Brachial Plexus Injury and Pain: Incidence and the Effects of Surgical Reconstruction

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Abstract

A prospective study of pain after brachial plexus injury was carried out on 246 patients with at least 2 years follow-up. All of them had closed traction injury from motorcycle accidents. There were 16 females and 230 males aged from 16 to 44 years old. The patients' biodata, onset of pain, characteristics of pain and treatment were recorded. Changes in pain after conservative and operative treatment and the outcome of treatment were analysed. Two hundred and nineteen patients (89%) had significant pain and 182 patients (74%) had severe pain. Most of them had continuous pain with 2 to 20 peaks of severe pain per day. Crushing type of pain was the most common but mixed type of pain caused the most distress. Conservative treatment before surgery could relieve the pain in 39 patients (15.8%). Surgical reconstruction could further relieve the pain in 176 patients (80.36%). However, 21 patients (8.5%) still had severe pain. Improvement in sensory function had more effect on pain reduction than motor function.

Key word : Brachial Plexus Injury, Pain, Incidence, Effects of Surgical Reconstruction

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Pain after brachial plexus injury is an interesting subject since its long lasting nature and severity cause disability and many problems in the patient's life. Yeoman and Seddon(1), and Taylor(2) first reported a series of their patients who had chronic pain syndrome after injury. Later, Wynn Parry(3) and Narakas(4) reported the incidence of severe pain, ranging from 10 to 20 per cent after truncal injury to 40 per cent of avulsion injury. Bruxelle et al reported details of the charac-

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teristics and severity of pain[5]. They also reported the correlation of pain and the extent of injury. Their study was carried out as a retrospective one. However, a certain number of their patients were not operated on. Therefore, the exact pathology was not demonstrated in these patients. Furthermore, although they found a relationship between motor recovery and decrease in pain intensity, they did not report the effect of sensory recovery on pain. The causes of brachial plexus injuries also varied from closed to open injury. Some patients may also have had associated injuries.

The aim of this study was to find out the incidence, severity and characteristics of pain after brachial plexus injury resulting from motorcycle accidents, which is the most common cause of brachial plexus injury. The factors that influenced pain and the effects of surgical management on pain were also analysed.

METHOD

Patient population and study design

The study was carried out as a prospective survey research with at least 2 years follow-up. The inclusion criteria were 1) closed traction injury from a motorcycle accident, 2) compliant patients, and 3) no previous surgery of the shoulder, great vessels around the shoulder and brachial plexus. The exclusion criteria were 1) patients who had multiple trauma, especially head injury, 2) patients who had underlying disease or chronic illness, 3) brachial plexus injury in children and birth palsy, and 4) non-cooperative patients.

Complete physical examination, plain radiography, cervical myelography, and periodic electrodiagnosis were performed in every patient. Moreover, either immediate or delayed surgical explorations were performed in all patients; thus the correlation of clinical and surgical findings were revealed.

Measurement

All patients were interviewed about their injuries, biodata, onset of pain, pain severity and pain characteristics. Pain severity was measured by specific nurses and self assessement at the first visit of each patient, 2 weeks before surgery, 2 weeks after surgery, 1 year follow-up and 2 year follow-up. No pain meant that the patients had no pain at all or just had some discomfort on the numbness area which did not disturb their normal activities and no analgesic was needed. Mild pain meant that the patients had pain on the numbness or adjacent areas but pain did not disturb their normal activities; weak and moderate analgesics were needed off and on. Severe pain meant that the patients had pain on the numbness or adjacent areas which disturbed their normal activities; moderate to strong analgesics in combination with antidepressants and or anticonvulsants were needed regularly. Factors that influenced pain severity and characteristics were also recorded.

Sensory evaluation was carried out on every patient by finger stroking, Semmess Weinstein nylon and static two-point discrimination[6]. Improvement of sensory function meant that the patients had positive results of any tests in the previous numbness areas or the skin areas which were innervated by the injured nerves. Proprioceptive sense was also evaluated in terms of elbow position sense by the ability to reproduce the same angle as the normal side while the patients' eyes were closed. Six positions of elbow flexion between 0 to 90 degrees were used and the angles were measured by CIBEX EDI 320 goniometer, CIBEX International, Ronkonkoma, New York, USA. Motor testing was carried out by physical examination which is based on a grading system by Sunderland, M0 to M6[7]. Improvement of motor function meant that the patients had at least motor function grade M3.

