 25 years and less than and equal 20 years, respectively. Most of the patients were single persons

(65.4%) and the education level was reported as secondary, diploma or equivalent and bachelor, respectively. The major cause of injury was motorcycle accidents at 95.3%; only 4.7% of them were car accidents.

**Table 2:** Mean and standard deviation of patients with brachial plexus injury post-reconstructive surgery classified by clinical characteristic (n=107)

Clinical characteristic	min-max (months)	mode (months)	mean±S.D (months)
The duration of surgery*	1-137	6	16.63±29.66
The duration of post-surgery**	3-129	10	32.67±28.90
The duration of illness***	4-198	18	49.43±43.75

\* The duration between the injury and the surgery

\*\* The duration between the surgery and the time of the data collection

\*\*\* The duration between the injury and the time of the data collection

Clinical characteristic of patients are presented in Table 2. The result in this study found that the mean score duration of surgery was 16.63±29.66 months and mode was 6 months, the mean score duration of post-surgery was 32.67±28.90 months and mode was 10 months. Finally, the mean score duration of illness was 49.43±43.75 months and mode was 18 months.

**Table 3:** Frequency and percentage of patients with brachial plexus injury post-reconstructive surgery classified by employment before injury and after injury (n=107)

Employment	Before injury f(%)	After injury f(%)
<b>Yes</b>	<b>79(73.8)</b>	<b>58(54.2)</b>
Employee	56(52.3)	33(30.8)
Government officer	11(10.3)	10(9.3)
Business owner	6(5.6)	10(9.3)
Agriculture	6(5.6)	5(4.7)
<b>No</b>	<b>28(26.2)</b>	<b>49(45.8)</b>

The employments before injury and after injury of the patients are presented in table 3. The majority of the patients had employment before injury (73.8%) and this decreased after injury (54.2%).

Among the 79 patients who had employment before injury, most of them worked as employee followed by government officer, business owner and agriculture.

As a result in this study, the percentage of unemployed patients before injury was 26.2% and this increased after injury to 45.8%.

**Table 4:** Frequency and percentage of patients with brachial plexus injury post-reconstructive surgery classified by financial status, age and employment after injury (n=107)

Financial status	Employment after injury	Age (years old)				Total f(%)
		≤20 f(%)	21-25 f(%)	26-49 f(%)	≥50 f(%)	
Enough	Business owner	-	3(2.8)	6(5.6)	-	<b>9(8.4)</b>
	Employee	1(0.9)	3(2.8)	22(18.7)	1(0.9)	<b>26(24.3)</b>
	Agriculture	-	2(1.9)	-	-	<b>2(1.9)</b>
	Government officer	-	1(0.9)	6(5.6)	-	<b>7(6.5)</b>
	Unemployed	10(9.3)	12(11.2)	16(15.0)	3(2.8)	<b>41(38.3)</b>
<b>Total</b>		<b>11(10.3)</b>	<b>21(19.6)</b>	<b>50(46.7)</b>	<b>4(3.7)</b>	<b>82(76.6)</b>
Not Enough	Employee	1(0.9)	1(0.9)	5(4.7)	-	<b>7(6.5)</b>
	Agriculture	-	-	2(1.9)	1(0.9)	<b>3(2.8)</b>
	Government officer	-	1(0.9)	2(1.9)	-	<b>3(2.8)</b>
	Unemployed	1(0.9)	1(0.9)	6(5.6)	-	<b>8(7.5)</b>
<b>Total</b>		<b>2(1.9)</b>	<b>3(2.8)</b>	<b>15(14.0)</b>	<b>1(0.9)</b>	<b>21(19.6)</b>

According to financial status, employment after injury and age are presented in table 4. The study found that most of the patients had enough income to bear the expense (76.6%) and the minority of the patients did not have enough income to bear the expense (19.6%).

As a result this study found that most of the patients who had enough income to bear the expense were age between 26 and 49 years and unemployed patients.

For the patients who did not have enough income to bear the expense, most of them were age between 26 and 49 years and unemployed patients.

**Table 5:** Frequency and percentage of patients with brachial plexus injury post-reconstructive surgery classified by type of injury and motor power

Motor power*	Type of injury	Muscle			
		Deltoid f(%)	Biceps f(%)	Wrist f(%)	Finger f(%)
MRC<3	Upper arm type (n=27)	-	3(11.1)	1(3.7)	-
	Total arm type (n=80)	4(5.0)	16(20.0)	7(8.8)	7(8.8)
MRC≥3	Upper arm type (n=27)	6(22.2)	19(70.4)	2(7.4)	1(3.7)
	Total arm type (n=80)	11(13.8)	35(43.8)	9(11.3)	6(7.5)

\*Motor power classified according to British Medical Research Council (MRC)

The motor recovery post-reconstructive surgery of the patients is presented in table 5. The study revealed that the best motor recovery was biceps followed by deltoid, wrist and finger respectively. This study found that patients with upper arm type had motor recovery greater than total arm type patients.

**Table 6:** Frequency and percentage of patients with brachial plexus injury post-reconstructive surgery classified by performance to the medical plan, type of injury and duration of post-surgery (n=107)

Medical plan	Upper arm type (n=27)				Total arm type (n=80)			
	Duration of post-surgery (months)				Duration of post-surgery (months)			
	≤12	13-36	>36	<b>Total</b>	≤12	13-36	>36	<b>Total</b>
	f(%)	f(%)	f(%)	<b>f(%)</b>	f(%)	f(%)	f(%)	<b>f(%)</b>
<b>EMS*</b>								
No	3(2.8)	5(4.7)	4(3.7)	<b>12(11.2)</b>	5(4.7)	7(6.5)	15(14.0)	<b>27(25.2)</b>
Yes	7(6.5)	5(4.7)	3(2.8)	<b>15(14.0)</b>	20(18.7)	16(15.0)	17(15.9)	<b>53(49.5)</b>
<b>Total</b>	<b>10(9.3)</b>	<b>10(9.3)</b>	<b>7(6.5)</b>	<b>27(25.2)</b>	<b>25(23.4)</b>	<b>23(21.5)</b>	<b>32(29.9)</b>	<b>80(74.8)</b>
<b>PT**</b>								
No	4(3.7)	4(3.7)	4(3.7)	<b>12(11.2)</b>	8(7.5)	9(8.4)	12(11.2)	<b>29(27.1)</b>
Yes	6(5.6)	6(5.6)	3(2.8)	<b>15(14.0)</b>	17(15.9)	14(13.1)	20(18.7)	<b>51(47.7)</b>
<b>Total</b>	<b>10(9.3)</b>	<b>10(9.3)</b>	<b>7(6.5)</b>	<b>27(25.2)</b>	<b>25(23.4)</b>	<b>23(21.5)</b>	<b>32(29.9)</b>	<b>80(74.8)</b>
<b>Pain medication</b>								
No	9(8.4)	9(8.4)	2(1.9)	<b>20(18.7)</b>	19(17.8)	20(18.7)	22(20.6)	<b>61(57.0)</b>
Yes	1(0.9)	1(0.9)	5(4.7)	<b>7(6.5)</b>	6(5.6)	3(2.8)	10(9.3)	<b>19(17.8)</b>
<b>Total</b>	<b>10(9.3)</b>	<b>10(9.3)</b>	<b>7(6.5)</b>	<b>27(25.2)</b>	<b>25(23.4)</b>	<b>23(21.5)</b>	<b>32(29.9)</b>	<b>80(74.8)</b>

\*electrical muscular stimulation    \*\*physiotherapy

The performance of a medical plan, type of injury and duration of post-surgery of the patients are presented in table 6. It is found that the majority of the patient was total arm type patients at 74.8% and 25.2% were upper arm type patients.

Among 80 patients with total arm type, most of them were receiving EMS and PT (49.5% and 47.7%, respectively), 57.0% of them reported for not receiving any pain medication.

Among 27 patients with upper arm type, most of them were receiving EMS, PT and 18.7% of them reported for not receiving any pain medication.

## Part 2 – Pain experienced

### 2.1 Perception of pain

**Table 7:** Frequency and percentage of patients with brachial plexus injury post-reconstructive surgery classified by pain perception, age and type of injury (n=107)

Pain perception	Type of injury	Age (years)				Total
		≤20	21-25	26-49	≥50	
		f(%)	f(%)	f(%)	f(%)	f(%)
Pain	Upper arm type	1(0.9)	8(7.5)	12(11.2)	4(3.7)	25(23.4)
	Total arm type	10(9.3)	15(14.0)	47(43.9)	1(0.9)	73(68.2)
<b>Total</b>		<b>11(10.3)</b>	<b>23(21.5)</b>	<b>59(55.1)</b>	<b>5(4.7)</b>	<b>98(91.6)</b>
Not pain	Upper arm type	1(0.9)	-	1(0.9)	-	2(1.9)
	Total arm type	1(0.9)	1(0.9)	5(4.7)	-	7(6.5)
<b>Total</b>		<b>2(1.9)</b>	<b>1(0.9)</b>	<b>6(5.6)</b>	<b>-</b>	<b>9(8.4)</b>

The perception of pain, type of injury and age of the patients are presented in table 7. It is found that 91.6% of the patients had pain experience. Most of them were total arm type patients (68.2%) with aged between 26 and 49 years followed by 21 and 45 years and less than and equal 20 years. For 24.2% were upper arm type patients.

For 8.4% of the patients had not pain experience; of these, most of them were total arm type patients and aged between 26 and 49 years.

### 2.2 Evaluation of pain; characteristics, location, pattern, onset, cause and severity of pain

For the data of pain onset and pattern of pain; the study found that 60.2% of the patients perceived pain before surgery and 39.8%, perceived pain after surgery. For 67.3% of the patients described pattern of pain as continuous and 32.7% was intermittent.

**Table 8:** Frequency and percentage of patients with brachial plexus injury post-reconstructive surgery classified by characteristics of pain and pattern of pain (n=98)

Characteristics of pain*	Pattern of pain		Total f(%)
	Continuous f(%)	Intermittent f(%)	
<b>Spontaneous pain characteristics</b>			<b>75(76.5)</b>
Crushing pain	18(18.4)	5(5.1)	23(23.5)
Electrical-like pain	19(19.4)	3(3.1)	22(22.4)
Shooting pain	5(5.1)	6(6.1)	11(11.2)
Sharp pain	5(5.1)	5(5.1)	10(10.2)
Burning pain	6(6.1)	3(3.1)	9(9.2)
<b>Abnormal sensation characteristics</b>			<b>33(33.7)</b>
Numbing pain	8(8.2)	11(11.2)	19(19.4)
Pin-and-needles sensations pain	6(6.1)	8(8.2)	14(14.3)
<b>Stimulation-evoke pain characteristics</b>			<b>6(6.1)</b>
Allodynia**	6(6.1)	-	6(6.1)
<b>Other characteristics</b>			<b>12(12.2)</b>
Cramp pain like	5(5.1)	2(2.0)	7(7.1)
Heavy pain	2(2.0)	1(1.0)	3(3.1)
Aching pain	-	2(2.0)	2(2.0)

\*One patient reported more than one answer

\*\* *Pain* due to a stimulus that does not normally provoke pain (Dworkin, 2002)

It can be noticed from table 8; the study found that the characteristics of pain was clarified to 4 groups as 1) spontaneous pain characteristics 2) abnormal sensation characteristics 3) stimulation-evoke pain characteristics and 4) other characteristics (76.5%, 33.7%, 6.1% and 12.2%, respectively).

Most of the patients described characteristics of pain were crushing pain followed by electrical-like pain, numbing pain, pin-and-needles sensations pain and shooting pain.

**Table 9:** Frequency and percentage of patients with brachial plexus injury post-reconstructive surgery classified by location of pain and type of injury (n=98)

Location of pain*	Type of injury		Total
	Upper arm type	Total arm type	
	f(%)	f(%)	f(%)
Whole arm	13(13.3)	43(43.9)	56(57.1)
Hand	7(7.1)	28(28.6)	35(35.7)
Forearm	3(3.1)	18(18.4)	21(21.4)
Distal-arm	7(7.1)	2(2.0)	9(9.2)
Trunk	1(1.0)	-	1(1.0)

\*One patient reported more than one answer

The location of pain is presented in table 9. The study revealed that most of the patients (in both groups; total arm type and upper arm type patients) perceived the pain location in the whole arm followed by hand and forearm.

**Table10:** Mean and standard deviation of patients with brachial plexus injury post-reconstructive surgery classified by pain severity and age (n=98)

Age (years old)	Pain severity			
	most pain	least pain	average pain	current pain
	mean±SD	mean±SD	mean±SD	mean±SD
≤20	5.55±2.24	1.09±1.92	4.36±1.91	2.18±2.68
21-25	6.52±2.35	2.17±1.95	4.39±2.02	1.96±2.31
26-49	7.41±1.98	2.58±1.79	5.20±1.88	3.24±2.40
≥50	7.20±2.28	2.60±3.29	4.60±1.67	3.00±2.12

The severity of pain in the patients is presented in table 10. It is found that the mean score level of pain severity at the time of the data collection (current pain) in all of the patients was mild. It was the highest in patients with age between 26 and 49 years followed by older than and equal 50 years and less than and equal 20 years.

**Table 11:** Mean and standard deviation of patients with brachial plexus injury post-reconstructive surgery classified by pain severity, type of injury and motor power of biceps (n=98)

Clinical characteristic	Pain severity			
	most pain mean±SD	least pain mean±SD	average pain mean±SD	current pain mean±SD
<b>Motor power of biceps</b>				
MRC<3	6.83±1.86	2.72±2.35	5.22±1.90	3.56±2.98
MRC≥3	6.94±2.40	2.26±2.06	5.23±2.05	2.77±2.38
<b>Type of injury</b>				
Upper arm type	6.00±2.43	2.12±2.68	4.72±2.30	2.64±2.84
Total arm type	7.32±1.96	2.38±1.66	4.95±1.79	2.86±2.29

The severity of pain in the patients is presented in table 11. The study revealed that the mean score level of pain severity (current pain) in the all of the patients was mild. It was the highest in patients who had MRC<3 and total arm type patients.

