



A Study of Brachial Plexus Injury

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Date of Submission: 10-07-2023

Date of Acceptance: 20-07-2023

ABSTRACT

INTRODUCTION: The brachial plexus surgery has been changed after the application of newer distal nerve transfers. Although complete recovery of upper limb function after brachial plexus reconstruction still remains unattainable, the exhilarating developments of brachial plexus management modalities in the past few years have significantly enhanced surgical outcomes and promising future.

MATERIAL AND METHODS: It was a prospective study with 30 patients having brachial plexus injury admitted under department of burns and plastic surgery, Civil Hospital, Ahmedabad during the period from 2020 to 2023. Patients with adult brachial plexus injury, initially treated elsewhere and referred to our department are also included in the study. Paediatric and obstetric brachial plexus palsy were not included in this study. The incidence, mechanics, several patterns, treatment regimes, outcome and morbidity factors of different types of Brachial plexus injury were assessed in this study.

RESULTS: In this study brachial plexus injury injuries were common in male (93.33%) and age group of 20-30 years (40%). Road traffic accident was the most common mode of injury (90%). More than half of patients were presented between 3 to 6 months of injury. 26 (86.66%) patients had preganglionic injury and 23 (83.33%) had supraclavicular injury. Upper and middle trunk were involved most commonly. 29 (96.66%) patients were operated for Neurotization with spinal accessory nerve (SAN) to suprascapular nerve (SSN) out of which 23 (76.66%) patients through anterior approach and 6 (20%) patients through posterior approach. Neurotization with Phrenic to Musculocutaneous nerve (MCN) and Intercostal nerve (ICN) to Musculocutaneous nerve through anterior approach in 66.66% and 30%

patients respectively.

CONCLUSION: This study gives an overview of the epidemiological aspects and mode of presentation of brachial plexus injuries in our unit which reflects the situation in India and also about the management of brachial plexus injuries and recovery following the surgical procedures.

Keywords: Brachial plexus injury, SAN- Spinal accessory nerve, SSN- Suprascapular nerve, MCN- Musculocutaneous nerve, ICN- Intercostal nerve

I. INTRODUCTION

In the early 19th century, before the development of microsurgical equipment and techniques, surgeons published encouraging results of brachial plexus reconstruction but the results were not remarkable. Subsequently, others reported high complication rates and poor results. After the 1980s, surgeons began to apply the fascicular nerve grafting techniques described by Millesi to birth and traumatic injuries of the brachial plexus. These pioneers established indications and techniques for brachial plexus reconstruction and reported better recovery in operated patients than in those observed without surgical reconstruction. In the late 1990s, very aggressive reconstructions were done using extra-plexal sources for re-innervations of vascularised muscle transfers. In the past few years, the role of nerve transfers has expanded. The introduction of novel distal nerve transfers has changed the way in which brachial plexus surgery is being performed. Although full recovery of function after brachial plexus reconstruction still remains unachievable as of now, the developments of the past few years have considerably improved surgical outcomes and given promising future directions.



II. MATERIAL AND METHODS

This was a prospective study conducted in year 2020–2023 under department of burns and plastic surgery, Civil Hospital, Ahmedabad in 30 patients of adult brachial plexus injury to review incidence, mechanics, various patterns, treatment regimes, outcome and morbidity factors of various types of Brachial plexus injury.

All patient had brachial plexus injury underwent for physiotherapy and nerve current therapy before and after surgery to preserve the motor end potentials preoperatively. Preoperatively, all patient were investigated by MRI brachial plexus, EMG –NCV, Muscle power charting of affected limb, Ultrasonography of abdomen and thorax to check the diaphragmatic movement for phrenic nerve palsy status. Colour Doppler ultrasound done in selected cases in which suspected for vascular injury.

Inclusion criteria :

- All patients with adult brachial plexus injury admitted during the period from 2020 to 2023 were included in this study.

- Patients with brachial plexus injury, initially treated conservatively elsewhere and referred to plastic surgery department for further treatment were also included in this study.

Exclusion criteria :

- Patients operated outside following Brachial plexus injury were not included.
- Pediatric or Obstetric brachial plexus injury

III. RESULTS

In this study, brachial plexus injury injuries were more common in male (93.3%) compared to female. There were 12 patients in 20-30 years age group, 10 patients in 30-40 years age group, 5 patients in 40-50 years age group and 3 patients were above the age of 50 years. Therefore this study showed that brachial plexus injury found more commonly in younger age group.

Road traffic accident was the most common mode of injury 27(90%) and remaining patients had history of fall from height.

TABLE 1

ATTENDANCE BASE	NO OF PATIENTS	PERCENTAGE (%)
0-3 MONTHS	08	26.66
3-6 MONTHS	16	53.33
>6 MONTHS	06	20
Total	30	100

As shown in table 1, maximum number of patients presented between 3 to 6 months of injury, followed by early presentation at 0 to 3 month, whereas 6 patients presented late i.e. more than 6 months of injury.