Management of pain

After patients were registered, a pain control programme was carried out on all patients before they underwent further investigation. Medication including analgesics such as paracetamol and NSAIDS, antidepressants such as amitriptyline, anticonvulsants such as carparmazepine and phenytoin, and high dosage of vitamins were used for every patient. A rehabilitation programme including active and passive exercise, splinting, transcutaneous electrical stimulation and occupational therapy was also carried out on every patient. The programme was tailored to fit each patient. Psychiatric and psychological interviews were carried out on every patient. Coping with pain and distraction of pain were tried on every patient. Group process in coping with and modulating pain were used for particular patients who could come to our service regularly.

Surgical management

For patients who had brachial plexus injury and came to us within 3 months, conservative treatment and a pain control programme were carried out. The improvement of neurological signs was closely observed and monitored by physical examination and periodic electrodiagnosis. If the patients had full recovery or partial recovery of every root, they were excluded from the study as no surgical intervention was indicated. Patients who had no recovery at all were included in the study and surgical exploration was performed at the 4^{th} to 5^{th} months after the injury. For patients who had partial recovery, conservative treatment and a pain control programme were continued. They were observed and monitored by physical examination and electrodiagnosis was carried out periodically. Surgical exploration was delayed until the recovery of neurological signs reached a plateau or very slow improvement. Surgical exploration must be performed before 8 months after the injury as nerve surgery usually gives poor results after this period[8].

For patients who had brachial plexus injury and came to us between 3 and 6 months, early surgical exploration was carried out after complete examination and investigation. Patients who had full or nearly full recovery of neurological signs were excluded.

Patients who had brachial plexus injury and came to us between 6 and 8 months with no recovery or partial recovery were operated on soon to give the best chance for nerve regeneration.

For patients who had injuries and came to us after 8 months, operation of free gracilis transfer was performed as soon as possible.

In surgical exploration, the patient was anesthesized by general anesthesia. No muscle relaxant was used to permit intraoperative nerve conduction studies. The patient was in the supine position and the injured upper limb was prepared and draped freely to facilitate exploration of the whole plexus. Skin incision was performed in lazy "Z" pattern starting from about 3 cm below the angle of the mandible along the posterior border of the sternocleidomastoid muscle until 1 cm above the clavicle. Then, the incision was changed to transverse direction about 1 cm above the clavicle passing to the deltopectoral groove. At the deltopectoral groove, the incision was changed to the vertical direction along the deltopectoral groove to the deltoid attachment on the humerus. In particular patients who had marked fibrosis and whose subclavian vessels might be injured during exploration, osteotomy of the clavicle was carried out to facilitate exposure. The external jugular vein was sacrificed in some patients to give better exposure to the roots behind the sternocleidomastoid muscle.

For patients who had rupture of the plexus and nerve distal to the ganglion, direct repair or repair with sural cable nerve graft was performed depending on the pathology. Intraoperative nerve conduction studies were done when lesions in continuity were displayed. If there was no muscle contraction distal to the neuroma, the neuroma was resected and repair was done. If there was muscle contraction distal to the neuroma, external neurolysis was performed and the pathology was recorded. Reexploration and repair might be needed if no recovery was observed within 8 months after the primary injury.

Patients who had root avulsion, neurotization, using spinal accessory nerve transfer with interposed nerve graft, or intercostal nerves, was performed randomly by their hospital numbers. In spinal accessory neurotization, a distal branch of the spinal accessory nerve on the ipsilateral side was identified by the nerve stimulator. One or two cable sural nerve grafts were used to anastomose the distal branches of the spinal accessory nerve to the musculocutaneous nerve in patients who had upper arm type of root avulsion (C5, C6 with or without C7 roots). For patients who had lower arm type (C7, C8 and T1 roots) root avulsion, cable sural nerve grafts were used to anastomase the distal branches of the spinal accessory nerve to the median nerve. In intercostal nerve neurotization, at least 3 intercostal nerves (T2 to T4 or T3 to T5 roots) were used. The ipsilateral intercostal nerves were identified between the mid axillary line and the sternal border. They were cut in proper length to allow direct repair to the musculocutaneous nerve or the median nerve, using the same indications as in spinal accessory neurotization.