**Table 12:** Frequency and percentage of patients with brachial plexus injury post-reconstructive surgery classified by perceived cause of pain (n=98)

Perceived cause of pain *	f (%)
- Cold weather/cold water	38(38.8)
- No particular primary cause of pain or inactivity	36(36.7)
- Air blow/pat/touch	19(17.6)
- More using the arm/heavy lifting/arm exercise	14(14.3)
- Muscle stretching/handful/elbow flexion/ to compress on arm/squeezing arm	13(13.3)
- Stop moving arm/hanging arm/lacking of physical therapy	11(11.2)
- Fever/debility	11(11.2)
- Not to do electrical stimulation	4(4.1)
- Stress	3(3.1)
- Eating pickles /Alcohol consumption	3(3.1)
- Doing the electrical stimulation	2(2.0)
- Having a period of menstruation	1(1.0)

\*One patient reported more than one answer

The perceived causes of pain by patients experienced are presented in table 12. The study revealed that the most common causes of pain were cold weather and cold water followed by no particular primary cause of pain or inactivity, air blow/pat/touch, more using the arm/heavy lifting/arm exercise and muscle stretching/handful/elbow flexion/ to compress on arm/squeezing arm.

### 2.3 Responses to pain; pain interferes ADLs

**Table 13:** Mean and standard deviation of patients with brachial plexus injury post-reconstructive surgery classified by pain interferes ADLs and age (n=98)

Interferes ADLs	Age (years old)			
	≤20 mean±SD	21-25 mean±SD	26-49 mean±SD	≥50 mean±SD
General activity	2.36±2.58	3.35±2.96	4.22±3.41	4.00±3.81
Mood	3.18±3.23	4.09±3.03	4.63±3.24	5.00±3.81
Mobility	0.82±1.66	2.43±2.73	3.19±3.10	2.60±3.98
Work/study	2.18±2.18	3.30±2.93	4.10±3.18	3.40±4.67
Relationship with other	1.09±3.01	0.65±1.82	2.78±3.17	1.60±3.58
Rest/sleep	2.64±2.91	4.22±3.25	4.64±3.38	2.40±3.29
Well-being	3.27±3.04	3.48±3.0	4.49±3.26	5.00±4.80

The pain responses classified by ages are presented in table 13. The study revealed that the mean score of pain interference was 0 to 5 on the 0-10 interference score in all of the patients. The mean score level was mild to moderate in all area of ADLs including general activity, mood, mobility, work/study, relationship with other, rest/sleep and well-being.

When considering each area of ADLs, the study revealed that the highest mean score of the affected areas; general activity, mobility, work/study, relationship with other and rest/sleep were patients with age between 26 and 49 years old. Finally the highest mean score of the affected areas as mood and well-being were patients with age more than and equal 50 years.

**Table 14:** Mean and standard deviation of patients with brachial plexus injury post-reconstructive surgery classified by the pain interferes ADLs and duration of illness (n=98)

Interferes ADLs	Duration of illness (months)		
	≤12 mean±SD	13-24 mean±SD	>24 mean±SD
General activity	3.67±2.87	3.15±3.63	4.17±3.15
Mood	4.42±2.58	4.12±3.41	4.47±3.26
Mobility	2.08±2.35	2.58±3.04	2.88±3.13
Work/study	4.08±2.71	3.50±3.36	3.71±3.14
Relationship with other	2.83±3.74	1.77±3.09	2.02±2.87
Rest/sleep	3.58±2.88	4.65±3.62	4.20±3.30
Well-being	4.50±3.15	3.62±2.99	4.20±3.35

The responses to pain classified by the duration of illness are presented in table 14. As a result, the mean score level of pain interference was mild in all area of ADLs.

When considering in each area of ADLs, the study found that the highest mean score of the affected areas; general activity, mood and mobility were patients who had the duration of illness more than 24 months. In the part of mood, work/study, relationship with other and well-being; the study revealed that the highest mean score was patients who had duration of illness less than 12 months. Only rest/sleep area, the study found the highest mean score was patients who had duration of illness 13 and 24 months.

## 2.4 Pain management strategies; the strategies that used for eliminating their pain by the patients, assistant personnel and their effectiveness of each strategy

**Table 15:** Frequency and percentage of patients with brachial plexus injury post-reconstructive surgery classified by type of pain management strategies and age (n=98)

Type of management strategies*	Age(years old)				Total f(%)
	≤20 f(%)	21-25 f(%)	26-49 f(%)	≥50 f(%)	
Did not try to manage	8(8.2)	11(11.2)	26(26.5)	1(1.0)	<b>46(46.9)</b>
Massage	4(4.1)	8(8.2)	10(10.2)	1(1.0)	<b>23(23.5)</b>
Use of medicines purchased by themselves	1(1.0)	4(4.1)	15(15.3)	-	<b>20(20.4)</b>
Passive exercise by uninjured hand	1(1.0)	3(3.1)	11(11.2)	1(1.0)	<b>16(16.3)</b>
Acupressure	-	4(4.1)	10(10.2)	2(2.0)	<b>16(16.3)</b>
Active exercise	1(1.0)	1(1.0)	6(6.1)	1(1.0)	<b>9(9.2)</b>
Change position	-	2(2.0)	5(5.1)	-	<b>7(7.1)</b>
Relaxation/distraction	-	-	5(5.1)	1(1.0)	<b>6(6.1)</b>
Heat therapy	-	2(2.0)	3(3.1)	1(1.0)	<b>6(6.1)</b>
Electrical muscular stimulation	-	1(1.0)	3(3.1)	1(1.0)	<b>5(5.1)</b>
Medications by physician	1(1.0)	2(2.0)	-	-	<b>3(3.1)</b>
Physiotherapy	-	1(1.0)	1(1.0)	1(1.0)	<b>3(3.1)</b>
Electrical shock	-	1(1.0)	-	-	<b>1(1.0)</b>
Alcohol consumption	-	1(1.0)	-	-	<b>1(1.0)</b>
To bash the arm	-	1(1.0)	-	-	<b>1(1.0)</b>

\*One patient reported more than one answer

The pain management strategies in patients are presented in table 15. The study revealed that nearly half of the patients did not try to manage their pain (46.9%). Of these, 26.5% reported that age between 26 and 49 years, 11.2% were patients with 21 and 25 years and 8.2% were less than and equal 20 years patients, respectively.

It is found in this study that the patients who managed their pain also used combination strategies; the study found that the first 3 strategies used by patients were

massage followed by use of medicines purchased by themselves and passive exercise by uninjured hand.

Electrical muscular stimulation, physiotherapy and medications by physician were the strategies in medical regimen; the study found that the patients used those strategies only 5.1%, 3.1% and 3.1%, respectively. In addition, other strategies such as electrical shock, alcohol consumption and bashing the arm were used by the patients with age between 21 and 25 years only.

**Table 16:** Frequency and percentage of patients with brachial plexus injury post-reconstructive surgery classified by type of pain management strategies, assistant personnel and perceived level of effectiveness (n=98)

Type of management strategies*	Assistant personnel			Perceived level of effectiveness	
	professional	family member	patient	poor (0%-30%)	good (40%-100%)
	f(%)	f(%)	f(%)	f(%)	f(%)
Massage	-	2(2.0)	21(21.4)	3(3.1)	20(20.4)
use of medicines purchased by themselves	-	-	20(20.4)	10(10.2)	10(10.2)
Passive exercise by uninjured hand	-	1(1.0)	15(15.3)	2(2.0)	14(14.3)
Acupressure	-	-	16(16.3)	2(2.0)	14(14.3)
Active exercise	-	-	9(9.2)	-	9(9.2)
Change position	-	-	7(7.1)	2(2.0)	5(5.1)
Relaxation/distraction	-	-	6(6.1)	-	6(6.1)
Heat therapy	-	1(1.0)	5(5.1)	1(1.0)	5(5.1)
Electrical muscular stimulation	-	-	5(5.1)	-	5(5.1)
Medication by physician	-	-	3(3.1)	-	3(3.1)
Physiotherapy	1(1.0)	-	2(2.0)	-	3(3.1)
Electrical shock	-	-	1(1.0)	1(1.0)	-
Alcohol consumption	-	-	1(1.0)	-	1(1.0)
To bash the arm	-	-	1(1.0)	1(0.9)	-

\*One patient reported more than one answer

The assistant personnel and perceived level of effectiveness of each strategy in the patients are presented in table 16. The study found that most of the patients manage their pain by themselves followed by assistance from family members and professionals, respectively.

For the effectiveness strategies perceived by patients perceived, the study showed that massage was the most effective strategy followed by passive exercise by uninjured hand, acupuncture, use of medicines purchased by them and active exercise.

Besides, a result of this study showed the interesting point that use of medicines purchased by them was the second strategy used by patients to manage their pain. For 10.2% of the patients reported the level of effectiveness was poor.

In addition, the pain management strategies in medical regimen as electrical muscular stimulation, physiotherapy and medication by physician the study revealed that all of the patients who used these strategies perceived the level of effectiveness as good.

**Part 3 – Other symptoms experienced**

**3.1 Perception of other symptoms**

**Table 17:** Frequency and percentage of patients with brachial plexus injury post-reconstructive surgery classified by perception of symptoms and duration of post-surgery (n=107)

Perception of symptom	Duration of post-surgery (months)			Total f(%)	Type of injury	
	≤3	4-12	>12		Upper arm	Total arm
	f(%)	f(%)	f(%)		f(%)	f(%)
<b>No symptom</b>	6(5.6)	4(3.7)	7(6.5)	<b>17(17.3)</b>	2(1.9)	15(14.1)
<b>Had symptom*</b>	29(27.1)	29(27.1)	32(29.9)	<b>90(84.1)</b>	25(23.4)	65(60.7)
<b>-Physical finding</b>						
<b>About motor end plate change</b>				<b>74(83.0)</b>		
Loss of motor power	20(22.2)	23(25.6)	24(26.7)	<b>67(74.4)</b>	17(18.9)	51(56.7)
Muscle exhausted	2(2.2)	2(2.2)	1(1.1)	<b>5(5.5)</b>	-	5(5.5)
Muscle atrophy	-	1(1.1)	-	<b>2(2.2)</b>	-	1(1.1)
<b>About sensory receptor change</b>				<b>33(36.7)</b>		
Numbness	15(16.7)	5(5.5)	9(10.0)	<b>29(32.2)</b>	9(10.0)	20(22.2)
Itchy	-	1(1.1)	-	<b>1(1.1)</b>	-	1(1.1)
Muscle spasm	1(1.1)	1(1.1)	1(1.1)	<b>3(3.3)</b>	1(1.1)	2(2.2)
<b>About complication post- surgery</b>				<b>6(6.7)</b>		
Disfigurement	-	2(2.2)	1(1.1)	<b>3(3.3)</b>	3(3.3)	-
Joint-stiffness	-	1(1.1)	2(2.2)	<b>3(3.3)</b>	1(1.1)	2(2.2)
<b>About sympathetic system change</b>				<b>1(1.1)</b>		
Sudation in hand when worked to hard	1(1.1)	1(1.1)	-	<b>1(1.1)</b>	-	1(1.1)
<b>-Psychological symptom</b>				<b>24(26.6)</b>		
Stress	3(3.3)	9(10.0)	1(1.1)	<b>13(13.3)</b>	4(4.4)	9(10.0)
Low self-esteem	2(2.2)	7(7.8)	2(2.2)	<b>11(10.0)</b>	5(5.6)	6(6.7)

\*One patient reported more than one answer

Other symptoms experienced by patients are presented in table 17. Most of the patients had other symptoms experience at 84.1% and only 17.3% of patients had not any experience of other symptoms.

Symptoms arisen from motor end plate changed were cited as the other symptoms experienced in 83.0% of cases, 36.7% of the patients said that they had symptoms arisen from sensory receptor changed experience and 26.6% of the patients said that they had psychological symptoms experience.

The other common symptoms experienced were loss of motor power, numbness, stress, low self-esteem and muscle exhausted, respectively.

In addition this study found that most of patients with 4-12 months post-reconstructive surgery had the psychological symptoms.

### 3.2 Evaluation of other symptoms; perceived cause of symptoms

**Table 18:** Frequency and percentage of patients with brachial plexus injury post-reconstructive surgery classified by other symptoms and perceived cause of symptoms (n=90)

Symptoms*	Perceived cause of symptoms	
	Yes f(%)	No f(%)
About motor end plate change	50(55.5)	24(26.7)
About sensory receptor change	30(33.3)	3(3.3)
About sympathetic system change	1(1.1)	-
About complication post- surgery	1(1.1)	5(5.6)
Stress	11(12.2)	2(2.2)
Low self-esteem	9(10.0)	2(2.2)

\*One patient reported more than one answer

The evaluation of other symptoms by patient's experiences is presented in table 18. The study revealed that most of the patients said that they perceived cause of other symptoms. Only symptom which was complication post-surgery, most of the patients said that they did not perceived cause of these symptoms.

### 3.3 Responses to other symptoms; other symptoms which interferes ADLs

**Table 19:** Frequency and percentage of patients with brachial plexus injury post-reconstructive surgery classified by symptoms arise from motor end plate change interferes ADLs and duration of illness (n=74)

Interferes*	Duration of illness (months)					
	≤12		13-24		>24	
	Yes f(%)	No f(%)	Yes f(%)	No f(%)	Yes f(%)	No f(%)
General activity	6(8.1)	2(2.7)	15(20.3)	3(4.1)	40(54.1)	8(10.8)
Mood	5(6.8)	3(4.1)	15(20.3)	3(4.1)	27(36.5)	21(28.4)
Mobility	3(4.1)	5(6.8)	11(14.9)	7(9.5)	27(36.5)	21(28.4)
Study/work	7(9.5)	1(1.4)	13(17.6)	5(6.8)	35(47.3)	13(17.6)
Relationship with other	3(4.1)	5(6.8)	9(12.2)	9(12.2)	14(18.9)	34(45.9)
Rest/sleep	2(2.7)	6(8.1)	6(8.1)	12(16.2)	10(13.5)	38(51.4)
Well-being	4(5.4)	4(5.4)	11(14.9)	7(9.5)	23(31.1)	25(33.8)

\*One patient reported more than one answer

The responses of symptoms which arise from the motor end plate change according to patients experienced are presented in table 19. The study revealed that the most affected areas of ADLs in patients who had duration of illness less than and equal 12 months were study/work followed by general activity and mood. The most affected areas of ADLs in patients who had duration of illness 13 to 24 months were general activity followed by mood and study/work. Finally the most affected areas of ADLs in patients who had duration of illness more than 24 months were general activity followed by study/work, mood and mobility.

