Original Research

Evaluation of Effect of Pre-Surgical Delay on Functional Outcomes during Brachial Plexus Injury Reconstruction

Vatsal N Kothari[1], Moolchand Prajapat[2]

[1]Assistant Professor, Department of Burns and Plastic Surgery, AMC MET Medical College and Sheth L. G. Municipal General Hospital, Ahmedabad, Gujarat, India.
[2]Associate Professor, Department of Burns and Plastic Surgery, B.J. Medical College and Civil Hospital, Ahmedabad, Gujarat, India.

Corresponding Author
Dr. Vatsal N Kothari
Assistant Professor, Department of Burns and Plastic Surgery, AMC MET Medical College and Sheth L. G. Municipal General Hospital, Ahmedabad, Gujarat, India.
Email: kotharivatsal25@gmail.com

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ABSTRACT

Background: Brachial plexus lesions result in a disconnection of the upper limb nerves from the spinal cord and brain. This study was conducted to assess the impact of pre surgical delay on functional outcome after reconstruction of brachial plexus injuries.

Material and Methods: Surgery for TBPI had been performed on one hundred individuals. Everyone suffered injuries to their complicated plexus. Twenty-one subjects out of hundred subjects had nerve grafting to the upper trunk in order to improve the function of their biceps as well as shoulders. The rest seventy-nine subjects had been disqualified because they either had partial upper trunk injuries, direct repairs, or nerve or tendon transfers. The subjects were aged from 15-55 years. In every instance, the brachial plexus had been exposed via the transclavicular, infraclavicular, or supraclavicular methods. After exposure, an evaluation of the extent and kinds of lesions observed was conducted. A lesion preventing proximal neural input into the upper trunk was present in all twenty-one individuals. Nerve grafts had been positioned between the upper trunk as well as the accessible roots, which were determined using intraoperative nerve conductivity testing. The superficial radial as well as sural nerves were among the donor nerves. Statistical analysis was conducted using SPSS software.

Results:Out of the twenty-one participants in the present investigation, sixteen were men and five were women, with ages ranging from 15 to 55 years. Motorcycle accidents were the main aetiology of brachial plexus injury. Road traffic accidents including drivers, passengers, as well as pedestrians were among the additional causes. The duration of the follow-up was two to six years. The twenty-one patients were split up into three groups: 0–2 weeks post-injury, 2 weeks–2 months, and >2 months post–injury. The first and second group comprised of 9 subjects each and the third group comprised of 3 subjects. Compared to 5 subjects in the 2 weeks-2 months group, 6 individuals in the <2 weeks group had "good" results (M4/5). In the >2 months group, only 1 individual had a satisfactory outcome, and most individuals only regained MRC grades <M3, meaning no flexion or flexion with gravity abolished.

Conclusion:According to new research on the neurobiological implications of axonal injury, prompt investigation as well as restoration of adult traumatic brachial plexus injuries reduces the harmful consequences of delay.

Keywords:Brachial Plexus, Injury, Delay, Outcome.

INTRODUCTION

Brachial plexus lesions result in a disconnection of the upper limb nerves from the spinal cord and brain. Surgery aims to restore function in some of the paralyzed muscles to improve the control of the flail limb. Elbow flexion has been recognized as the most important function to be restored in adults in this type of injury.[1,2] This function can be achieved through the reinnervation of elbow flexors from ruptured roots suitable for grafting or through nerve transfers.[3] When possible, intraplexual nerve transfers are preferred. In total or near-total brachial plexus injuries, we are usually forced to resort to using extraplexual donor nerves. These include the intercostal nerves, the spinal accessory nerve, the phrenic nerve, and contralateral C7 root.[4-6] Intercostal nerves have been used to target the lateral cord, the musculocutaneous nerve, or even the biceps nerve branch.[7-9] Direct intercostal nerve

transfer to musculocutaneous nerve is recommended, avoiding interpositional grafts for better functional outcomes.[10]

Traumatic brachial plexus injuries (TBPI) tend to occur in young, otherwise healthy and active individuals. While brachial plexus injuries themselves are not fatal, they can cause disability and can be very difficult to reverse.[11] In addition to motor and sensory deficits, they may also cause pain and functional limitations.[12] Over the years, opinions concerning the treatment of lesions of the brachial plexus have changed.[13] The development of microsurgery and associated technology renewed interest in surgical reconstruction, and has given rise to more favourable results in comparison to earlier studies.[14,15]This study was conducted to assess the impact of pre surgical delay on functional outcome after reconstruction of brachial plexus injuries.

MATERIALS AND METHODS

Surgery for TBPI had been performed on one hundred individuals. Everyone suffered injuries to their complicated plexus. Twenty-one subjects out of hundred subjects had nerve grafting to the upper trunk in order to improve the function of their biceps as well as shoulders.

The rest seventy-nine subjects had been disqualified because they either had partial upper trunk injuries, direct repairs, or nerve or tendon transfers. The subjects were aged from 15-55 years. In every instance, the brachial plexus had been exposed via the transclavicular, infraclavicular, or supraclavicular methods. After exposure, an evaluation of the extent and kinds of lesions observed was conducted. A lesion preventing proximal neural input into the upper trunk was present in all twenty-one individuals. Nerve grafts had been positioned between the upper trunk as well as the accessible roots, which were determined using intraoperative nerve conductivity testing. The superficial radial as well as sural nerves were among the donor nerves.