The shoulder and elbow were immobilized in an interlocking sling for 6 weeks after neurotization. Then, passive exercise and training were advocated. Periodic physical examination and electrodiagnosis were performed to monitor reinnervation. No transcutaneous muscle stimulation was used.

For 3 patients who had no injury to the supra scapular nerve, phrenic nerve neurotization to the suprascapular nerve was carried out for active shoulder abduction. The phrenic nerve was identified at the anterior aspect of the anterior scalene muscle and was directly anastomosed to the suprascapular nerve.

In free gracilis transfer, the patient was under general anesthesia. No muscle relaxant was used to allow intraoperative nerve stimulation. The patient was in the supine position. The injured upper limb was prepared and draped freely to allow exploration of the whole plexus and tendon transfer to wrist extensors. The contralateral lower limb was also prepared and draped freely to allow harvesting of the whole gracilis muscle including its neurovascular pedicle. The brachial plexus was explored in the same fashion as has been described in neurotization. When root avulsion was observed, the coracoacromial vessels were identified in the deltopectoral groove. The ipsilateral lower branches of the spinal accessory nerve were identified and prepared for direct nerve anastomosis. Then, the gracilis muscle was harvested. The vascular pedicle was dissected down to the main branch of the obturator vessels. The motor nerve to the gracilis muscle was dissected down to the obturator foramen to gain enough length for direct anastomosis to the spinal accessory nerve. The explored thigh was then placed in full hip abduction and knee extension to make the gracilis at full stretch. The length of the muscle fibre was marked with stitches of 4-0 nylon along the muscle. Each stitch was 5 centimeters in distance from each other. These stitches allowed proper tension setting of the gracilis muscle after transfer. The neurovascular pedicle was then cut and the muscle was transferred to the shoulder. The proximal part of the muscle was sutured to the acromion process and vascular pedicle was anastomosed to the coracoacromial vessels. To lessen the ischemic time, arterial anastomosis was carried out first, followed by venous anastomosis. The nerve to gracilis was directly anastomosed to distal branches of the spinal accessory nerve. Subcutaneous tunnel was made anterior to the biceps muscle and the gracilis muscle was passed into the tunnel. At the elbow, the gracilis tendon was hooked around the biceps tendon, from anterior to medial and then posterior to the biceps tendon. Then, the gracilis tendon was passed into the dorsal compartment of the forearm and direct suture to the tendon of the extensor carpi radial brevis was done under proper tension with the elbow at 90 degree flexion and 45 degree wrist extension. So, when the gracilis muscle contracted, elbow flexion in the combination of wrist extension would be observed. The elbow and shoulder were immobilized in long arm slab for 6 weeks; then, passive exercise was allowed.

RESULTS

The study was carried out between 1987 and 1993. There were 246 patients with 230 males and 16 females. The average age was 24.8±11.1 years, ranging from 16 to 44 years old. Two hundred and nineteen patients (89%) had significant pain. One hundred and eighty two patients (74%) had severe pain and the remaining 37 patients (15%) had mild pain.

One hundred and twenty patients (48.7%) had complete palsy with root avulsion (Table 1). One hundred and sixty-nine patients or 97 per cent of the patients who had complete palsy had severe pain (Table 2). One hundred and fifty-three patients or 87.9 per cent of the patients who had root avulsion had severe pain (Table 3). The patients who came to us later than 6 months usually had severe pain (Table 4). Most of the patients had pain onset with in 2 weeks after the injury, 122 patients (Table 5). Most of the patients who had avulsion root had early onset of pain. Early onset of pain usually resulted in severe pain (Table 6).

184 patients (84%) had pain confined to the anaesthetic area while 27 patients had pain on the anaesthetic area and adjacent skin. The other 8 patients had pain on the area without correlation to the injured nerves or roots.

All severe pain patients and 16 out of 37 mild pain patients had continuous pain with 2 to 20 peaks of severe pain per day. The other 21 patients had mild intermittent pain which ranged from 1 to 16 times a day. They had no severe pain between the intermittent pain.