**Table 20:** Frequency and percentage of patients with brachial plexus injury post-reconstructive surgery classified by the symptoms arise from sensory receptor change interferes ADLs and duration of illness (n=33)

Interferes ADLs	Duration of illness (months)					
	≤12		13-24		>24	
	Yes f(%)	No f(%)	Yes f(%)	No f(%)	Yes f(%)	No f(%)
General activity	-	3(9.1)	2(6.1)	10(30.3)	1(3.0)	17(51.5)
Mood	1(3.0)	2(6.1)	4(12.1)	8(24.2)	2(6.1)	16(48.5)
Mobility	-	3(9.1)	-	12(36.4)	1(3.0)	17(51.5)
Study/work	-	3(9.1)	2(6.1)	10(30.3)	-	18(54.5)
Relationship with other	-	3(9.1)	1(3.0)	11(33.3)	-	18(54.5)
Rest/sleep	-	3(9.1)	4(12.1)	8(24.2)	2(6.1)	16(48.5)
Well-being	-	3(9.1)	1(3.0)	11(33.3)	-	18(54.5)

\*One patient reported more than one answer

The responses of symptoms which arise from sensory receptor change according to patients experienced are presented in table 20. The study found that most of the patients perceived these symptoms were not affecting ADLs including the general activity, mood, mobility, study/work, relationship with other, rest/sleep and well-being.

### 3.4 Other Symptoms management strategies; the strategies that used for eliminating their symptoms by the patients, assistant personnel and their effectiveness of each strategy

**Table 21:** Frequency and percentage of patients with brachial plexus injury post-reconstructive surgery classified by type of physical symptoms management strategies

Physical symptoms	Management strategies *			
	Yes	f (%)	No	f (%)
About motor end plate change (n=74)	-Active exercise	36(48.6)	-Did not try to manage	15(20.3)
	-EMS**	30(40.5)		
	-Passive exercise	23(31.2)		
	-PT***	19(25.7)		
	-Massage	8(10.8)		
	-Pouring hot water	1(1.4)		
About sensory receptor change (n=33)	-Massage/Bending finger and hand	11(33.3)	-Did not try to manage	25(75.8)
	-PT***	2(6.1)		
	-Avoiding cold weather	2(6.1)		
	-Taking medication as order	1(3.0)		
About sympathetic system change (n=1)			-Did not try to manage	1(100)
About complication post-surgery (n=6)	-Passive exercise	3(50.0)	-Did not try to manage	4(66.7)
	-Bending finger/ strengthening hand	3(50.0)		

\*One patient reported more than one answer, \*\* electrical muscular stimulation

\*\*\* Physiotherapy

The physical symptoms management strategies according to the patient's experienced are presented in table 21. For the symptoms arisen from motor end plate change; the study found that most of the patients used the strategies for manage their symptoms. The most common management strategies for relived their symptoms were active exercise followed by EMS, passive exercise and PT.

In the part of symptoms arisen from sensory receptor change, the study revealed that most of the patients did not try to manage their symptoms followed by using massage/bending finger/strengthening, PT and avoiding cold weather. Furthermore, most of the patients did not use any strategy for relieving the symptoms arisen from sympathetic system and symptoms which was complication post-surgery.

**Table 22:** Frequency and percentage of patients with brachial plexus injury post-reconstructive surgery classified by type of psychological symptoms management strategies

Psychological symptoms	Management strategies *			
	Yes	f (%)	No	f (%)
Stress (n=13)	-Distraction/relaxation	10(76.9)	-Did not try to manage	1(7.7)
	-Encouraging oneself	3(23.1)		
	-Isolated from other	2(15.4)		
	-Avoiding the problem	1(7.7)		
	-Alcohol consumption	1(5.3)		
Low self-esteem (n=11)	-Distraction	4(36.4)	-Did not try to manage	8(72.7)
	-Covering arm	4(36.4)		

\*One patient reported more than one answer

The psychological symptoms management strategies according to the patient's experienced are presented in table 22. The study about stress management strategies revealed that most of patients used the distraction/relaxation followed by encouraging oneself and isolated from other (76.9%, 23.1% and 15.4%, respectively). In the part of low self-esteem management strategies, the study revealed that most of the patients did not try to manage these symptom followed by used the distraction and covering arm (72.7%, 36.4% and 36.4%, respectively).

**Table 23:** Frequency and percentage of patients with brachial plexus injury post-reconstructive surgery classified by type of symptoms arisen from motor end plate change management strategies, assistant personnel and perceived level of effectiveness (n=74)

Type of management strategies*	Assistant personnel			Perceived level of effectiveness	
	professional	family member	patient	poor (0%-30%)	good (40%-100%)
	f(%)	f(%)	f(%)	f(%)	f(%)
-Active exercise	1(1.4)	-	35(47.3)	-	36(48.6)
-EMS**	5(6.8)	5(6.8)	20(27.0)	3(4.1)	27(36.5)
-Passive exercise	-	2(2.7)	21(28.4)	5(6.8)	18(24.3)
-PT ***	6(8.1)	-	13(17.6)	2(2.7)	17(23.0)
-Massage	-	2(2.7)	6(8.1)	-	8(10.8)
-Pouring hot water	-	-	1(1.4)	-	1(1.4)

\*One patient reported more than one answer

\*\* Electrical muscular stimulation

\*\*\* Physiotherapy

The symptoms which arise from motor end plate change management strategies, assistant personnel and the effectiveness of each strategy perceived by patients are presented in table 23. The study found that most of the patients manage their symptoms by themselves. Active exercise was the most effective strategy followed by EMS and passive exercise.

**Table 24:** Frequency and percentage of patients with brachial plexus injury post-reconstructive surgery classified by type of symptoms arise from sensory receptor change management strategies, assistant personnel and perceived level of effectiveness (n=33)

Type of management strategies*	Assistant personnel			Perceived level of effectiveness	
	professional	family member	patient	poor (0%-30%)	good (40%-100%)
	f(%)	f(%)	f(%)	f(%)	f(%)
-Massage/Bending finger and hand	-	-	11(33.3)	2(6.1)	9(27.3)
-PT**	1(3.0)	-	1(3.0)	-	2(6.1)
-Avoiding cold weather	-	-	2(6.1)	-	2(6.1)
-Taking medication as order	-	-	1(3.0)	-	1(3.0)

\* One patient reported more than one answer    \*\* Physiotherapy

The symptoms which arise from sensory receptor change management strategies, assistant personnel and the effectiveness of each strategy perceived by patients are presented in Table 24. It is found that most of the patients manage these symptoms by them. The most effective strategy was massage/bending finger and hand followed by PT and avoiding cold weather.

## **CHAPTER V**

### **DISCUSSION**

This study is a descriptive research design. The aim of this study was to investigate the experienced of pain and other symptoms and the management strategies used and effectiveness of each strategy in patients with brachial plexus injury post-reconstructive surgery. The discussions are presented in 4 sections as follows:

- Section 1:** Pain experienced: pain perception, pain evaluation and pain responses in patients with brachial plexus injury post-reconstructive surgery
- Section 2:** Pain management strategies in patients with brachial plexus injury post-reconstructive surgery
- Section 3:** Other symptoms experienced: other symptoms perception, other symptoms evaluation and other symptoms response in patients with brachial plexus injury post-reconstructive surgery
- Section 4:** Other symptoms strategies in patients with brachial plexus injury post-reconstructive surgery

### **Section 1: Pain experienced: pain perception, pain evaluation and pain responses in patients with brachial plexus injury post-reconstructive surgery**

1.1 This study explored the pain experienced within the one month period before the study; as the result in this study found that most of the patients had pain experience reported at 91.6%, most of them were total arm type patients and aged between 26 and 49 years (68.2% and 55.1%, respectively). However, they reported the mean score level of pain severity in current pain was mild. The mean±SD score duration of post-surgery was 32.67±28.90 months (range 3 to 129 months, mode 10 months).

These findings are in agreement with the study of Wynn Parry (1980) who conducted a study on 122 patients with pre-ganglionic injury for between three and 30 years and found that in 48 patients the pain persisted for more than three years. In 28 the pain abated, in 15 within 12 months and in 11 between 12 and 36 months. In addition, these findings are also in consistent with Kato et al. (2006) who conducted a retrospective and prospective study; 85 patients who were prospective from prior to their nerve repair and throughout the process of rehabilitation. There was also a retrospective study group of 63 patients, 45 of them had undergone nerve repair and 18 of them had been admitted to rehabilitation unit sometime after their nerve repair (1 to 11 years). The patients were followed up for a mean of 8.0 years (3 to 16). Assessment of pain in both groups using visual analog scale (VAS) score was from zero (no pain) to ten (worst). A worst VAS (VAS- worst) was recorded at every review; the VAS at the final review was the VAS-final. The result showed that the mean VAS-worst was 8 to 9. And at the final review the mean VAS-final was decreased at 2 to 5. Bruxelle et al. (1988) revealed that a decrease in pain after surgery repair occurred significantly more frequently in patients who finally achieved a motor improvement (16/43=37%) than in patients who showed no motor improvement (5/33=15%;  $p<0.05$ ).

This data indicates that most of the patients with brachial plexus injury post-reconstructive surgery reported the mean score level of pain severity on current pain was mild. The possible reason may be that the patients in this study received neurotization technique. These procedures can enhance their motor power to good level (MRC $\geq$ 3) (Kandenwein et al., 2005; Songcharoen, 1995). Berman et al. (1998)

found a close relationship between the pain relieve and return of muscle power. In addition, the previous study also found patients who had surgical repairs of the injured brachial plexus and had less pain than patients who did not undergo surgery and the pain was persistent in patient who did not received surgery longer than patients who had reconstructive surgery (Kato et al., 2006; Wynn Parry, 1980). It is possible that this reduction in pain was probably associated with return of motor function and regeneration of large myelinated fibers (A-beta fibers), especially at the muscle (Berman et al., 1998).

1.2 It is found in the present study that most of the patients described their pain characteristics were crushing pain followed by electrical-like pain, numbing pain, pin-and-needles sensations pain and shooting pain (23.5%, 22.4%, 19.4, 14.3% and 11.2%, respectively). Patients in this study described two patterns of their pain as continuous and intermittent (67.3% and 32.7%, respectively). For 60.2% of the patients perceived pain before surgery. The majority of patients perceived the pain location in the whole arm followed by hand and forearm (57.1%, 35.7% and 21.4%).

The findings of this study are similar to that of Berman et al. (1998) who showed that the most common of pain characteristics in patients with brachial plexus injury was shooting, burning, aching and crushing pain. All of patients had onset of pain within 1 month of the injury. Kato et al. (2006) reported that there are two patterns of pain: 1) constant pain in the insensible hand, usually described as crushing, burning and burshing; and 2) shooting pain was always felt in the dermatome of the injured spinal nerve, but only occurred when there was a constant feature of the pain. The onset of pain was immediate, within 24 hours, 2weeks, 6 weeks, 3 months, 6 months and more than 6 months after the injury (39.8%, 14.2%, 12.2%, 23.6%, 6.8%, 2.1% and 1.4%, respectively). In addition to present research is also in consistent with a study by Bruxelle et al. (1988) who reported that the pain onset in patients with brachial plexus injury, 85% of the patients developed a pain syndrome and pain was permanent for 72% of patients and intermittent for the other 28%.

Most of the pain characteristics in the present study may be similar to neuropathic pain characteristics. This is in consistent with a study by Boureau et al. (1990) who found that the most common terms that patients with neuropathic pain use describe their pain were burning, electrical-shock, and tingling reported by 54%, 53%

and 48%, respectively. Furthermore the location of neuropathic pain is projected and with few exceptions, the pain distribution matches the level of the lesion (Dworkin, 2002; Hannson, 2002). Pain in brachial plexus injury may arise from nerve root as avulsion (Berman et al, 1998). There are distinctive aspects of brachial plexus injury which may involve central nervous system and distal axon of sensory neurons at different spinal root level. Peripheral, as well as central, mechanisms, contributes to the generation of neuropathic pain. (Melzack, 1975 cited in Htut et al., 2006).

1. Peripheral nervous system mechanism. This probable mechanism may be considered that when nerve root are avulsion from cervical spinal cord, its effect is on the sensory neurons within the statia gelatinosa at dorsal horn of injured spinal cord. Thus these sensory neurons release the chemical substances such as noradrenaline, bradykinin, histamine, prostaglandins, potassium, cytokine, norepinephrin (NE), 5-hydroxytryptamine (5Ht) and neuropeptides. These cellular mediators act to sensitize nociceptor to further neural input. This produces changes in the number and location of ion-channels, especially sodium ion channels-in injured nociceptor nerve fibers and their dorsal root ganglia. As a result the threshold for depolarization is lowered and spontaneous discharges known as ectopic discharges can occur in abnormal locations. Consequently, the response of nociceptor to thermal and mechanical stimuli is increased. This phenomenon is known as peripheral sensitization (Beydoun & Bockanja, 2003; Nicholson, 2000). However, persistent neural activity and changes that occur because of nerve injury can cause chemically mediated electrical connection between injured nerve fibers and nearby uninjured fibers. It is assumed that this transmission, known as ephaptic conduction (“cross excitation” or “cross talk”), cause non painful stimuli to evoke activity in these normally “silent” nociceptors and there by produce pain (Bridges, Thompson & Rice, 2001).

Other possible mechanisms may be the gliosis of injured nerve occurs. The gliosis is scar formation within dorsal horn which causes long-term changes in neuron functions in the spinal cord as the C-fiber and the dorsal horn at the ganglion are continuously stimulated for a long time. Moreover, the inhibitory neuron functions and the level of gamma- aminobutyric acid (GABA) are decreased and the nerve fibers are rearranged leading to touch-evoked allodynia.

2. Central nervous system mechanism. This probable mechanism may be a key process known as central sensitization, which is the abnormal hyperexcitability of central nociceptor neurones, is assumed to take place in the spinal cord because of peripheral injury and the release of tachykinins and neurotransmitters. Tachykinins include neuropeptides substance P and neurokinin A (Beydoun & Bockanja, 2003). Neurotransmitters include glutamate, calcitonin gene-related peptide and gamma-aminobutyric acid (GABA). Prolonged release and binding of these substances to neural receptors activate the N-methyl-D-aspartate (NMDA) receptor, which causes an increase in intracellular calcium levels (Siddall & Cousins, 1997). The increase in calcium levels is believed to occur through N-type calcium channels (Xio & Bennett, 1995 cite in Pasero, 2004), one of several calcium channels in the central nervous system, and is considered important for the maintenance of central sensitization (Bridges et al., 2001; Nicholson, 2000). These changes, in turn, lead to a series of biochemical reactions in dorsal horn neurons. These threshold for activation are lowered, the response to stimuli is increased (in both magnitude and duration), and the size of the receptive field is enlarged (a greater area on the neuron surface is available to receive stimuli) (Beydoun & Bockanja, 2003).

