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Original Article

Comparison of Posterior versus Anterior Approach for Spinal Accessory to Suprascapular Nerve Transfer in Patients of Brachial Plexus Injury

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Abstract

Objective: The aim of the study was to compare posterior approach versus anterior approach for suprascapular to spinal accessory nerve transfer in patients with brachial plexus injury.

Methods: The study includes patients with brachial plexus injuries operated for spinal accessory to suprascapular nerve transfer. The patients were divided into two groups A and B. Patients in Group A were operated through anterior approach and patients in Group B were operated through posterior approach. The study was conducted on a total of 16 patients; eight patients in each group.

Results: We have studied 16 male patients in age group 22–40 years. All patients were operated within 1year of injury. In Group A, we obtained M1 strength in three patients and M2 strength in five patients. In Group B, we obtained M1 strength in two patients, M2 strength in three patients, M3 strength in two patients, and M4 strength in one patient.

Conclusion: Posterior approach for transfer of spinal accessory to suprascapular nerve transfer is a good option in patients with late presentation, double injuries and scapular fractures.

Key words: Brachial plexus injury, Spinal accessory nerve, Suprascapular nerve, Anterior approach, Posterior approach

INTRODUCTION

Brachial plexus injuries (BPIs) are severely traumatizing and disabling injuries for the patients.

BPIs occur because of trauma (open or closed), pediatric BPI post-delivery, compression, tumor, inflammation, infection, toxins, and other etiology.

Clinical examination and proper history taking remain the key steps in evaluation of patient, establishing site of injury, estimating degree of injury, and determining surgical treatment and prognosis.

Imaging studies such as magnetic resonance imaging and computerized tomography, investigations such as electromyography, nerve conduction studies help in diagnosing, and localizing the lesion.

- Neurotization, nerve repair, nerve grafts, nerve transfers, and free functioning muscle transfers are possible options for brachial plexus reconstruction. Different levels of injuries have different reconstructive strategies.
- Shoulder stabilization and recovery of abduction are considered one of the priority objectives in brachial plexus surgeries.
- The spinal accessory nerve (SAN) to suprascapular nerve (SSN) transfer is a widely used procedure for shoulder stabilization. This can be done through anterior and posterior approaches.

Usually, the transfer was done through the same approach as for brachial plexus through anterior approach.

The occurrence of injury of SSN at scapular notch, nerve lesions not identified microscopically, and lesion identified at SSN prevents realization of anterior approach, hence, posterior approach was started.[1-5]

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PATIENTS AND METHODS

Study Design and Patients

- This is a retrospective study carried out in Department of Burns and Plastic Surgery, Civil Hospital Ahmedabad.
- The study was carried out in 16 patients with BPI after road traffic accident.
- The patients were randomly divided into two groups – Group A was operated by anterior approach and Group B was operated by posterior approach.
- The period of study included patients operated from 2014 to 2021.
- The results were decided on the basis of approach of surgery, degree of shoulder abduction, shoulder stabilization, and scar characteristics.

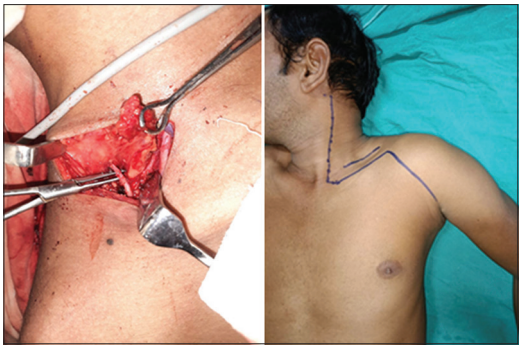
Inclusion and Exclusion Criteria

Patients were investigated by image MRI, electromyography, and nerve conduction study. Sixteen male patients between the age of 22–40 years were included in the study.