Crushing type of pain was noted in 82 patients (37%), followed by burning in 59 patients (27%) and electrical shock in 51 patients (23%). Mixed type of pain was found in 20 patients (9%) and 7 patients (3.2%) could not explain the characteristics of their pain clearly. Mixed type of pain caused the most disabling and distressful impression on the patients and it was also the most resistant pain to any kind of treatment. Crushing type of

Table 1. The relationship between clinical findings and the pathology of brachial plexus injury.

Clinical findings	Pathology			
	Root avulsion	Distal lesion	Combined lesions	Total
Complete palsy (C5 to T1 roots)	120	13	41	174
Partial palsy				
upper arm type (C5,C6 with or without C7 roots)	42	3	3	48
lower arm type (C7, C8, T1 roots)	1	3	2	6
Combined type (C5 to T1 roots)	11	4	3	18
Total	174	23	49	246

Table 2. The relationship between severity of pain and clinical findings at the first visit.

Severity of pain \ Clinical findings	Complete palsy	Partial palsy			Total
		Upper arm (C5,C6,C7)	Lower arm (C7,C8,T1)	Combined (C5 to T1)	
No pain	2	15	4	6	27
Mild pain	3	28	2	4	37
Severe pain	169	5	-	8	182
Total	174	48	6	18	246

Table 3. The relationship between severity of pain at the first visit and surgical findings at exploration of brachial plexus.

Severity of pain	Surgical findings			
	Root avulsion	Distal lesion	Combined lesions	Total
No pain	2	18	7	27
Mild pain	19	4	14	37
Severe pain	153	1	28	182
Total	174	23	49	246

Table 4. Severity of pain and the time from the injury to the first visit.

Severity of pain	The time from the injury to the first visit				
	0-3 months	3-6 months	6-8 months	more than 8 months	Total
No pain	19	7	1	-	27
Mild pain	24	10	1	2	37
Severe pain	29	88	32	33	182
Total	72	105	34	35	246

Table 5. The relationship between onset of pain at the first visit and surgical findings at exploration of brachial plexus.

Onset of pain	Surgical findings			
	Root avulsion	Distal lesion	Combined lesions	Total
0-2 weeks	111	-	11	122
2-4 weeks	34	-	16	50
late than 4 weeks	27	5	15	47
Total	172	5	42	219

Table 6. The relationship between severity of pain at the first visit and onset of pain.

Severity of pain at the first visit	Onset of pain			
	0-2 weeks	2-4 weeks	more than 4 weeks	Total
No pain	-	-	-	27
Mild pain	-	4	33	37
Severe pain	122	46	14	182
Total	122	50	47	219/246

Table 7. Number of patients who had different severity of pain at different steps of management.

Pain severity	At the first visit	Before surgery	Post operation	At the 1 year follow-up	At the 2 year follow-up
No pain	27	45	39	73	96
Mild pain	37	38	36	115	129
Severe pain	182	163	171	58	21
Total	246	246	246	246	246
X^2		4.70	3.58	8.13	24.85
P		<0.05	<0.05	<0.05	<0.05

pain was the second most distressful pain followed by electrical shock.

Before surgery, 39 patients, 11 males and 28 females, had significant improvement in pain by intensive conservative treatment. Of those who experienced improvement, 21 patients turned from severe pain to mild pain. Moreover, 18 patients who had mild pain at the first visit became pain free. However, 2 patients with mild pain at the first visit changed to severe pain (Table 7). These 2 patients had complete palsy with complete root avulsion and came to us later than 8 months (Table 8). All patients who had improvement in pain had neither vascular injury nor associated major bone injury around the shoulder. Most of them had pain after the second week of the post injury period and early pain control was started in these patients. Twenty-three patients from the pain improved group had slight but significant improvement in sensory function but not in motor function.

After surgery, 6 patients who underwent exploration and neurolysis and 8 patients who underwent exploration and nerve repair had increased pain severity for an average of 6.5 weeks,

Table 8. Changes of pain severity of the patients at different steps of management, concerning the time from the injury to the first visit.