In addition, this study found that patients with brachial plexus injury post-reconstructive surgery perceived other characteristics of pain as cramp pain like, heavy pain and aching pain (7.1%, 3.1% and 2.0%, respectively). There is possible explanations for these result that these pain characteristics may arise from muscle contraction which results from post-operative scar and affect to muscle loss of flexibility (Songcharoen & Mahaisavariya, 1996). There are evidences that scar generally exhibit abnormal sensation compared to normal skin, often being insensate but sometimes painful or hypersensitive due to C-fibers and A-delta are sensory neuron involved in these areas. Substance P is neurotransmitters suggested to be mediators for both of sensation and healing process, it is thought to have a role in sensation as a mediator of pain in small unmyelinated C-fibers. Elevates Substance P levels have been found to be painful (Henderson et al., 2006; Scott et. al, 2008).

1.3 In this study it is found that the most common causes of pain in patients were cold weather and cold water, no particular primary cause of pain or that inactivity, air blow/pat/touch, more using the arm/heavy lifting/arm exercise and

muscle stretching/handful/elbow flexion/ to compress on arm/squeezing arm (38.8%, 36.7%, 17.6%, 14.3% and 13.3%, respectively). These findings are in consistent with a study by Kato et al. (2006) who found that pain in the patients occurred autonomous or on patient's movement. The pain is exacerbated by cold weather, cold water, stress and concurrent illness. The possible reasons for explanation of this result may be brachial plexus injury brings about lesion in injured nerve from nerve root avulsion. Pathological changes may result in pain in brachial plexus injury patients that occur spontaneous or in response to the environment (stimulation-evokes pain) and are usually sustained and chronic (Beydoun & Backonja, 2003; Dworkin, 2002). In addition, this study also found that 3.1% of patients said that stress was the cause of pain. These findings are similar to that of Devance (2002) who found that stimulation of the amygdale in the brain, in response to fear or anxiety; cause the release of substance P and an increased perception of pain.

1.4 This study revealed that the mean score level of pain interference was mild to moderate in all areas of activities of daily living in each areas such as general activity, mood, mobility, work/study, relationship with other, rest/sleep and well-being. The mean score of pain interference was 0 to 5 on the 0-10 interference score in all of the patients.

These findings are in agreement with the study of McDermott et al. (2006) who explored the burden of illness associated with a board range 600 patients of neuropathic pain syndromes. It was a crossectional survey and he found that patients reported a mean $\pm$ SD overall level of pain interference of 4.5 $\pm$ 2.4. The most affected areas were general activity, work, sleep, mood and enjoyment of life with mean score close to 5 on the 0-10 interference score. However, the study was carried out in patients with neuropathic pain and it was not specialty in brachial plexus injury patients. Berman et al. (1996) reported that all of patients (19) it was interfering with every aspect of activities of daily living. They decreased the extent of disturbance of work, study, hobbies and sporting pursuits, sleep and mood. However, they did not report any level of pain interference.

However the possible reason to explain this result might be the fact that the mean score level of pain severity in average pain and current pain in patients with brachial plexus injury post-reconstructive surgery was only moderate and mild,

respectively. Also the pain may affect to patient perform activities of daily living only mild to moderate level.

## **Section 2: Pain management strategies in patients with brachial plexus injury post-reconstructive surgery**

2.1 This study found that nearly half of the patients with brachial plexus injury post-reconstructive surgery did not try to manage their pain (46.9%) and patients who used strategies for relieving their pain, most of them managed pain by themselves followed by assistance from family members and professionals, respectively.

The possible reason for their actions might be the fact that as a result in this study the mean score of pain severity in average pain and current pain was moderate and mild level, respectively. Beside, the mean score level of pain interference in patients was only mild to moderate in all areas of activities of daily living. According to Dodd et al. (2001) whether minor or severe they are triggers that lead people to seek treatment. They manage symptoms when such symptoms also disturb social functionality, patients seek for ways to deal with the symptoms to eliminate or relieve such symptoms, and this enables them to live with such symptoms and continue to live their life as normally as possible. Therefore, the patients in this study may be did not try to manage their pain and did not depend on professionals.

2.2 Massage was the most effective strategy perceived by patients followed by passive exercise by uninjured hand and acupressure (20.4%, 14.3% and 14.3%, respectively). These data indicates that most of strategies used by patients with brachial plexus injury post-reconstructive surgery for managing their pain are non-pharmacological intervention which may be feasibly performed by one. Non-pharmacological intervention for pain may be used to alleviate pain directly and indirectly by inducing analgesia (Chwistek, 2005 cited in Godfrey, 2005). Massage and acupressure are thought activated large diameter A-beta fibers which will close the “gate” and inhibit pain information conducted in A-delta and C-fibers from reaching the brain (Lundeberg & Stener-Victorin, 2002 cite in Godfrey, 2005).

In addition, this study also found that other strategies such as electrical-shock, alcohol consumption and to bash the arm. Only patients with age between 21 and 25

years used these strategies. The reason for this might be the fact that patients in this group are young adult age or passing adolescent ages, they may still have impetuously and lack of restrain, so that they may be reasonable loss for selected strategies to relieve their symptoms. The selection may be only trial-error methods (Kawkungvan, 1997).

### **Section 3: Other symptoms experienced: perception of symptoms, evaluations of symptoms and responses to symptoms in patients with brachial plexus injury post-reconstructive surgery**

For other symptoms, most of the patients had loss of motor power symptom experienced. Moreover the study revealed that most of the patients perceived the symptom arise from motor end plate change affecting their performance of activities of daily living. In addition it was found that after injury the percentage of patients with employment decreased from 73.8% to 54.2 % and the percentage of unemployed patients increased from 26.2% to 45.8%. The majority of the patients were male (91.6%) and the mean $\pm$ SD score of age was 30.40 $\pm$ 9.10 years.

These data indicate that most of the patients in this study were male at working age. People at this age usually work to win expectation of career advancement or financial stability in their lives. The symptoms that lead to limited use of hands and arms in performing activities of daily living may have effect to the extent of unemployment or inability to work. Therefore, the patients might perceived the symptom arisen from motor end plate changes as a disturbance in various aspects of their lives, including general activities, mood, mobility, work/study, relationship with others, rest/ sleep, and well-being. Moreover, current treatment with reconstructive surgery does not fully recover the intrinsic hand function in patients with brachial plexus injury to the normal level (Songcharoen, 1987). Post-reconstructive patients may have the disabilities of arm and/ or hand and such disabilities may affect the patients' performance of activities of daily living.

This study also found that the mean $\pm$ SD score duration of surgery was 16.63 $\pm$ 29.66 months, which is longer than the previous studies. This delayed treatment may lead to ineffective outcome because the duration between the injury and surgery has effect on patients' rehabilitation. Patients who receive early surgery tend to have

faster recovery of arm functions than those who received delayed surgery (Petroni et al., 2003). This is probably because the delayed reconstruction after the injury and the long period of damaged nerve contribute to the dystrophy or degeneration of the motor end plate and the sensory receptor of the ending organ. The damaged nerve is then replaced with fibrous tissue or neuroma, thus reducing the recovery of muscle strength and sensory reception (Berman et al., 1996; Birch et al., 1998; Kandewein et al, 2005; Songcharoen, 1996; Spinner et al., 2005).

Other interesting other symptoms includes psychological symptoms. It was found that patients with brachial plexus injury post-reconstructive surgery reported stress and low self-esteem at 13.3% and 10.0%, respectively. These symptoms were mostly found in the patients who had reconstructive surgery for 4 – 12 months and most of them were total arm type patients. This finding is consistent with the study conducted by Choi et al. (1997) who reported moderate level of stress in post-surgery patients after they were discharged from the hospital and were returned to work. Dubinson and Kline (2002) conducted 3 years follow-up study with 78 patients who received surgery and found that 2 patients had committed suicide in the 12<sup>th</sup> and 14<sup>th</sup> months after surgery. However, the causes of these suicides were not mentioned in their report. The psychological symptoms among patients in this study may be due to the fact that most of the patients were male at working age. These patients were concerned about career advancement, social relationship, and their self-image. Such concerns are due to the fact that the career and family life are at the beginning at this age (Kawkungvan, 1997). Even though brachial plexus injury can be treated with surgical treatment, the patients still can not work as usual. Moreover, the surgery may leave scars, muscle atrophy, or deformity of hands/ arms. These consequences may lead to loss of self-image, self-esteem, and sex appeal. Referring to the interview about the impact of disability, some patients gave the following answers:

“I sometimes feel unconfident when people look at me – like when they see me using feet. I am concerned when other people look. It’s not too bad if I am alone. I use feet when playing games and will lose confidence when other people look at me. I am concerned about what they would say. But if you ask whether I can live like this – yes, I can.”

“I stay at home most of the time, and do not go out much. I have to work too so I don’t go out. I used to go out in the past though. This arm has a scar, you see? And it is dangling when I walk because it is longer than the other arm – there’s a dip here.”

“I think I participate in social activities less than before. I have withdrawn from other people because I don’t want to disturb anybody and don’t want to be looked at as a disabled person.”

#### **Section 4: Other symptoms strategies in patients with brachial plexus injury post-reconstructive surgery.**

Most of the patients managed symptoms arise from the changes of the motor end plate by having active exercise followed by electrical muscular stimulation, passive exercise, and physiotherapy (48.6%, 40.5%, 31.2%, and 25.7%). There is evidence that most of the patients used the strategies that was appropriate to manage their symptoms. The possible reason is the patients perceived these symptoms had effect on the patients performing activities of daily living thus they may be more concerned about the symptoms. Moreover, electrical muscular stimulation and physiotherapy are included in the rehabilitation program for patients with brachial plexus injury who receive surgery. The patients usually receive physiotherapy and electrical stimulation at four weeks after surgery (Songcharoen & Mahaisavariya, 1996) and physiotherapy can also prevent muscle atrophy and enhance the motor recovery (Spinner et al., 2005).

This study also found that some patients used strategies that might be harmful for managing their symptoms, such as pouring hot water. The patients reported that these strategies were recommended by their neighbors; however, the neighbors might lack of knowledge and the recommended strategies may lead to negative outcomes. Patients with brachial plexus injury usually have numbness and loss of sensitivity in the injured arm due to the dystrophy of sensory receptors in the end organ. The application of pouring hot water is more likely to have negative outcomes than positive ones. The patients might believe and follow the recommendation because the neighbors are close to them and are influential to their decision. Moreover, they might also have significant role in caring for the patients (Bartlome, et al., 1992 cited in

Duangjai, 1999). Therefore, it is important for the healthcare providers to provide knowledge, information and understanding about symptom management to family members and people in the community, in addition to provide appropriate knowledge about signs and symptoms.

## **CHAPTER VI**

### **CONCLUSION**

#### **Summary of the study**

The aim of this descriptive research designed was to investigate pain and other symptoms experienced, the management strategies used and effectiveness of each strategy in patients with brachial plexus injury post-reconstructive surgery. The research framework was based on the symptom management model of Dodd et al. (2001). The sample in this study was composed of 107 patients with brachial plexus injury post-reconstructive surgery. They were selected by purposive sampling according to the inclusion criteria such as they were older than 15 years of age, either male or female, and receiving follow-up treatments at the orthopedic follow-up clinic on the 1<sup>st</sup> floor of Syamindra Building, Siriraj Hospital, from June to October 2007. The research instruments are questionnaires including the demographic and clinical information, pain and pain management strategies interview questionnaire and other symptoms and their management strategies interview questionnaire. Data was analyzed by frequency, percentage, mean and standard deviation. The opened-end questionnaires were analyzed by using content analysis.

#### **1. The demographic and clinical information**

The study revealed that the majority of the patient was male (91.6%). The mean±SD score of age was 30.40±9.10 years, most of them aged between 26 and 49 years, 21 and 25 years and less than and equal 20 years (60.7%, 22.4%, and 12.1%, respectively). Most of the patients were single persons (65.4%). The education level was reported as secondary, diploma or equivalent and bachelor, respectively.

For employment of the patients, the study revealed that 73.8% of the patients had employment before the injury and this decreased after the injury (54.2%). The percentage of unemployed patients before the injury was 26.2% which increased after

the injury to 45.8%. In addition, the result in this study found that most of the patients had enough income to bear expenses (76.6%).

The major cause of injuries was motorcycle accidents at 95.3% and 4.7% were car accidents. Most of the patients were total arm type patients at 74.8% and 25.2% were upper arm type. The mean duration between the injury and the surgery were  $16.63 \pm 29.66$  months, the mean duration between the surgery and the time of the data collection were  $32.67 \pm 28.90$  months and the mean duration between the injury and the time of the data collection were  $49.43 \pm 43.75$  months, respectively. The best of motor recovery was biceps function.

For performance to the medical plan, most of the total arm type patients received electrical muscular stimulation and physiotherapy (49.5% and 47.7%, respectively) and 57.0% reported that they were not receiving any pain medication. For the patients with upper arm type, the majority of them were receiving electrical muscular stimulation and physiotherapy and 18.7% of them reported for not receiving any pain medication.

## **2. Pain experienced**

### **2.1 Perception of pain**

The study revealed that 91.6% of the patients experienced pain. Most of them were total arm type patients (68.2%) with aged between 26 and 49 years and they were followed by 21 and 45 years and less than and equal to 20 years. However there were 24.2% upper arm type patients.

### **2.2 Evaluation of pain**

The result in this study showed that 60.2% of the patients perceived pain before surgery. Most of the patients described the characteristics of pain as crushing pain followed by electrical-like pain, numbing pain, pin-and-needles sensations pain and shooting pain (23.5%, 22.4%, 19.4%, 14.3% and 11.2%, respectively) and described pattern of pain as continuous and intermittent (67.3% and 32.7%, respectively). In the part of the pain location, the study revealed that most of the patients perceived pain in the whole arm followed by hand and forearm (57.1%, 35.7% and 21.4%, respectively). The most common causes of pain in patients were cold weather and cold water followed by no particular primary cause of pain and inactivity,

air blow/pat/touch, more use of the arm/heavy lifting/arm's exercise and muscle stretching/handful/elbow flexion/to compress on arm/squeezing arm (38.8%, 36.7%, 17.6%, 14.3% and 13.3%). The mean score level of pain severity at the time of the data collection was mild.