TABLE 2:

TYPE OF INJURY	NO OF PATIENTS	PERCENTAGE (%)
HEAD INJURY	6	20
BONY INJURY	5	16.66
THORACIC INJURY	1	3.33
NO INJURY	18	60

In this study, 6 patients had associated head injury, 5 had bony injury, 1 had thoracic injury, and 18 patient had no other associated injury. Majority of patients presented with brachial plexus injury had no associated injuries. (table 2)

Here, 26 (86.66%) patients had preganglionic injury and more common in right side in 20(70%) patients.

In this study, it was noted that injury of upper was maximum i.e. 29 (96.66%) whereas global injury was found only in 24 patients (80%).

Here, 29 (96.66) patients had supraclavicular injury. One patient had both supra and infra-clavicular injury.

TABLE 3:

NEUROTIZATION	NO. OF PATIENTS	PERCENTAGE (%)
SAN TO SSN	29	96.66
PHRENIC TO MC	20	66.66
ICN TO MC	9	30



Out of 30 patients 23 patients (76.66%) were operated via anterior approach and 6 (20%) operated via posterior approach for neurotization with spinal accessory nerve (SAN) to suprascapular nerve (SSN) done. Neurotization with Phrenic to Musculocutaneous nerve (MC) and Intercostal nerve (ICN) to Musculocutaneous nerve were done in 20 (66.66%) and 9 (30%) patients respectively. (table 3)

Among all patients who underwent SAN to SSN neurotization, 27 patients showed good shoulder recovery in follow up period. While phrenic and intercostal to musculocutaneous neurotization in 25 patients showed good recovery in elbow function.

IV. DISCUSSION

There are varying statistics about the epidemiology of traumatic brachial plexus injuries in different parts of the world. Kim from USA studied the outcome of surgery in 1019 brachial plexus lesions but this study included tumours and thoracic outlet syndrome [3]. Our study group involved only post-traumatic brachial plexus injuries and did not include iatrogenic injuries or tumours of the brachial plexus. This study was also a prospective study as other studies with long-term follow up status of patients.

Road traffic accidents are the predominant cause of traumatic brachial plexus injuries in most of the studies but the contribution of road traffic accidents towards the brachial plexus injuries varies in different studies. Songcharoen reported that 91% of the brachial plexus injuries in Thailand were due to road traffic accidents [4]. S Raja Sabapathy from, Ganga Hospital, Tamil Nadu, India found that 94% of the traumatic brachial plexus injuries were due to road traffic accidents and 90% of these road traffic accidents are associated with two wheelers [1]. In our study, we found that 90% of the traumatic brachial plexus injuries were due to road traffic accidents and, which is similar to the other literature. This clearly indicates the kind of vehicles used and the economic status of the country.

We found no open injuries, whereas the study done by Dubuisson had 23 open injuries out of 100 patients [5]. In our study, 40% of the patients were part of poly-trauma and 60% were isolated brachial plexus injuries. In S Raja Sabapathy study, 54% of the patients were part of poly-trauma and 46% were isolated brachial plexus injuries. [1]. Terzis showed that 57% had some fracture and 20% had clavicle fracture in the involved extremity [2].

In centres which receive more high-velocity trauma, vascular injury appears to be more common. Clavicle was the most frequently associated fracture reported by Kandenwein, which was 20.9%, whereas in our study we found clavicle fracture in 5 (16.66%) of the patients [6]. There were two individuals who had a clavicle fracture and an associated vascular injury. Lesser number of associated injuries suggests that the injuries sustained in our population could be due to low velocity when compared to the west. In our study, it was recorded that maximum number of patients had pre-ganglionic injury which was 86.66% as compared to postganglionic injury which was 13.33%. Association of upper Trunk injury was maximum which was 96.66% and lower trunk 53.33% respectively whereas global injury was found in almost 80% patients. In our study 96.66 per cent of patient had supraclavicular injury. Brophy had found that 70-75% of the lesions were supraclavicular [7].

The dominant arm was found to be the most commonly injured, which is the right side. This is similar to many other studies. This reinforces that the side of the road used for driving does not determine the side of the arm affected [8].

The average time interval from the date of injury to exploration of the brachial plexus was 6 month and 24 (80%) patients presented to us within this duration. This reflects the awareness among the patients about centres treating brachial plexus injuries. This is a good trend in a developing country. Patient, public and peer education can even probably reduce this time interval.

The presence of pain has shown a wide range of incidence in various studies. In our study, all of the patients had pain at the time of presentation. In our study we preferred anterior and posterior approach for shoulder function in which we obtained good recovery of function in 93.10% patients and for elbow function of which 86.20 % patients had good recovery.

V. CONCLUSION

Brachial plexus injury is seen more commonly in young adults and mostly in male and right upper limb. Road traffic accidents are the most common mode of traumatic brachial plexus injury. Brachial plexus injury formed a part of polytrauma in 40% of this study group and 60% had isolated brachial plexus injury. Brachial plexus injury management remains challenging and suggests the need for early referral to a specialized center. Graft repair and neurotization procedures play an important role in brachial plexus reconstruction. Follow-up of the patients in this



study confirms the premise that an aggressive surgical approach, combined with the use of these therapeutic modalities, remains appropriate.

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