The time from the injury to the first visit	Pain severity	At the first visit	Before surgery	Post operation	At 1 year follow-up	At 2 years follow-up
0 - 3	No pain	19	31	28	57	60
months	Mild pain	24	29	29	15	12
n = 72	Severe pain	29	12	15	-	-
3 - 6	No pain	7	13	10	15	26
months	Mild pain	10	8	6	86	79
n = 105	Severe pain	88	84	89	4	-
6 - 8	No pain	1	1	1	1	10
months	Mild pain	1	1	1	14	20
n = 34	Severe pain	32	32	32	19	4
more than 8	No pain	-	-	-	-	-
months	Mild pain	2	-	-	-	18
n = 35	Severe pain	33	35	35	35	17
Total		246	246	246	246	246

ranging from 2 to 10 weeks. Then, the pain gradually subsided. The other 232 patients had no change in pain severity during the first 10 weeks after the operation.

At the 1 year follow-up, 73 patients had no pain and 115 patients had mild pain (Table 7). Severe pain was observed in 58 patients. The patients who came to us and received adequate pain control before 6 months after the injury had better pain improvement than those who came to us later than 6 months (Table 8). There were 138 patients who had improvement in pain. One hundred and twenty-eight patients had improvement in motor and sensory functions. Eight patients had only sensory improvement and only 2 patients had only motor improvement. The pattern and characteristics of pain did not change in those who had pain after the operation.

After exploration and neurolysis, 6 patients were pain-free and they also had improvement in neurological functions, including sensory and motor functions within 3 to 6 months. All had recovery of elbow position sense. There were 17 patients who had exploration and nerve repair. All had improvement in neurological functions within 6 to 12 months and all had recovery of elbow position sense. They were pain-free at the 1 year follow-up.

Thirty-five patients underwent free gracilis transfer. Two patients had increased pain severity and they were in the severe pain group during conservative treatment. The pain had not changed at the 1 year follow-up even though 29 patients had improvement of motor function. Active elbow flexion was observed about 12 months after the operation. No recovery of sensory functions was observed.

One hundred and eighty-eight patients underwent neurotization, 65 by intercostal nerves, 120 by spinal accessory nerve, and 3 by phrenic combined with spinal accessory nerves.

In the intercostal nerve neurotization, seven patients had no pain before and after the surgery. Fifty-one patients had improvement in pain but 3 patients had no improvement. Of the patients who had pain improvement, 43 patients had neurological function improvement at least 1 grade within 8 to 12 months, and 8 patients had only sensory improvement. Fourteen patients had recovery of elbow position sense. Of the 3 patients who had no pain improvement, 1 patient had sensory and the other 2 patients had no neurological improvement.

In spinal accessory nerve neurotization, thirteen patients had no pain before and after surgery. At the 1 year follow-up, 61 patients had improvement in pain but 42 patients had no improvement. Of the patients who had pain improvement, 59 had neurological function improvement at least 1 grade within 12 months and 2 patients had only motor function improvement. Only 3 patients had recovery of elbow position sense. Of the 42 patients who had no improvement in pain, 36 patients had improvement in motor function only, 2 patients had improvement in neurological functions and 4 patients had no neurological improvement.

In phrenic and spinal accessory combined neurotization, there were 3 males and all had complete palsy with complete root avulsion. All had improvement in motor and sensory functions at least 1 grade within 8 to 12 months. They also had improvement in pain.

At the 2 year follow-up, 96 patients had no pain and 129 patients had mild pain (Table 7). There were 21 patients who still had severe pain. Patients who received pain control within 6 months after the injury had better pain improvement (Table 8). One hundred and seventy-six patients had improvement in pain compared to the first visit. One hundred and fifty patients also had improvement of motor and sensory functions. Fifteen patients had only motor improvement and 11 patients had only sensory improvement. Forty-three patients had no pain improvement. The pattern and characteristics of pain in those who still had pain did not change either.

Six patients who had exploration and neurolysis and 17 patients who had exploration and nerve repair had no pain and all had marked improvement in neurological functions.

Three patients who had neurotization with combined spinal accessory and phrenic nerve neurotization had no pain. They had at least 2 grades improvement in motor and sensory functions. They also had recovery of elbow position sense.