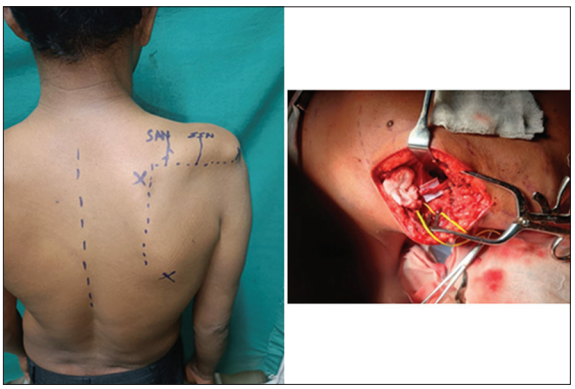
Mainly, patients with upper trunk (C5 and C6) injuries, pan brachial (C5-T1) injuries, irreparable from the roots through grafts, and time period more than 2.5 months from injury were included in the study.

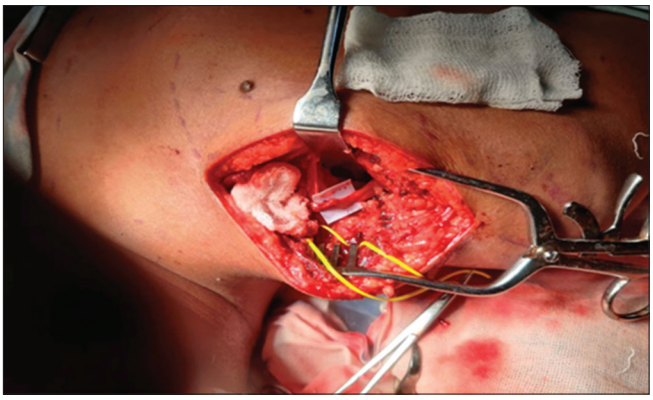
Surgical Photos

Anterior approach



Posterior approach





Evaluation

All patients were followed up and evaluated at regular intervals. Physiotherapy and nerve stimulation were started after 21 days in all patients.

Patients were evaluated on the basis on shoulder abduction; the degree of range of motion; and the power of muscles.

For shoulder abduction strength, we used:

- M0, no evidence of contractility;
- M1, muscle contractions, but no active movement;
- M2, abduction less than 60°;
- M3, abduction more than 60° (for 10 s);
- M4, abduction to 60° against the resistance applied to elbow; and
- M5, abduction to 60° against resistance applied to forearm.

RESULTS

We have studied 16 male patients in age group 22–40 years. All patients were operated within 1 year of injury. Following is the table of results seen:

The quantitative variables were expressed as mean and standard deviation. Mann–Whitney test for comparison between groups was used, assuming a significance level of 0.05.

GROUP A:

PATIENT LIST	AGE	INTERVAL BETWEEN INJURY AND SURGERY	SHOULDER ABDUCTION	TIME PERIOD AT WHICH RESULT NOTED
PATIENT 1	28	3 MONTHS	M1	2 YEARS
PATIENT 2	30	3 MONTHS	M2	2 YEARS
PATIENT 3	35	6 MONTHS	M1	4 YEARS
PATIENT 4	22	3 MONTHS	M2	2 YEARS
PATIENT 5	25	9 MONTHS	M2	1.5 YEARS
PATIENT 6	30	4 MONTHS	M2	1.5 YEARS
PATIENT 7	38	3 MONTHS	M2	2.5 YEARS
PATIENT 8	22	6 MONTHS	M1	1 YEAR

Group B:

PATIENT LIST	AGE	INTERVAL BETWEEN INJURY AND SURGERY	SHOULDER ABDUCTION	TIME PERIOD AT WHICH RESULT NOTED
PATIENT 1	30	3 MONTHS	M1	7 YEARS
PATIENT 2	36	3 MONTHS	M4	6 YEARS
PATIENT 3	25	2.5 MONTHS	M3	3 YEARS
PATIENT 4	24	3 MONTHS	M5	4 YEARS
PATIENT 5	35	2.5 MONTHS	M2	6 YEARS
PATIENT 6	20	6 MONTHS	M2	3 YEARS
PATIENT 7	26	2 MONTHS	M2	2 YEARS
PATIENT 8	30	3 MONTHS	M1	6 MONTHS

The critical value for U at $P < 0.05$ is 13. Therefore, the result is not significant.

In Group A, we obtained M1 strength in three patients and M2 strength in five patients.