The British Medical Research Council (MRC) Motor Grading Scale (M0 Z no contraction, M1 Z fasciculations, M2 Z contraction with gravity eliminated, M3 Z contraction against gravity, M4 Z contraction against resistance, and M5 Z normal) was used to measure pre- and postoperative biceps strength, which was used to determine the effectiveness of nerve grafting. Statistical analysis was conducted using SPSS software.

RESULTS

Out of the twenty-one participants in the present investigation, sixteen were men and five were women, with ages ranging from 15 to 55 years. Motorcycle accidents were the main aetiology of brachial plexus injury. Road traffic accidents including drivers, passengers, as well as pedestrians were among the additional causes. The duration of the follow-up was two to six years.

The twenty-one patients were split up into three groups: 0–2 weeks post-injury, 2 weeks–2 months, and >2 months post–injury. The first and second group comprised of 9 subjects each and the third group comprised of 3 subjects.

Compared to 5 subjects in the 2 weeks-2 months group, 6 individuals in the <2 weeks group had "good" results (M4/5). In the >2 months group, only 1 individual had a satisfactory outcome, and most individuals only regained MRC grades <M3, meaning no flexion or flexion with gravity abolished.

Table 1: Gender-wise distribution of subjects.

Gender	Number of subjects	Percentage
Males	16	76.19
Females	05	23.81
Total	21	100%

Table 2: Group-wise distribution of subjects based on period of pre-surgical delay.

Pre-surgical delay	<2 weeks	2 weeks-2 months	>2 months	Total
Total number of patients	9	9	3	21

DISCUSSION

Adult post traumatic brachial plexus injuries (TBPI) occur in more than 1% of all multi-trauma victims[16] and account for between 4 and 9% of all upper limb peripheral nerve injuries.[17] Despite continual improvements in diagnostic and microsurgical reconstructive techniques, patients are often left with permanent, devastating neurological dysfunction. Nerve grafting, nerve transfers, or both, are necessary to bridge the nerve defects for up to 75% of patients.[18]

In nerve transfers, proximal stumps of injured nerves are frequently used to provide distal reinnervation and to restore continuity according to the normal anatomical relationship or according to functional and prognostic priorities.[19,20]

This study was conducted to assess the impact of pre surgical delay on functional outcome after reconstruction of brachial plexus injuries.

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patients were split up into three groups: 0–2 weeks post-injury, 2 weeks–2 months, and >2 months post–injury. The first and second group comprised of 9 subjects each and the third group comprised of 3 subjects. Compared to 5 subjects in the 2 weeks-2 months group, 6 individuals in the <2 weeks group had "good" results (M4/5). In the >2 months group, only 1 individual had a satisfactory outcome, and most individuals only regained MRC grades <M3, meaning no flexion or flexion with gravity abolished.Jivan S et al (2009)[21] conducted a study in which the influence of pre-surgical delay on the outcome of brachial plexus reconstruction was examined retrospectively. All patients who underwent surgery for traumatic brachial plexus injury in the Leeds Plastic and Reconstructive Surgery unit (UK), between 1987 and 2002, were identified. Of the 110 patients identified, 27 had nerve grafting to the upper trunk to restore shoulder and biceps muscle function. Postoperative functional outcome was evaluated in this subgroup of patients. The 27 patients were divided into three groups: surgery <2 weeks (n = 10), 2 weeks to 2 months (n = 10) and >2 months (n = 7) following injury. When surgery was delayed beyond 2 months there was no significant difference between mean pre- and postoperative elbow grades.Hicks, Katie E et al (2021)[22] investigated the impact of surgery delay on elbow flexion strength in patients with brachial plexus nerve injuries undergoing single fascicular nerve transfer (SFT) or double fascicular nerve transfer (DFT) for restoration of elbow flexion. The protocol was registered with PROSPERO and PRISMA guidelines were followed. MEDLINE, EMBASE, and The Cochrane Library were systematically searched. English studies investigating the outcomes of SFT or DFT for restoration of elbow flexion in adult brachial plexus injury were included. Studies (n = 31) reporting individual patient data (n = 408 patients) who underwent SFT (n = 341) or DFT (n = 67) for restoration of elbow flexion were included for analysis. The mean age, time from injury to surgery, and follow-up was 29.6 years, 6.5 months, and 27.1 months, respectively. Good elbow flexion strength was found in most patients; MRC ≥ 3 in 352 (86.3%) and MRC ≥ 4 in 288 (70.6%). In the adjusted analysis, increased age (P = 0.0219, 95% CI: 0.64–0.97), C5-7 (P = 0.0036, 95% CI: 0.29–0.78) and pan-plexus injuries (P < 0.0001, 95% CI: 0.01–0.08) were associated with worse motor recovery. In a separate model where the delay to surgery was dichotomized to either within 6 months or after 6 months, patients who had their nerve transfer procedure within 6 months of injury had 2.4 times the odds of favourable motor recovery (P = 0.0003, 95% CI: 1.50–3.92). Delay to surgery negatively affects nerve transfer outcomes to restore elbow flexion in brachial plexus injury. SFT and DFT provide excellent elbow flexion strength in the majority ofpatients and should be performed within 6 months of injury.

CONCLUSION

According to new research on the neurobiological implications of axonal injury, prompt investigation as well as restoration of adult traumatic brachial plexus injuries reduces the harmful consequences of delay.

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