Clinical Journal of Plastic and Reconstructive Surgery
An official Journal of Plastic Surgery Education Foundation

ORIGINAL RESEARCH

Distal Spinal Accessory to Suprascapular Nerve Transfer: Our Experience and Challenges

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Keywords:
Brachial Plexus injury, suprascapular nerve, spinal accessory nerve

ABSTRACT

Background: Brachial Plexus Injury is one of the most debilitating consequences following traumatic injuries commonly seen among young adults, causing significant loss of function in a part or entire upper limb. Restoring the function of the affected limb is challenging to both, surgeon and the patient.

Method: This article reviews the experience of the author among 26 cases in 2-years duration who underwent neurotization of the spinal accessory nerve to Suprascapular nerve via posterior approach for patients with post-traumatic Brachial Plexus Injury with various extents of the lesion.

Results: Patient demography and recovery of shoulder abduction in terms of motor power & range of motion were analyzed and discussed.

Conclusion: It can be inferred that the duration of injury, the extent of injury, and post-operative rehabilitation play an important role in determining functional outcomes.

Clinical Journal of Plastic and Reconstructive Surgery, 2023; 1(2).

Introduction

Brachial Plexus Injuries (BPI) cripple the function of the upper limb which affects the ability to perform daily living activities as well as jobs at the workplace. This can lead to suffering in terms of physical, mental and economic well-being.

In patients with pan brachial plexus injury (C5-T1 injury), the priority of repair is elbow flexion, shoulder abduction, elbow extension, and wrist flexion. Stabilizing the shoulder is necessary for the good functioning of distal joints, hence some prefer prioritizing shoulder abduction over other functions. Primary nerve reconstructive procedures like direct nerve repair or nerve transfer are associated with significantly better results, in patients who present early within 6 months of injury.

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***How to cite:** Kashyap VH, Singh VK, Haq A. Distal Spinal Accessory to Suprascapular Nerve Transfer: Our Experience and Challenges. Clinical Journal of Plastic and Reconstructive Surgery. 2023;1(2):70–73*

Patients with a poor probability of spontaneous recovery may undergo surgery earlier, and patients with a good probability of spontaneous recovery may be observed.[2] Donor nerves for re-innervation of the shoulder include musculocutaneous, suprascapular (SSN), axillary, radial, and median nerve.[3] Our study aims to observe the outcome of shoulder recovery in terms of power and range of motion in patients with post-traumatic brachial plexus injury.

Methods

Hospital record Data of the Department of Burns & Plastic Surgery, AIIMS, Patna was retrospectively analyzed and patients who were diagnosed with post-traumatic brachial plexus injury, who underwent neurotization of Spinal accessory nerve (SAN) to Suprascapular nerve (SSN) via posterior approach were included in our study regardless of level and degree of injury.

Patient demography like age, sex, occupation, dominance of hand; Duration of Injury, Mode of Injury, type/Level of Injury, motor power of limb at presentation, surgery performed, motor power, and range of shoulder abduction at recovery period.