Of the patients who had free gracilis transfer, 18 patients had mild pain but 17 patients still had severe pain. All had significant improvement in elbow flexion with grade 3 to 5 in all except 2 patients who suffered failed transfer. No patient had sensory and elbow position sense improvement.

In the intercostal nerve neurotization, 54 patients had improvement in pain. Forty-four patients had at least 2 grades improvement in motor and sensory functions while 11 had only sensory improvement. Twenty-one patients had recovery of elbow position sense.

In the spinal accessory nerve neurotization, 80 patients had improvement in pain and neurological functions. All patients who had motor improvement had motor power grade 3 to 4. Only 12 patients had recovery of elbow position sense. All of them changed from severe pain to mild pain but no patient who had pain before surgery became pain-free. Twenty-three patients had no pain improvement although 21 patients had motor improvement and 2 of them had no neurological function improvement.

DISCUSSION

Compared to other studies, our patients had a higher incidence of severe pain as we found 219 patients or 89 per cent who had significant pain after brachial plexus injury with 182 patients or 74 per cent having severe pain. Bruxelle[5] reported 51 per cent severe pain, and previous authors, Yeoman and Seddon[1], Wynn parry[3] and Narakas[4] reported severe pain in 40 per cent of total root avulsion. Our results might be caused by 2 factors. First, our patients had more severe injury. One hundred and seventy-four patients or 70 per cent had complete palsy (Tables 1, 2 and 3,) while Bruxelle reported complete palsy in 65 per cent and only 25 per cent of the patients had complete root avulsions. In our patients, 49 per cent (120/246) had complete (C5 to T1) root avulsion. This evidence supported the concept that chronic painful syndrome is related to root avulsion that produces deafferentation[3,9-11]. The second factor was the time between the injury and the time of proper pain control. Most of the patients reported by Bruxelle[5] came to be treated early after the injury while our patients had an average time of 4.5 months after the injury before pain control was started (Table 4). The patients who came to us early and had proper pain control and nerve surgery resulted in less pain compared to the ones who came to us late and only free gracilis transfer was carried out (Table 8).

The onset of pain in our patients was also earlier compared to Bruxelle's report[5]. In their patients, about 43 per cent had pain within 2 weeks after the injury. In our patients, about 50 per cent started to have pain within 2 weeks after the injury (Table 5). Most of our patients who had pain very early also had severe pain (Table 6). This finding might affect the outcome as there were 21 patients or 8.5 per cent who still had chronic severe pain after definitive surgery at the 2 year follow-up.

Conservative treatment before surgery gave acceptable results as we had 39 patients or 15.8 per cent who had improvement of pain. Most of them felt that physical therapy, occupational therapy and psychiatric interventions especially group therapy and group process were effective in controlling pain. These functions helped them to cope with pain and distracted them from pain. Concerning medication only 50 per cent of the patients (111/219) felt that pain could be controlled by the use of various kinds of drugs.

The characteristics and pattern of pain in our patients were comparable to that reported by Bruxelle et al[5]. However, there were some differences, as there was less incidence of burning sensation in this report. Most of our patients who had burning sensation had combined lesions. Sources of pain might be the injured nerves. The most distressful sensation in our patients was the mixed type of pain while crushing type of pain was reported to be the worst in their patients. Factors influencing pain in this study were comparable to previous reports. The effects of cold on pain were less in our patients.

One finding that was different from previously reported findings was the relationship of functional recovery on pain. Although motor function was improved in most pain patients, pain improvement related more to the improvement of sensory function. At the 2 year follow-up, all 11 patients who had only sensory improvement, had significant improvement in pain. Only 15 patients from 54 patients or 27.7 per cent who had improvement only in motor had improvement in pain. Improvement in sensory function seemed to have more effect in pain control. This relationship was also found at the 1 year follow-up (Table 9). There was no definitive explanation about the effect of sensory improvement on pain from this study. Modulation of control pain parthway by new sensory input from neurotization may contribute to improvement of pain[12,13].

Of the patients who received intercostal nerve neurotization, not only motor but the sensory fibres were also transferred. The distribution of the motor and sensory fibres of the intercostal nerve is comparable to the musculocataneous nerve. Spinal accessory nerve consists mainly of motor fibres, although it also carries proprioceptive fibres. These factors might affect the outcome of pain control. At the 1 year follow-up, 51/65 patients or 78.5 per cent who received intercostal nerve

Table 9. Biographic data of the patients who received neurotization with intercostal nerves and spinal accessory nerve.