### **2.3 Responses to pain**

The result in this study found that the mean score level of pain interference was mild to moderate in all areas of activities of daily living including general activity, mood, mobility, work/study, relationship with other rest/sleep, and well-being.

### **2.4 Pain management strategies**

The pain management strategies included the strategies that were used for relieving their pain by the patients, assistant personnel and effectiveness of each strategy. As a result this study revealed that most of the patients did not try to manage their pain (46.9%). The patients who managed their pain also used combination strategies and most of the patients managed their pain by themselves followed by assistance from family member and professionals. The first strategy used by the patients was massage followed by use of medicines purchased by themselves and passive exercise by uninjured hand (23.5%, 20.4% and 16.3%, respectively). Massage was the most effective strategy perceived by patients followed by passive exercise by uninjured hand, acupuncture, use of medicines purchased by them and active exercise (20.4%, 14.3%, 14.3%, 10.2%, and 9.2%).

In addition, the other strategies such as electrical shock, alcohol consumption and bashing the arm were used only in the patients with 21 and 25 years of age.

## **3. Other symptoms experienced**

### **3.1 Other symptoms experienced**

The data in this study found that nearly all of patients had other symptoms experienced (84.1%). The other common symptoms experienced were loss of motor power, numbness, stress, low self-esteem, muscle exhausted and joint- stiffness (74.4%, 32.2%, 13.3%, 10.0%, and 5.5%, respectively).

This study revealed that most of the patients had symptoms which arose from the change of motor end plate and most of them perceived it's interfere to activities of daily living including general activity, mood, mobility, work/study, relationship with

other rest/sleep, and well-being.

### **3.2 Other symptoms management strategies**

This study found that most of the patients used active exercise for managing symptoms which arose from motor end plate change followed by use of electrical muscular stimulation, passive exercise and did not try to manage these symptoms (48.6%, 40.5%, 31.2%, 25.7% and 20.3%). Moreover most of them managed their symptoms by themselves. Active exercise was the most effective strategy perceived by patients followed by electrical muscular stimulation and passive exercise (48.6%, 36.5% and 24.3%).

For the symptoms which arose from sensory receptor change; the study revealed that most of the patients did not try to manage their symptoms followed by massage/bending finger/strengthening, physiotherapy and avoiding cold weather (75.8%, 33.3%, 6.1% and 6.1%).

In addition, as a result of stress management strategies, the study found that most of the patients used distraction/relaxation followed by encouraging oneself and isolating from other (76.9%, 23.1% and 15.4%). The data in this study revealed that the patients who had low self-esteem, did not try to manage these symptoms followed by using distraction and covering arm (72.7%, 36.4% and 36.4%, respectively).

### **Implications of research findings on nursing practice**

1. This study showed that most of the patients with brachial plexus injury post-reconstructive surgery perceived pain before surgery. Thus, nursing intervention to relieve their pain should be applied before they undergo surgery. These interventions are massage, passive exercise, acupressure and active exercise. It was found that most of the patients used these strategies and they perceived the effectiveness of these strategies.

In addition, the study revealed that the reconstructive surgery was very effective to relieve their pain. Thus, healthcare providers should establish a multidisciplinary team to care for their patients for the purpose of providing early reconstructive surgery. Furthermore, before the surgery, healthcare providers should inform the causes of pain such as cold weather and cold water, air blow/ pat/ touch etc so that they can avoid them.

2. It is observed that according to patient's perception, loss of motor power is the major symptom which has effect on the activities of daily living. Thus, healthcare providers should provide information about the strategies to enhance the motor recovery, such as active exercise, electrical muscular stimulation, passive exercise, physiotherapy and massage because it was found that most of the patients used these strategies and perceived their effectiveness.

3. It is discovered in the study that most of the patients who have post-surgery duration of 4<sup>th</sup> to 12<sup>th</sup> months have psychological distress. Thus, this fact should be taken into account by healthcare providers.

### **Implications of research findings on future research**

1. The relaxation technique, massage, passive and active exercise and acupressure are also good effective pain management strategies perceived by the patients. Therefore, future research should focus on addressing intervention related to those strategies to relieve the pain in brachial plexus injury patients especially before surgery period.

2. Loss of motor power is the other symptom which interferes activities of daily living in patients with brachial plexus injury post-reconstructive surgery at the most. Hence, nursing intervention to promote motor recovery such as rehabilitation program is the interesting issue for study.

3. This study is a cross-sectional research design which collected the data at 3 months post-surgery while the recovery of patients with brachial plexus injury post-reconstructive surgery is a dynamic process. Thus, conducting a longitudinal prospective research design in pain and other symptoms in patients with brachial plexus injury is recommended.

4. Future research should focus on the intervention to promote self-esteem and to reduce stress in patients with brachial plexus injury. These interventions such as relaxation technique, meditation, group therapy and dyadic therapy are also recommended.

### **Recommendations**

1. In this study, the sample group was selected for the purpose of sampling according to the inclusion criteria and collected at the Siriraj hospital only. Thus, the data of this study for generalization of the population should be considered.
2. Future studies related to severity of pain in patients with brachial plexus injury post-reconstructive surgery should concern about the use of pain medication by patients at the same time of data collection.

## REFERENCES

- American Pain Society Quality of Care Committee. (1995). Quality improvement guidelines for the treatment of acute pain and cancer pain. *Journal of the American Medical Association*, 274(23), 1874-1880.
- Barlow, J., Wright, C., Sheasby, J., Turner, A., & Hainsworth, J. (2002). Self-management approach for with chronic conditions; a review. *Patient Education and Counseling*, 48, 177-187.
- Bartholomew, L. K., Gzyzewski, D. I., Parcel, G. S., Swank, P. R., Sockrider, M. M., Mariotto, M. J, et al. (1993). Self-management of cystic fibrosis: short-term outcomes of cystic fibrosis family education program. *Health Education Behavior*, 24(5), 652-666.
- Berman, J. S., Birch, R., & Anand, P. (1998). Pain following human brachial plexus injury with spinal cord root avulsion and the effect of surgery. *Pain*, 75, 199-207.
- Berman, J. S., Anand, P., Chen, L., Taggeart, M., & Birch, R. (1996). Pain Relief From Pregaglionic Injury to the Brachial Plexus By Late Intercostal Nerve Transfer. *Journal Bone Joint Surgery (British)*, 78b, 759-760.
- Beydoun, A., & Backonja, M-M. (2003). Mechanistic stratification of antineuralgic agents. *Journal of Pain and Symptom Management*, 25, S18-S30.
- Bickenback, J. E. (1993). *Physical Disability and Social Policy*. University of Toronto Press, Buffalo, New York.
- Boureau, F., Doubrere, S, E., Luu, M. (1990). Study of verbal description in neuropathic pain. *Pain*, 42, 145-152.
- Bridges, D., Thomson, S, W. N., & Rice, A, S, C. (2001). Mechanisms of neuropathic pain. *British Journal of Anaesthesia*, 87, 12-26.
- Bruxelle, J., Travers, V., & Thiebaut, J. B. (1988). Occurrence and Treatment of Pain After Brachial Plexus Injury. *Clinical Orthopaedics and Related Research and Related Research*, 237, 87-94.

- Chalidapong, P., Sananpanich, K., Kraissarin, J., & Bumroongkit, C. (2004). Pulmonary and biceps function after intercostals and phrenic nerve transfer for brachial plexus injuries. *Journal of Hand Surgery (British and European Volume)*, 29B(1), 8-11.
- Chapet, C. et al. (2003). Brachial Plexus Injuries, Traumatic. *e-Medicine*.
- Chaudakshetrin, P. (2006). A Survey of Patients with Neuropathic Pain at Siriraj Pain Clinic. *Journal Medical Associated Thai*, 89(3), 354-361.
- Choi, P. D., Novak, C.B., Mackinnon, S.E., & Kline, D. G. (1997). Quality of Life and Functional Outcome Following Brachial Plexus Injury. *The Journal of Hand Surgery*, 22A, 605-612.
- Chun, Y. H. (1997). *The Theory of the Welfare of the Disabled People*. Seoul: Hak Mun Publishing Co.
- Cleeland, C., Ryan, K. (1996). Pain assessment: global use of the Brief Pain Inventory. *The Annals Academy of Medicine*, 23, 129-138.
- Collins, E. D., Novak, C. B., Mackinson, S. E., Weisenborn, S. A. (1996). Long-term Follow-up Evaluation of Cold Sensitivity Following Nerve Injury. *The Journal of Hand Surgery*, 21A, 1078-1085.
- Danaidutsadeekul, S. (1999). *Transition process to holistic health of the Thai amputees*. Unpublished Doctoral dissertation in Nursing Science, Faculty of Graduate Studies, Mahidol University.
- Dodd, M., Janson, S., Facione, N., Faucett, J., Froelicher, E. S., Humphreys, J, et al. (2001). Advancing the science of symptom management. *Journal of Advanced Nursing*, 33(5), 668-676.
- Devance, C. L. (2002). Substance P: a new era. *Pharmacotherapy*, 21(9), 1061-1069.
- Duangjai, P. (1999). *Effects of Collaborative symptom management between an asthmatic patient and a nurse*. Unpublished Master's Thesis of Nursing Science (Adult Nursing), Faculty of Graduate Studies, Mahidol University.
- Dubuisson, A. S. & Kline, D. G., Brachial Plexus Injury: A Surgery of 100 Consecutive cases from a Single Service. *Neurosurgery*, 51(3), 673-683.
- Dworkin, R. H. (2002). An Overview of Neuropathic Pain: Syndromes, Symptoms, Signs and Several Mechanisms. *The Clinical Journal of Pain*, 18(6), 343-349.

- Gofin, R. (1999). Incidence and impact of childhood and adolescent injuries. *The Journal of Trauma: Injury, Infection and Critical Care*, 41(1), 15-21.
- Godfrey, H. (2005). Understanding pain, part 2: pain management. *British of Nursing*, 14(17), 904-909.
- Fagerhaugh, S. & Strauss, A. (1997). *Politics of Pain Management: Staff- Patient Interaction*. Addison-Wesley Publishing Co., Menlo Park.
- Foley, K. M. (1993b). Complications of cancer and its treatment. In J. F. Holland, et al. (Ed.), *Cancer Medicine*, 2(3), 2119-2241. Philadelphia: Leg & Febiger.
- Gustafsson, M., Persson, L. O., & Amilon, A. (2000). A qualitative study of stress factors in the early stage of acute traumatic hand injury. *Journal of Advanced Nursing*, 32(6), 1333-1340.
- Gustafsson, M. & Ahlström, G. (2004). Problems experienced during the first year of an acute traumatic hand injury- a prospective study. *Journal of Clinical Nursing*, 13, 986-995.
- Hansson, P. (2002). Neuropathic pain: clinical characteristics and diagnostic workup. *European Journal of Pain*, 6(Suppl. A), 47-50.
- Haderson, J., Terenghi, G., McGrouther, D. A., & Fergusom, M. W. J. (2006). The reinnervation pattern of wounds and scars may explain their sensory symptoms. *Journal of Plastic, Reconstructive and Aesthetic Surgery*, 59, 942-950.
- Holman, H. & Legig, K. (2000). Patients as partners in managing chronic distress: Partnership is a prerequisite for effective and efficient health care. *British Medical Journal*, 320(7234), 526-527.
- Htut, M., Misra, P., Anand, P., Brich, R., & Carlstedt, T. (2006). Pain Phenomena and Sensory Recovery Following Brachial Plexus Avulsion Injury and Surgical Repairs. *Journal of Hand Surgery (British and European Volume)*, 31B(6), 596-605.
- Kandenvein, J. A., Kretschmer, T., Engelhardt, Hans-Peter, R., & Antoniadis, G. (2005). Surgical intervention for traumatic lesions of the brachial plexus: a retrospective study of 134 cases. *Journal Neurosurgery*, 103, 614-621.

- Kato, N., Htut, M., Taggart, M., Carlstedt, T., & Birch, R. (2006). The effects of operative delay on the relief of neuropathic pain after injury to the brachial plexus. *The journal of Bone and Joint surgery*, 88-B(6), 756-759.
- Kim, S. J., & Kang, K. A. (2003). Meaning of life for adolescents with a physical disability in Korea. *Journal of Advanced Nursing*, 43(2), 145-157.
- Kitisomprayoonkul, W., Klaphajone, J., & Kovindha, A. (2006) Thai Short-Form McGill Pain Questionnaire. *Journal Medical Associated Thai*, 89(6), 846-853.
- Kleinman, A. (1978). Concept and model for the comparison of medical system as cultural system. *Social Science Medicine*, 12, 85-95.
- Khlongyant, P. (2001). *Pain experiences, depression, and pain management of the hospitalizec elderly*. Unpublished master's thesis, Mahidol University, Bangkok, Thailand.
- Kralik, D., Koch, T., Price, K., & Howard, N. (2004). Chronic illness self-management; taking action to creating order. *Journal of clinical Nursing*, 13, 256-267.
- Larson, P. R. (1994). A model for symptom management. *Journal of Nursing Scholarship*, 26(4), 272-276.
- Leechavengvongs, S., Witoonchart, K., Uerpaikit, C., Thuvasethakul, P., & Ketmalasiri, W. (1998). Nerve Transfer to Biceps Muscle Using a Part of the Ulnar Nerve in Brachial Plexus Injury (Upper Arm Type): A Report of 32 Cases. *Journal of Hand Surgery*, 23A,
- Leechavengvongs, S., Witoonchart, K., Uerpaikit, C., Thuvasethakul, P., & Malungpaishrope, K. (2006). Combined Nerve Transfers for C5 and C6 Brachial Plexus Avulsion Injury. *Journal of Hand Surgery*, 31A, 183-189.
- McCaffrey, R., Frock, T. L., & Garguilo, H. (2003). Understanding Chronic Pain and Mine-Body Connection. *Physiology Holistic Nursing Practice*, 17(6), 281-287.
- McDemott, A. M., Toelle, T. R., Rowbotham, J. D., Schaefer, C. P., & Dukes, E. M. (2006). The burden of neuropathic pain: results from a cross-sectional survey. *European Journal of Pain*, 10, 127-135.
- Merrell, A. G., & Wolfe, W. S. (2002). Adult Brachial Plexus and Thorscic Outlet Surgery. *Techniques in Shoulder & Elbow Surgery*, 3(4), 271-281.