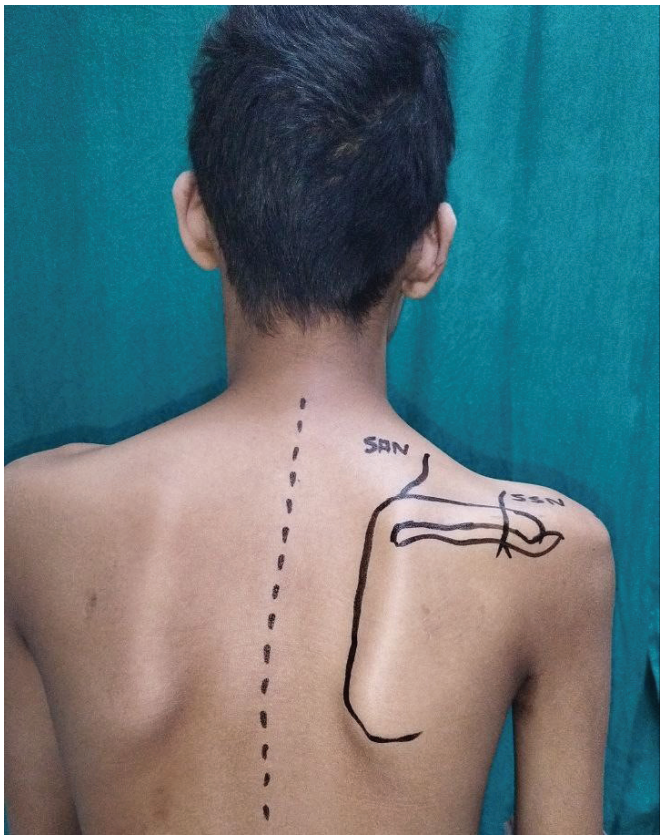

Figure 1: Pre-operative marking of spinal accessory & suprascapular nerve through posterior approach.

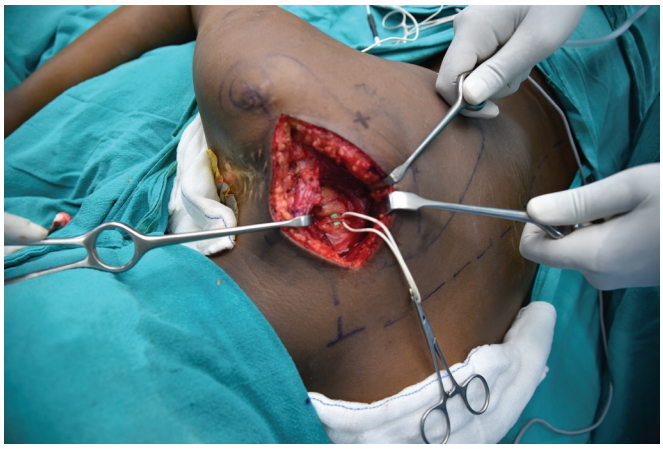

Figure 2: Exploration of SAN and SSN.

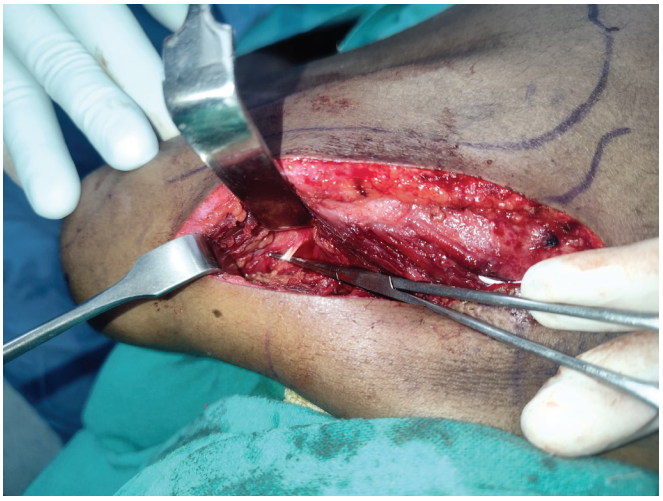

Figure 3: Superior transverse scapular ligament.

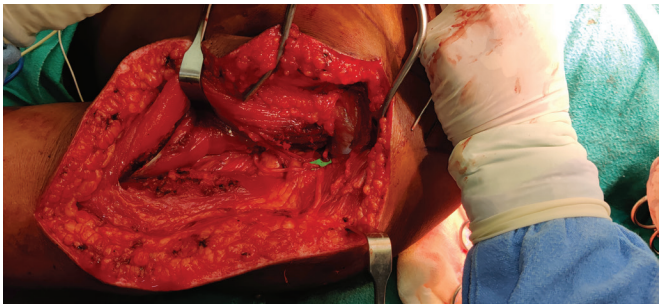

Figure 4: Distal neurotization of SAN to SSN

Surgical Technique

The author prefers the posterior approach for the transfer of the spinal accessory nerve to reinnervate the suprascapular nerve, the advantage of this approach is a more distal repair to a healthy portion of the suprascapular nerve.[4-6]

Both the spinal accessory and the suprascapular nerves can be exposed via a transverse incision at the superior border of the scapula. The suprascapular nerve is located midway between the superior angle of the scapula and the acromion. After identifying the nerve at the suprascapular notch, the superior transverse ligament is divided, and the nerve is dissected as far proximally as possible.