		Intercostal nerve neurotization n = 65	Spinal accessory nerve neurotization n = 120	P-value
Sex :	Male	61	112	x^2=0.03
	Female	4	8	P>0.05
Age :	Average	28.4±12.2	26.4±10.9	P=0.23
	Range	17 to 44	16 to 40	
The time from the injury to the first visit (days)				
:	Average	121.2±68.4	120.4±60.6	P=0.47
	Range	32 to 210	40 to 200	
Severity of pain				
:	No pain	7	13	x^2=2.2
	Mild pain	9	18	P>0.05
	Severe pain	49	89	
Onset of chronic pain syndrome after the injury (days)				
:	Average	42.0±30.4	48.0±27.0	P=0.39
	Range	5 to 110	7 to 66	
Clinical findings				
	Complete plasy	42	79	x^2=1.9
	Partial palsy	23	41	P>0.05
Pathology				
	Root avulsion	52	101	x^2=2.6
	Combined lesion	13	19	P>0.05

neurotization had pain improvement while 61/120 patients or 50.8 per cent who underwent spinal accessory nerve neurotization had pain improvement, X^2=11.34, P<0.05. Intercostal nerve neurotization resulted in better pain control than spinal accessory nerve neurotization while preoperative biodata and pain severity of these 2 groups were comparable (Table 9).

In conclusion, pain after brachial plexus injury is a significant problem and most patients have severe chronic pain. Early intensive conservative treatment can reduce pain in a certain number of patients. Reconstructive surgery improved pain in 64 per cent of the patients and restoration of sensory function should also be considered in terms of pain control.

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ความปวดภายหลังการบาดเจ็บของกลุ่มประสาทแขน : อุบัติการณ์และการตอบสนองต่อการรักษา

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รายงานการศึกษาถึงอุบัติการณ์และการตอบสนองต่อการรักษาความปวดภายหลังการบาดเจ็บของกลุ่มประสาทแขน เป็นการศึกษาไปข้างหน้าในผู้ป่วย 246 ราย ที่ได้รับการบาดเจ็บของกลุ่มประสาทแขน จากอุบัติเหตุจักรยานยนต์โดยไม่มีแผลเปิด เป็นหญิง 16 รายและชาย 230 ราย อายุระหว่าง 16 ถึง 44 ปี ศึกษาถึงความสัมพันธ์ระหว่างลักษณะทางชีววิทยาของผู้ป่วยและลักษณะของความปวดที่มีอิทธิพลต่อการรักษา พบว่าผู้ป่วย 219 รายหรือร้อยละ 89 มีความปวด และ 182 ราย หรือ 74% มีความเจ็บปวดรุนแรงจนต้องพบแพทย์เพื่อการควบคุมความปวด ผู้ป่วยส่วนใหญ่มีความปวดตลอดเวลาและมีระยะที่ปวดมาก 2 ถึง 20 ครั้งต่อวัน ความปวดชนิดที่เหมือนเนื้อเยื่อถูกบดพบมากที่สุด การรักษาโดยอนุรักษ์นิยม ได้แก่ ยา เวชศาสตร์ฟื้นฟู และการรักษาทางจิตเวช ให้ผลดีในผู้ป่วย 39 รายคิดเป็นร้อยละ 15.8 การรักษา การผ่าตัดให้ผู้ป่วยสามารถใช้งานของแขนและมีความรู้สึกขึ้นบ้างในบริเวณที่ชา ให้ผลในการควบคุมความปวดได้ดีใน 176 ราย คิดเป็นร้อยละ 80.36 การผ่าตัดเพื่อช่วยฟื้นการทำงานของประสาทความรู้สึก ช่วยลดความปวดได้ดีกว่าการผ่าตัดช่วยเหลือเฉพาะการทำงานของกล้ามเนื้อ

คำสำคัญ : การบาดเจ็บของกลุ่มประสาทแขน, ความปวด, อุบัติการณ์, การตอบสนองต่อการรักษา

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