- Nicolaidis, S. C., & Willaims, H. B. (2001). Muscle Preservation Using An Implantable Electrical System after Nerve Injury and Repair. *Microsurgery*, 21, 241-247.
- Osborne, T. L., Raichle, K. A., Jensen, P. M., Ehde, D. M., & Kraft, G. (2006). The Reliability and Validity of Pain Interference Measure in Persons with Multiple Sclerosis. *Journal of Pain and Symptom Management*, 32(3), 217-229.
- Pasero, C. (2004). Pathophysiology of Neuropathic Pain. *Pain Management Nursing*, 5(4), suppl 1, 3-8.
- Petroni, I., Marsavelski, A., Nikolic, G., & Cirovic, D. (2003). Postoperative rehabilitation in patients with peripheral nerve lesion. *Acta chirurgica Iugoslavica*, 50(1), 83-86.
- Piva, B., Shala, A., Saltari, R., & Gill, G. (2003). Spinal Cord Stimulation in the Management of Pain from Brachial Plexus Avulsion. *Neuromodulation*, 6(1), 27-31.
- Privat, J. M., Allieu, Y., Bonnel, F., & De Godebout, J. (1985). Pain following traumatic lesions of the brachial plexus (radicular avulsions and truncular lesions). [in French]. *Neurochirurgie*, 31, 435-441.
- Raichle, K. A., Osborne, T. L., Jensen, M. P., & Cardenas, D. (2006). The Reliability and Validity of PainInterference Measures in Persons With Spinal Cord Injury. *The Journal of Pain*, 7(3), 179-186.
- Rumsey, N., Clarke, A., White, P., al., Williams, M, W., & Garlick, W. (2004). Altered body image: appearance-related concerns of people with visible disfigurement. *Journal of Advanced Nursing*, 48(5), 443-453.
- Saitoh, Y., Hirano, S., Kato, A., Kishima, H., Hirata, M., Yamamoto, K., & Yoshimine, T. (2001). Motor cortex stimulation for deafferentation pain. *Neurosurgery Focus*, Sep 15, 11(3), E1.
- Sawatsing C. (2003). *Provision and Utilization of Traditional Health Services in Rural Thailand*. Unpublished Master's Thesis of Nursing Science (Community Health Nursing), Faculty of Graduate Studies, Mahidol University.
- Scott, J. R., Muangman, P., & Gibran, N. S. (2007). Making sense of hypertrophic scar: a role for nerve. *Wound Repair and Regeneration*, 15, S27-S31.

- Serlin, R. C., Mendoza, T. R., Nokamura, Y., Edwards, K. R., & Cleeland, C. S. (1995). When is cancer pain mild, moderate or severe? Grading pain severity by its interference with function. *Pain, 61*, 277-284.
- Siddall, P. J., & Cousins, M. J. (1999). Spine update: Spinal pain mechanisms. *Spine, 22*, 98-104.
- Songcharoen, P. (1995). Brachial Plexus Injury in Thailand; a report of 520 cases. *Microsurgery, 16*, 35-39.
- Songcharoen, P., Wongtrakul, S., Mahaisavariya, B., Spinner, R. J., & Rochester. (2001). Hemi-Contralateral C7 Transfer to Median Nerve in the Treatment of Root Avulsion Brachial Plexus Injury. *Journal of Hand Surgery, 26A*, 1058-1064.
- Spinner, R. J., Shin, A. Y., & Bishop, A. T. (2005). Update on Brachial Plexus Surgery in Adults. *Techniques in Hand and Upper Extremity Surgery, 9*(4), 220-232.
- Stanton-Hick, M., Baron, R., & Bous, R., et al. (1998). Complex Regional Pain Syndrome: Guidelines for therapy. *The Clinical Journal of Pain, 14* (consensus report), 155-166.
- Sungpet, A., Suphachatwong, C., & Kawinwonggowith, V. (1999). Standard of Living Following Brachial Plexus Injury. *The Thai Journal of Orthopaedic Surgery, 24*(1), 6-11.
- Sungpet, A., Suphachatwong, C., & Kawinwonggowith, V. (2000). Restoration of Shoulder Abduction in Brachial Plexus Injury With Phrenic Nerve Transfer. *Australian and New Zealand Journal of Surgery, 70*, 783-785.
- Thorn, S., Paterson, B. & Russell, C. (2003). The Structure of Everyday Self-care Decision Making in hemepes described how self care Chronic illness. *Qualitative Health Research, 13*, 1337-52.
- Waikakul, S., Orapin, S., & Vanadurongwan, V. (1999). Clinical Results of Contralateral C7 Root Neurotization to The Median Nerve in Brachial Plexus Injury with total root avulsion. *Journal of Hand Surgery (British and European Volume), 24B*(5), 556-560.
- Wilkinson, Mc., Birch, R., & Bonney, G. (1993). Brachial Plexus Injury: When to amputate?. *Injury, 24*, 603-603.

- William, H. B. (1996). A clinical pilot study to assess functional return following continuous muscle stimulation after nerve injury and repair in the upper extremity using a complete implantable electrical system. *Microsurgery*, 17(11), 597-605.
- Wook, J. L., & Wolfensohn, D. J. (2006). World Report on Road Traffic Injury Prevention. Geneva: WHO.
- World Health Organization. (2006). World Report on Road Traffic Injury Prevention. Retrieved February 10, 2006, from <http://www.who.org>.
- Wynn Parry, C. B. (1980). Pain in Avulsion Lesion of the Brachial Plexus. *Pain*, 9(1), 41-53.
- Zelman, D. C., Gore, M., Dukes, E., Tai, K., & Brandenburg, N. (2005). Validation of a modified version of the Brief Pain Inventory for painful diabetic peripheral neuropathy. *Journal of Vascular Nursing*, 23(3), 97-104.
- กัญญา ดิวิเศษ. (บรรณาธิการ). (2539). (Deeviset, K., 1996). *การแพทย์แผนไทย การแพทย์แบบองค์รวม*. กรุงเทพฯ: โรงพิมพ์องค์การสงเคราะห์ทหารผ่านศึก.
- จุฑาทิพย์ นันทวินิตย์. (2541). (Nantavinit, J., 2000). *ผลของการใช้โปรแกรมการสอนที่เน้นกระบวนการกลุ่มสำหรับผู้ป่วยที่ได้รับบาดเจ็บของข่ายประสาทส่วนแขนที่มีต่อความสามารถในการปรับตัว*. วิทยานิพนธ์พยาบาลศาสตรมหาบัณฑิต, สาขาบริหารการพยาบาล, บัณฑิตวิทยาลัย จุฬาลงกรณ์มหาวิทยาลัย, กรุงเทพมหานคร.
- ปาริชาติ จันทรสุนทรพร. (2548). (Jansoontraporn, P., 2005). *การศึกษาการจัดการเกี่ยวกับอาการปวดเข้าในผู้ป่วยโรคข้อเข่าเสื่อม*. วิทยานิพนธ์พยาบาลศาสตรมหาบัณฑิต, สาขาการพยาบาลผู้ใหญ่, บัณฑิตวิทยาลัย มหาวิทยาลัยมหิดล, กรุงเทพมหานคร.
- พงศ์ภารดี เจาทะเกตรินและคณะ. (2547). (Chaudakshetrin, P., 2004). *ชุดตำราพื้นฐานความปวด เล่มที่ 1 (พิมพ์ครั้งที่ 2)*. กรุงเทพมหานคร: ทีมส์ (ประเทศไทย).
- พงษ์ศักดิ์ วัฒนา. (2539). (Wattana, P., 1996). *ตำราออร์โธปิดิกส์ 1 (พิมพ์ครั้งที่ 1)*. ในวิรุฬ เหล่าภัทรเกษม, บรรจง มไหสวริยะ และ สารเนตร ไวกกุล. ขอนแก่น: ศิริภัณฑ์ออฟเซต.
- ่องรัตน์ รัตนไทย. (2540). (Ratthanathai, P., 1997). *ประสบการณ์ความปวดและวิธีจัดการกับความปวดในผู้ป่วยโรคมะเร็ง*. วิทยานิพนธ์พยาบาลศาสตรมหาบัณฑิต (การพยาบาลผู้ใหญ่), บัณฑิตวิทยาลัย มหาวิทยาลัยมหิดล, กรุงเทพมหานคร.
- ภานุพันธ์ ทรงเจริญ และ บรรจง มไหสวริยะ. (2539). (Songcharoen, P., & Mahaisavariya, B., 1996). *การบาดเจ็บของเส้นประสาท (พิมพ์ครั้งที่ 1)*. กรุงเทพฯ: เรือนแก้วการพิมพ์.

- ภานุพันธ์ ทรงเจริญ. (2530). (Songcharoen, P., 1987). A Preliminary Report on 110 Brachial Plexus Injuries Treated at Siriraj Hospital. *วารสารสมาคมออโรโธปีดิกส์แห่งประเทศไทย*, 12(2), 109-118.
- ภานุพันธ์ ทรงเจริญ, บรรจง มไหสวริยะ และเจริญ โชติกวนิชย์. (2539). (Songcharoen, P., Mahaisavariya, B., & Chotigavanich, C., 1996). การรักษาการบาดเจ็บของ brachial plexus ด้วยวิธี neurotization. *วารสารสมาคมออโรโธปีดิกส์แห่งประเทศไทย*, 21(1), 2-11.
- วิจิตร ศรีสุพรรณ. (2545). (Srisupan, V., 2002). *การวิจัยทางการแพทย์: หลักการและแนวปฏิบัติ* (พิมพ์ครั้งที่ 2). เชียงใหม่: โครงการตำรา คณะพยาบาลศาสตร์ มหาวิทยาลัยเชียงใหม่.
- ศูนย์ข้อมูลสารสนเทศ สำนักงานตำรวจแห่งชาติ. (2548).
- ศูนย์ข้อมูลสารสนเทศ โรงพยาบาลศิริราช. (2549).
- ศิริชัย กาญจนวาสี, ทวีวัฒน์ ปิตยานนท์และดิเรก ศรีสุขโ. (2540). (Kanchanawasri, S., Pityanon, T., & Srisukho, D., 1997). *การเลือกใช้สถิติที่เหมาะสมสำหรับการวิจัย* (พิมพ์ครั้งที่ 2). กรุงเทพฯ: พชรกานต์พับลิเคชั่น.
- ศิริพร จิรวัดน์กุล. (2548). (Jirawattanakul, S., 2005). *การวิจัยเชิงคุณภาพในวิชาชีพพยาบาล* (พิมพ์ครั้งที่ 2). ขอนแก่น: ศิริภัณฑ์ออฟเซ็ท.
- ศรีเรือน แก้วกังวาน. (2540). (Kawkungvan, S., 1997). *จิตวิทยาพัฒนาการชีวิตทุกช่วงวัย* (เล่ม 2) (พิมพ์ครั้งที่ 7). กรุงเทพฯ: โรงพิมพ์มหาวิทยาลัยธรรมศาสตร์.
- สำนักงานตำรวจแห่งชาติ. (2546). *สถิติอุบัติเหตุ/ โจรสารของกองวิศวกรรมจราจร กรมทางหลวง*.

## **APPENDIX**

## **APPENDIX A**

### **LIST OF EXPERTS**

The contents of the research instruments were validated by three experts as below:

1. Prof. Banchong Mahaisavariya, M.D.,  
Department of Orthopedic Surgery,  
Faculty of Medicine Siriraj Hospital,  
Mahidol University, Bangkok, Thailand
2. Assoc. Prof. Wannee Satyawiwat, M.Ed., S.R.N.O.N.C.,  
Nurse Instructor,  
Department of Surgical Nursing, Faculty of Nursing,  
Mahidol University,  
Bangkok, Thailand
3. Miss Chutatip Nuntawinit, M.N.S. (Nursing Administration),  
Senior Register Nurse,  
Operating room of Orthopedic Surgery,  
Division of Nursing, Siriraj Hospital, Thailand

# APPENDIX B PERMISSION LETTERS FOR DATA COLLECTING



## บันทึกข้อความ

คณะพยาบาลศาสตร์
เลขที่ 4810
วันที่ 1.1.ย. 2550
เวลา

ส่วนราชการ คณะแพทยศาสตร์ศิริราชพยาบาล มหาวิทยาลัยมหิดล โทร. 0 2419 9407-9

ที่ ศร 0517.07/ 9698 วันที่ ๙ มิถุนายน 2550

เรื่อง ยินดีให้ความอนุเคราะห์ข้อมูลประกอบการทำวิทยานิพนธ์

เรียน คณบดีคณะพยาบาลศาสตร์ มหาวิทยาลัยมหิดล

ตามที่ คณะพยาบาลศาสตร์ มหาวิทยาลัยมหิดล ได้ขอความอนุเคราะห์ให้ นางสาวพรทิพย์ สาริโส นักศึกษาหลักสูตรพยาบาลศาสตรมหาบัณฑิต สาขาการพยาบาลผู้ใหญ่ คณะพยาบาลศาสตร์ มหาวิทยาลัยมหิดล เข้าเก็บข้อมูลโดยวิธีการสัมภาษณ์ผู้ป่วยที่ได้รับบาดเจ็บชายประสาทส่วนแขนภายหลังการผ่าตัด ที่หน่วยตรวจและติดตามผลการรักษาออร์โธปิดิกส์ (ห้องเมือก) ตึกสยามินทร์ ชั้น 1 จำนวน 224 ราย เพื่อเป็นข้อมูลประกอบการทำวิทยานิพนธ์ เรื่อง "อาการปวดและวิธีการจัดการกับอาการปวด ในผู้ป่วยที่ได้รับการผ่าตัดชายประสาทส่วนแขนภายหลังการผ่าตัด" ความละเอียดแจ้งแล้วนั้น

คณะแพทยศาสตร์ศิริราชพยาบาล มหาวิทยาลัยมหิดล พิจารณาแล้วยินยอมให้ นางสาวพรทิพย์ สาริโส ทำการเก็บข้อมูลตามที่ขอความอนุเคราะห์มา ทั้งนี้ได้ผ่านการรับรองโครงการวิจัย จากคณะกรรมการจริยธรรมการวิจัย ในคน คณะแพทยศาสตร์ศิริราชพยาบาล เมื่อวันที่ 18 พฤษภาคม 2550 ที่แนบมา

จึงเรียนมาเพื่อโปรดทราบ

เรียน ประธานคณะกรรมการบริหารหลักสูตร  
พยาบาลศาสตรมหาบัณฑิต  
แจ้งโปรดทราบ  
เรื่องส่ง.....  
*(Signature)*  
11 มิ.ย. 50

*(Signature)*  
(ศาสตราจารย์นายแพทย์อรุณ นานา)  
รองคณบดีฝ่ายบริหาร ปฏิบัติราชการแทน  
คณบดีคณะพยาบาลศาสตร์ศิริราชพยาบาล

- งพ. พิศม สร้อยชูงาม  
11 มิ.ย. 50
- ๑) มณฑลใน วิทยาลัยมหิดล
  - ๒) สยามเมือก ออร์โธปิดิกส์ ชั้น 1
  - ๓) สยามเมือก ออร์โธปิดิกส์ ชั้น 1

สำนักงานรองคณบดีฝ่ายวิจัย  
โทร. 0 2419 9407-9 โทรสาร 0 2418 3307

# APPENDIX C INFORMATION CONSENT FORM

สำหรับผู้เข้าร่วมวิจัยที่มีอายุตั้งแต่ 15 ปีบริบูรณ์ขึ้นไป

หนังสือแสดงเจตนายินยอมเข้าร่วมการวิจัย



วันที่.....เดือน..... พ.ศ.....