The spinal accessory nerve is located at a point 40% of the distance between the dorsal midline and the acromion. It can be identified deep in the trapezius muscle, which is separated parallel to the course of its fibers. The spinal accessory nerve is divided distally to achieve a coaptation without tension.

Post-operative Rehabilitation

All patients were counselled regarding extensive physiotherapy that would be a part of treatment and was called upon till satisfactory results were observed.

Results

A total of 26 patients with post-RTA BPI were included in the study where exploration and transfer

Figure 5: Left sided Pan BPI

of Spinal accessory to suprascapular nerve was done through a posterior approach.

The participants were between 15 and 39 years of age group. Out of 26 participants, 25 were male and one of female gender. 15 participants had Pan brachial plexus injury, 7 had C5 & C6 root injury, and rest 4 had C5 – C7 injury. Duration of Injury ranged from 4 to 8 months with mean of 5.8 months.

Each patient had trapezius MRC motor power of 5/5 & shoulder abduction of MRC power 0/5. Motor power of shoulder abduction at recovery (more than 10 months follow-up period) ranged from 0/5 to 4/5, with 10 patients having 0/5 power, 8 patients with 2/5 power, 7 patients with 3/5 motor power & one patient with 4/5 power.

Active range of shoulder abduction measured by goniometer ranged between 0 degree & highest of 90 degrees. 13 patients had 0–30 degrees of active abduction, one with 0–40 degrees, 0–60, and two patients had 0–90 degrees.

Patients with a duration of injury were 6 months or more, had shoulder abduction of power 3/5 or less with a maximum range being 30 degrees. Two patients with 90 degrees or more of active abduction with 4/5 motor power, had a duration of injury of 4 and 5 months.

Discussion

Brachial plexus injuries in India are increasing in number because of increasing road traffic accidents. The most common scenario is a young adult being thrown away while riding two-wheeler. Awareness or compulsion of wearing helmets can downgrade the extent of traumatic brain injury, which relatively increases the incidence of Brachial plexus injury.

With the introduction of microsurgical techniques, microstructures, and new understanding in nerve repair and regeneration started a renaissance in the surgical repair of brachial plexus injuries led by pioneers like Narakas, Millesi, Allieu, Brunelli, Gu, Terzis, Doi, and others.[7,8]

Brachial plexus injuries with no spontaneous recovery in 3 months deserve to be explored, due to the eventual loss of neuromuscular end plates at 20 to 24 months after denervation.[9] It is accepted that in the setting of brachial plexus injuries, the sooner the intervention, the better the functional outcome.[10]

Surgical outcomes vary depending on the age of the patient, duration of injury, extent of injury, and post-operative rehabilitation. Patients in the younger age group had better functional recovery. Patients with recovery in shoulder abduction of 0/5 motor power had a mean age of 32 years and 7.5 months of injury duration.

Conclusion

Early intervention is one of the prominent factors in determining functional recovery in patients with Brachial plexus injury. Once factors like root avulsion, and non-recovery in the sensory or motor function of the affected limb are confirmed clinically, radiologically, or through nerve conduction studies, surgical intervention and aggressive physiotherapy should be initiated. Since brachial plexus injury is managed in multiple stages, patients should be referred to centers dealing with such cases and without any delay.

Patients should be counseled regarding the disaster they are suffering and motivated into a disciplined lifestyle to save their limbs and have maximum benefit from performed surgery.

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