ข้าพเจ้า.....อายุ.....ปีอาศัยอยู่บ้านเลขที่.....  
ถนน.....ตำบล.....อำเภอ.....  
จังหวัด.....รหัสไปรษณีย์.....โทรศัพท์.....

ขอแสดงเจตนายินยอมเข้าร่วมโครงการวิจัย เรื่องอาการปวดและวิธีการจัดการกับอาการปวด ในผู้ป่วยที่ได้รับบาดเจ็บชายประสาทส่วนแขนภายหลังการผ่าตัด

โดยข้าพเจ้าได้รับทราบรายละเอียดเกี่ยวกับที่มาและจุดมุ่งหมายในการทำวิจัยรายละเอียดขั้นตอนต่างๆ ที่จะต้องปฏิบัติหรือได้รับการปฏิบัติ ประโยชน์ที่คาดว่าจะได้รับของการวิจัยและความเสี่ยงที่อาจเกิดขึ้นจากการเข้าร่วมการวิจัย รวมทั้งแนวทางป้องกันและแก้ไขหากเกิดอันตรายขึ้น ค่าตอบแทนที่จะได้รับ ค่าใช้จ่ายที่ข้าพเจ้าจะต้องรับผิดชอบจ่ายเอง โดยได้อ่านข้อความที่มีรายละเอียดอยู่ในเอกสารชี้แจงผู้เข้าร่วมการวิจัยโดยตลอด อีกทั้งยังได้รับคำอธิบายและตอบข้อสงสัยจากหัวหน้าโครงการวิจัยเป็นที่เรียบร้อยแล้ว

ข้าพเจ้าจึงสมัครใจเข้าร่วมในโครงการวิจัยนี้  
หากข้าพเจ้ามีข้อข้องใจเกี่ยวกับขั้นตอนของการวิจัย หรือหากเกิดผลข้างเคียงที่ไม่พึงประสงค์จากการวิจัยขึ้นกับข้าพเจ้า ข้าพเจ้าจะสามารถติดต่อกับนางสาวพรทิพย์ สารีโส โทรศัพท์ 089-7129907 ได้ 24 ชม.  
หากข้าพเจ้าได้รับการปฏิบัติไม่ตรงตามที่ได้ระบุไว้ในเอกสารชี้แจงผู้เข้าร่วมการวิจัย ข้าพเจ้าจะสามารถติดต่อกับประธานคณะกรรมการจริยธรรมการวิจัยในคน หรือผู้แทน ได้ที่ สำนักงานคณะกรรมการจริยธรรมการวิจัยในคน ดิโกดูลู เดชวิกรม ชั้น 5 ร.พ.ศิริราช โทร (02) 419-7000 ต่อ 6405

ข้าพเจ้าได้ทราบถึงสิทธิที่ข้าพเจ้าจะได้รับข้อมูลเพิ่มเติมทั้งทางด้านประโยชน์และโทษจากการเข้าร่วมการวิจัย และสามารถถอนตัวหรืองดเข้าร่วมการวิจัยได้ทุกเมื่อ โดยจะไม่มีผลกระทบต่อค่าบริการและการรักษาพยาบาลที่ข้าพเจ้าจะได้รับต่อไปในอนาคต และยินยอมให้ผู้วิจัย ใช้ข้อมูลส่วนตัวของข้าพเจ้าที่ได้รับจากการวิจัย แต่จะไม่เผยแพร่ต่อสาธารณะเป็นรายบุคคล โดยจะนำเสนอเป็นข้อมูลโดยรวมจากการวิจัยเท่านั้น

ข้าพเจ้าได้เข้าใจข้อความในเอกสารชี้แจงผู้เข้าร่วมการวิจัย และหนังสือแสดงเจตนายินยอมนี้โดยตลอดแล้ว จึงลงลายมือชื่อไว้

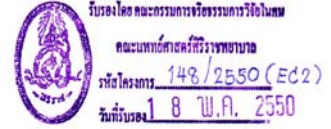
ลงชื่อ.....ผู้เข้าร่วมการวิจัย/ผู้แทน โดยชอบธรรม/ วันที่.....  
(.....)

ลงชื่อ.....ผู้ให้ข้อมูลและขอความยินยอม/หัวหน้าโครงการวิจัย/ วันที่.....  
(.....)

ในกรณีผู้เข้าร่วมการวิจัยอ่านหนังสือไม่ออก ผู้ที่อ่านข้อความทั้งหมดแทนผู้เข้าร่วมการวิจัยคือ.....  
จึงได้ลงลายมือชื่อไว้เป็นพยาน

ลงชื่อ.....พยาน/ วันที่.....  
(.....)

**เอกสารชี้แจงผู้เข้าร่วมการวิจัย**  
(Participant Information Sheet)



ในเอกสารนี้อาจมีข้อความที่ท่านอ่านแล้วยังไม่เข้าใจ โปรดสอบถามหัวหน้าโครงการวิจัย หรือผู้แทนให้ช่วยอธิบายจนกว่าจะเข้าใจดี ท่านอาจจะขอเอกสารนี้กลับไปอ่านที่บ้านเพื่อปรึกษาหรือกับญาติพี่น้อง เพื่อนสนิท แพทย์ประจำตัวของท่าน หรือแพทย์ท่านอื่น เพื่อช่วยในการตัดสินใจเข้าร่วมการวิจัย

ชื่อโครงการ อากาศปวดและวิธีการจัดการกับอาการปวด ในผู้ป่วยที่ได้รับบาดเจ็บข้อประสาทส่วนแขนภายหลังการผ่าตัด

ชื่อผู้วิจัย นางสาวพรทิพย์ สาริโส

สถานที่วิจัย หน่วยตรวจและติดตามผลการรักษาออร์โธปิดิกส์ (ห้องฝึก) ศึกสยามมินทร์ ชั้น 1 โรงพยาบาลศิริราช

สถานที่ทำงานและหมายเลขโทรศัพท์ที่ติดต่อได้ทั้งในและนอกเวลาราชการ เบอร์โทรศัพท์ 089-7129907

โครงการวิจัยนี้ทำขึ้นเพื่อศึกษาถึงการรับรู้ การประเมิน และการตอบสนองต่ออาการปวด และอาการอื่นๆที่นอกเหนือจากอาการปวด รวมถึงวิธีการจัดการและประสิทธิผลของการจัดการกับอาการดังกล่าว ซึ่งจะมีประโยชน์ที่คาดว่า จะได้รับคือเป็นข้อมูลพื้นฐานในการดูแลผู้ป่วยที่ได้รับบาดเจ็บข้อประสาทส่วนแขนภายหลังการผ่าตัด โดยนำข้อมูลที่ได้จากการวิจัยมาแก้ไขปัญหายาอาการปวด และอาการอื่นๆที่เกิดขึ้น เพื่อให้ตรงกับความต้องการของผู้ป่วย ทำให้มองเห็นภาพรวมของผู้ป่วยเพื่อที่จะสามารถให้การปฏิบัติการพยาบาลที่เป็นองค์รวมได้อย่างเหมาะสมและมีประสิทธิภาพมากยิ่งขึ้น นอกจากนี้ยังเป็นข้อมูลเบื้องต้นในการพัฒนาคุณภาพการพยาบาลในด้านการทำวิจัยเพื่อสร้างองค์ความรู้ใหม่ โดยนำข้อมูลที่ ได้จากการวิจัยในครั้งต่อไปเป็นข้อมูลเบื้องต้นในการศึกษาวิจัยในผู้ป่วยที่ได้รับการบาดเจ็บข้อประสาทส่วนแขนภายหลังการผ่าตัดต่อไป

ท่านได้รับเชิญให้เข้าร่วมการวิจัยนี้เนื่องจาก ท่านเป็นผู้หนึ่งที่มีคุณสมบัติเหมาะสมตามเกณฑ์การคัดเลือกประชากรเข้าเป็นกลุ่มตัวอย่างในครั้ง นี้ คือท่านเป็นผู้ที่มีอายุ 15 ปีขึ้นไป ได้รับการบาดเจ็บข้อประสาทส่วนแขน และได้รับการผ่าตัด 3 เดือนถึง 2 ปี และไม่มีประวัติเกี่ยวกับอาการปวดที่เกิดจากสาเหตุอื่นร่วมด้วย ได้แก่ อาการปวดจากโรคเกาต์ รูมาคอยด์หรือกระดูกหัก

จะมีผู้เข้าร่วมการวิจัยนี้ทั้งสิ้นประมาณ 224 คน ระยะเวลาที่จะทำวิจัยทั้งสิ้น 12 เดือน

เมื่อท่านเข้าร่วมการวิจัยแล้ว ผู้วิจัยจะขอให้ท่านตอบแบบสัมภาษณ์จำนวน 3 ส่วน ได้แก่ แบบบันทึกข้อมูลทั่วไป แบบสัมภาษณ์เกี่ยวกับอาการปวดและวิธีการจัดการอาการปวด จำนวน 11 ข้อ และแบบสัมภาษณ์อาการและวิธีการจัดการอาการอื่นๆ ที่นอกเหนือจากอาการปวด จำนวน 6 ข้อ จะใช้เวลาประมาณ 60 นาที โดยระหว่างการสัมภาษณ์ผู้ร่วมวิจัยสามารถยุติการตอบแบบสัมภาษณ์นี้ได้ตลอดเวลา โดยไม่มีผลต่อการรักษาและการให้การพยาบาลใดๆ เมื่อผู้เข้าร่วมวิจัยไม่เข้าใจในแบบสัมภาษณ์สามารถซักถามกับผู้วิจัยได้ และผู้วิจัยขออนุญาตในการบันทึกเทปและจดบันทึกในระหว่างการสัมภาษณ์เพื่อความถูกต้องครบถ้วนของเนื้อหาและป้องกันการสูญหายของข้อมูล

ความเสี่ยงที่อาจเกิดขึ้นเมื่อเข้าร่วมการวิจัย เนื่องจากโครงการวิจัยนี้เป็นเพียงการสัมภาษณ์เพราะฉะนั้นในการวิจัยครั้งนี้จะไม่ก่อให้เกิดอันตรายกับท่าน แต่ทั้งนี้อาจทำให้ท่านเสียเวลาในการตอบแบบสัมภาษณ์ประมาณ 60 นาที หรือมี อาจจะมีบางข้อคำถามที่ทำให้ท่านไม่สบายใจที่จะตอบ ท่านสามารถไม่ตอบคำถามในข้อนั้นได้ ถ้าหากระหว่างกร

สัมภาษณ์พบว่ามีการไคที่รุนแรง เช่นปวดมากจนทนไม่ไหว และเป็นบ่อยครั้ง หรือเครียดมาก ผู้วิจัยจะส่งต่อท่าน ให้กับแพทย์ผู้เชี่ยวชาญเพื่อทำการรักษาต่อไป

หากท่านไม่เข้าร่วมในโครงการวิจัยนี้ ท่านก็จะได้รับการตรวจเพื่อการวินิจฉัยและรักษาโรคของท่านตามวิธีการที่เป็นมาตรฐาน

หากท่านสงสัยหรือข้อข้องใจที่จะสอบถามเกี่ยวข้องกับกรวิจัย สามารถติดต่อได้ผู้วิจัยโดยตรงที่ นางสาวพรทิพย์ สาริโส ตามที่อยู่และหมายเลขโทรศัพท์ที่ระบุไว้ในตอนต้นของเอกสาร

ในการเข้าร่วมวิจัยครั้งนี้ ท่านไม่ต้องเสียค่าใช้จ่ายใดๆ ทั้งสิ้น

หากมีข้อมูลเพิ่มเติมทั้งด้านประโยชน์และโทษที่เกี่ยวข้องกับการวิจัยนี้ ผู้วิจัยจะแจ้งให้ทราบโดยรวดเร็วไม่ปิดบัง

ข้อมูลส่วนตัวของท่านจะถูกเก็บรักษาไว้ ไม่เปิดเผยต่อสาธารณะเป็นรายบุคคล แต่จะรายงานผลการวิจัยเป็นข้อมูลส่วนรวม ข้อมูลของท่านเป็นรายบุคคลอาจมีคณะบุคคลบางกลุ่มเข้ามาตรวจสอบได้ เช่น ผู้ให้ทุนวิจัย, สถาบัน หรือองค์กรของรัฐที่มีหน้าที่ตรวจสอบ, คณะกรรมการจริยธรรมฯ เป็นต้น

ท่านมีสิทธิถอนตัวออกจากโครงการวิจัยเมื่อใดก็ได้ โดยไม่ต้องแจ้งให้ทราบล่วงหน้า และการไม่เข้าร่วมการวิจัยหรือถอนตัวออกจากโครงการวิจัยนี้จะไม่ผลกระทบต่อการบริการและการรักษาที่สมควรจะได้รับแต่ประการใด

หากท่านได้รับการปฏิบัติที่ไม่ตรงตามที่ได้ระบุไว้ในเอกสารชี้แจงนี้ ท่านจะสามารถแจ้งให้ประธานคณะกรรมการจริยธรรมฯ ทราบได้ที่ สำนักงานคณะกรรมการจริยธรรมการวิจัยในคน ดิโกศลเวชวิกรม ชั้น 5 ร.พ.ศิริราช เบอร์โทร. (02)419-7000 ต่อ 6405

ข้าพเจ้าได้อ่านรายละเอียดในเอกสารนี้ครบถ้วนแล้ว

ลงชื่อ...../วันที่.....  
(.....)



สำหรับผู้เข้าร่วมวิจัยที่มีอายุน้อยกว่า 15 ปีบริบูรณ์

หนังสือแสดงเจตนายินยอมเข้าร่วมการวิจัย

วันที่..... เดือน..... พ.ศ.....

ข้าพเจ้า.....อายุ.....ปีอาศัยอยู่บ้านเลขที่..... ถนน.....ตำบล.....อำเภอ..... จังหวัด.....รหัสไปรษณีย์.....โทรศัพท์.....

ขอแสดงเจตนายินยอมให้เด็กในปกครองของข้าพเจ้าเข้าร่วม โครงการวิจัย เรื่องอาการปวดและวิธีการจัดการกับอาการปวด ในผู้ป่วยที่ได้รับบาดเจ็บชายประสาทส่วนแขนภายหลังการผ่าตัด

โดยข้าพเจ้าได้รับทราบรายละเอียดเกี่ยวกับที่มาและจุดมุ่งหมายในการทำวิจัยรายละเอียดขั้นตอนต่างๆ ที่จะต้องปฏิบัติหรือได้รับการปฏิบัติ ประโยชน์ที่คาดว่าจะได้รับของการวิจัยและความเสี่ยงที่อาจเกิดขึ้นจากการเข้าร่วมการวิจัย รวมทั้งแนวทางการป้องกันและแก้ไขหากเกิดอันตรายขึ้น ค่าตอบแทนที่จะได้รับ ค่าใช้จ่ายที่ข้าพเจ้าจะต้องรับผิดชอบจ่ายเอง โดยได้อ่านข้อความที่มีรายละเอียดอยู่ในเอกสารชี้แจงผู้เข้าร่วมการวิจัยโดยตลอด อีกทั้งยังได้รับคำอธิบายและตอบข้อสงสัยจากหัวหน้าโครงการวิจัยเป็นที่เรียบร้อยแล้ว

ข้าพเจ้าจึงสมัครใจให้เด็กในปกครองของข้าพเจ้าเข้าร่วมในโครงการวิจัยนี้ หากข้าพเจ้ามีข้อข้องใจเกี่ยวกับขั้นตอนของการวิจัย หรือหากเกิดผลข้างเคียงที่ไม่พึงประสงค์จากการวิจัยขึ้นกับข้าพเจ้า ข้าพเจ้าจะสามารถติดต่อกับนางสาวพรทิพย์ สารีโส โทรศัพท์ 089-7129907 ได้ 24 ชม. หากเด็กในปกครองของข้าพเจ้า ได้รับการปฏิบัติไม่ตรงตามที่ได้ระบุไว้ในเอกสารชี้แจงผู้เข้าร่วมการวิจัย ข้าพเจ้าจะสามารถติดต่อกับประธานคณะกรรมการจริยธรรมการวิจัยในคน หรือผู้แทน ได้ที่ สำนักงานคณะกรรมการจริยธรรมการวิจัยในคน ตึกอคูลดชชวกรรม ชั้น 5 ร.พ.ศิริราช โทร (02) 419-7000 ต่อ 6405

ข้าพเจ้าได้ทราบถึงสิทธิที่ข้าพเจ้าจะได้รับข้อมูลเพิ่มเติมทั้งทางด้านประโยชน์และโทษจากการเข้าร่วมการวิจัย และสามารถถอนตัวหรืองดเข้าร่วมการวิจัยได้ทุกเมื่อ โดยจะไม่มีผลกระทบต่อการบริหารและการรักษาพยาบาลที่ข้าพเจ้าจะได้รับต่อไปในอนาคต และยินยอมให้ผู้วิจัย ใช้ข้อมูลส่วนตัวของข้าพเจ้าที่ได้รับจากการวิจัย แต่จะไม่เผยแพร่ต่อสาธารณะเป็นรายบุคคล โดยจะนำเสนอเป็นข้อมูลโดยรวมจากการวิจัยเท่านั้น

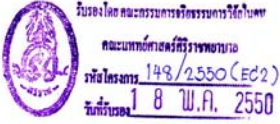
ข้าพเจ้าได้เข้าใจข้อความในเอกสารชี้แจงผู้เข้าร่วมการวิจัย และหนังสือแสดงเจตนายินยอมนี้โดยตลอดแล้ว จึงลงลายมือชื่อไว้

ลงชื่อ.....ผู้เข้าร่วมการวิจัย/ผู้แทนโดยชอบธรรม/ วันที่.....

ลงชื่อ.....ผู้ให้ข้อมูลและขอความยินยอม/หัวหน้าโครงการวิจัย/ วันที่.....

ในกรณีผู้เข้าร่วมการวิจัยอ่านหนังสือไม่ออก ผู้ที่อ่านข้อความทั้งหมดแทนผู้เข้าร่วมการวิจัยคือ..... จึงได้ลงลายมือชื่อไว้เป็นพยาน

ลงชื่อ..... พยาน/ วันที่.....





แบบสัมภาษณ์ประมาณ 60 นาที หรือมีอาจจะมียางข้อคำถามที่ทำให้เด็กในปกครองของท่านไม่สบายใจที่จะตอบ เด็กในปกครองของท่านสามารถไม่ตอบคำถามในข้อนั้นได้ ถ้าหากระหว่างการสัมภาษณ์พบว่ามีอาการใดที่รุนแรง เช่นปวดมากจนทนไม่ไหว และเป็นบ่อยครั้ง หรือเครียดมาก ผู้วิจัยจะส่งต่อเด็กในปกครองของท่านให้กับแพทย์ผู้เชี่ยวชาญเพื่อทำการรักษาต่อไป

หากเด็กในปกครองของท่านไม่เข้าร่วมในโครงการวิจัยนี้ เด็กในปกครองของท่านก็จะได้รับการตรวจเพื่อการวินิจฉัยและรักษาโรคตามวิธีการที่เป็นมาตรฐาน

หากเด็กในปกครองของท่านสงสัยหรือข้องใจที่จะสอบถามเกี่ยวกับโครงการวิจัย สามารถติดต่อได้ที่ผู้วิจัยโดยตรงที่ นางสาวพรทิพย์ สาริโส ตามที่อยู่และหมายเลขโทรศัพท์ที่ระบุไว้ในคอนต้นของเอกสาร

ในการเข้าร่วมวิจัยครั้งนี้ เด็กในปกครองของท่าน ไม่ต้องเสียค่าใช้จ่ายใดๆ ทั้งสิ้น

หากมีข้อมูลเพิ่มเติมทั้งด้านประโยชน์และโทษที่เกี่ยวข้องกับการวิจัยนี้ ผู้วิจัยจะแจ้งให้ทราบโดยรวดเร็วไม่มีบิดบัง

ข้อมูลส่วนตัวของเด็กในปกครองของท่านจะถูกเก็บรักษาไว้ ไม่เปิดเผยต่อสาธารณะเป็นรายบุคคล แต่จะรายงานผลการวิจัยเป็นข้อมูลส่วนรวม ข้อมูลของเด็กในปกครองของท่านเป็นรายบุคคลอาจมีคณะบุคคลบางกลุ่มเข้ามาตรวจสอบได้ เช่น ผู้ให้ทุนวิจัย, สถาบัน หรือองค์กรของรัฐที่มีหน้าที่ตรวจสอบ, คณะกรรมการจริยธรรมฯ เป็นต้น

เด็กในปกครองของท่านมีสิทธิถอนตัวออกจากโครงการวิจัยเมื่อใดก็ได้ โดยไม่ต้องแจ้งให้ทราบล่วงหน้า และการไม่เข้าร่วมการวิจัยหรือถอนตัวออกจากโครงการวิจัยนี้จะไม่มีผลกระทบต่อค่าบริการและการรักษาที่สมควรจะได้รับแต่ประการใด

หากเด็กในปกครองของท่านได้รับการปฏิบัติที่ไม่ตรงตามที่ได้ระบุไว้ในเอกสารชี้แจงนี้ ท่านจะสามารถแจ้งให้ประธานคณะกรรมการจริยธรรมฯ ทราบได้ที่ สำนักงานคณะกรรมการจริยธรรมการวิจัยในคน ตึกอคูลเดชวิกรม ชั้น 5 ร.พ.ศิริราช เบอร์โทร. (02)419-7000 ต่อ 6405

ข้าพเจ้าได้อ่านรายละเอียดในเอกสารนี้ครบถ้วนแล้ว

ลงชื่อ...../วันที่.....  
(.....)



## APPENDIX D DATA COLLECTION INSTRUMENTS

ลำดับที่.....  
วัน/เดือน/ปี.....

### ส่วนที่ 1 แบบบันทึกข้อมูลทั่วไป

คำชี้แจง ให้ผู้วิจัยสัมภาษณ์กลุ่มตัวอย่างแล้วบันทึกข้อมูล โดยการทำเครื่องหมายถูก (✓) ลงใน  หน้าข้อความที่ตรงกับคำตอบของกลุ่มตัวอย่างหรือเติมข้อความลงในช่องว่างที่กำหนด

#### 1.1 แบบบันทึกข้อมูลส่วนตัว

1. เพศ

ชาย

หญิง

2. อายุ.....ปี

3. สถานภาพสมรส

โสด

คู่

มีภรรยา

หย่า

แยกกันอยู่

อื่นๆ.....

4. ....

5. ....

6. ....

10. ....

### 1.2 แบบบันทึกข้อมูลการเจ็บป่วย

1. การวินิจฉัยโรค.....
2. สาเหตุของการบาดเจ็บ.....วันที่ได้รับบาดเจ็บ.....
3. ชนิดของการบาดเจ็บ.....
4. ....
5. ....
6. ....
7. ....
- 10.....

**ส่วนที่ 2 แบบสัมภาษณ์อาการปวดและวิธีการจัดการกับอาการปวด ในผู้ป่วยที่ได้รับบาดเจ็บชาย  
ประสาทส่วนแขนภายหลังการผ่าตัด**

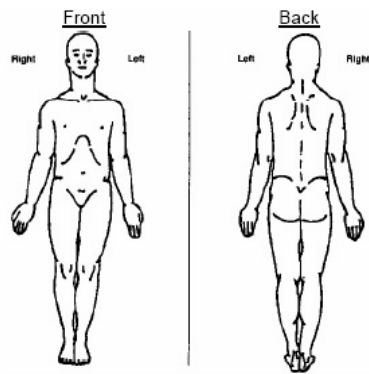
**คำชี้แจง** ในแต่ละข้อคำถาม ให้ผู้วิจัยอ่านข้อคำถามให้ผู้ถูกสัมภาษณ์ตอบคำถามที่ตรงกับความรู้สึก  
ของผู้ถูกสัมภาษณ์มากที่สุด โดยใช้เครื่องหมาย X ลงบนคำตอบที่กลุ่มตัวอย่างตอบ

1. ในชีวิตที่ผ่านมา ท่านคงจะเคยมีประสบการณ์ของอาการปวดในลักษณะต่างๆ มาบ้างแล้ว เช่น  
ปวดศีรษะ ปวดฟัน หรือ อาการปวดเคล็ด ชัด ขอก ใน 1 เดือนที่ผ่านมา ท่านมีอาการปวด  
หรือไม่ อาการปวดของท่านมีลักษณะเป็นอย่างไร

- ไม่มี
- มี ลักษณะของอาการปวด.....

.....

2. กรุณาระบุตำแหน่งบนร่างกายตามรูปต่อไปนี้ที่ท่านรู้สึกปวด



3. ในระยะเวลา 1 เดือนที่ผ่านมา อาการปวดที่ท่านรู้สึกว่ารุนแรงมากที่สุดอยู่ในระดับใด

---

0      1      2      3      4      5      6      7      8      9      10

ไม่มีอาการปวด

ปวดมากที่สุด

- 4.....
- 5.....
- 6.....
- 12.....

**ส่วนที่ 3 แบบสัมภาษณ์อาการและวิธีการจัดการกับอาการอื่นๆ ที่นอกเหนือจากอาการปวด ในผู้ป่วย  
ที่ได้รับการบำบัดเจ็บป่วยประสาทส่วนแขนภายหลังการผ่าตัด**

**คำชี้แจง** ผู้วิจัยดำเนินการสัมภาษณ์กลุ่มตัวอย่างแล้วบันทึกข้อมูลที่กลุ่มตัวอย่างตอบ

1. ข้อคำถามเกี่ยวกับการรับรู้อาการภายหลังการผ่าตัด
  - 1.1 ในรอบ 1 เดือนที่ผ่านมาหลังจากผ่าตัด ท่านมีอาการอื่นๆ ที่นอกเหนือจากอาการปวด  
อะไรเกิดขึ้นบ้าง
  - 1.2 อาการนั้นมีลักษณะเป็นอย่างไร
2. ข้อคำถามเกี่ยวกับการประเมินอาการภายหลังการผ่าตัด
  - 2.1 อาการที่เกิดขึ้นนั้นเป็นบ่อยครั้งแค่ไหน
  - 2.2 ท่านคิดว่าอะไรที่เป็นสาเหตุของการเกิดอาการนั้น
- 3.....
- 4.....

## **BIOGRAPHY**

<b>NAME</b>	Miss Porn tip Sareeso
<b>DATE OF BIRTH</b>	5 June 1979
<b>PLACE OF BIRTH</b>	Udonthani, Thailand
<b>INSTITUTIONS ATTENDED</b>	Mahidol University, 2001: Bachelor of Nursing Science Mahidol University, 2009: Master of Nursing Science (Adult Nursing)
<b>RESEARCH-GRANT</b>	Support by Siriraj Routine to Research Management Fund
<b>POSITION&amp;OFFICE</b>	2001-2003: Adsadang building (11 <sup>th</sup> floor) Unit, Department of Medicine, Siriraj Hospital, Mahidol University, Bangkok, Thailand. Position: Registered Nurse 2003-2005: Medicine-Surgery unit, Fort Prachaksinlapakom Hospital, Udonthani, Thailand Position: Registered Nurse
<b>HOME ADDRESS</b>	1 Mho 1, Tambol Bankhao, Amphur Muang, Udonthani, Thailand, 41000. E-mail: aoy_pss@hotmail.com