In Group B, we obtained M1 strength in two patients, M2 strength in three patients, M3 strength in two patients, and M4 strength in one patient.

Based on Mann–Whitney U test, there is no statistical significance between time interval of surgery and strength of shoulder abduction obtained.

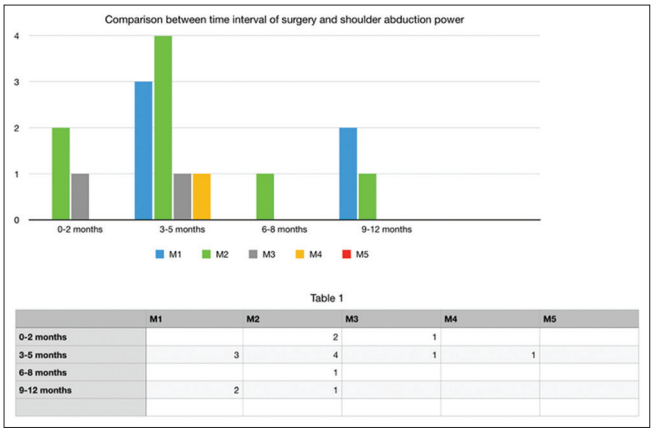


Table 1

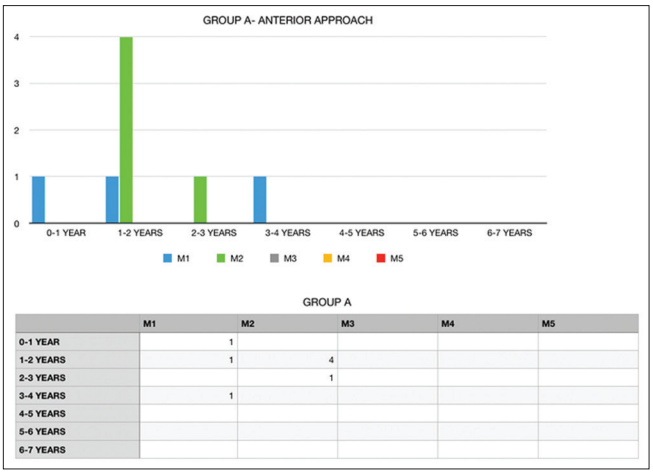
	M1	M2	M3	M4	M5
0-2 months		2	1		
3-5 months	3	4	1	1	
6-8 months		1			
9-12 months	2	1			

Based on the comparison between a total group patients and time interval of surgery, the majority of the patients gained strength M2 irrespective of time after surgery.

It can be observed from the table that in patients operated after 6 months, patient operated by posterior approach have gained strength M2 compared to M1 in anterior approach.

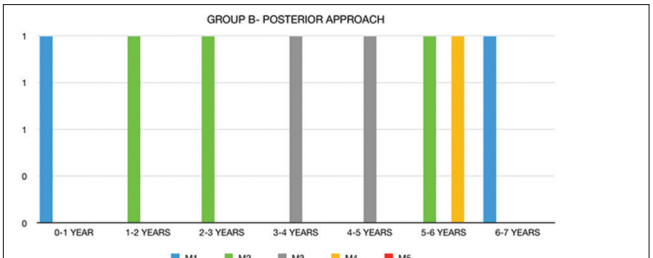
As it can be observed from the two graphs, patients operated by anterior approach are recovering.

At 6 years of follow-up, patients operated by posterior approach showed up to M4 power.



GROUP A

	M1	M2	M3	M4	M5
0-1 YEAR	1				
1-2 YEARS	1	4			
2-3 YEARS		1			
3-4 YEARS	1				
4-5 YEARS					
5-6 YEARS					
6-7 YEARS					



GROUP B

	M1	M2	M3	M4	M5
0-1 YEAR	1				
1-2 YEARS		1			
2-3 YEARS		1			
3-4 YEARS			1		
4-5 YEARS			1		
5-6 YEARS		1		1	
6-7 YEARS	1				

As nerve regeneration is a slow process and requires continuous nerve stimulation, exercises, and physiotherapy along with a lot of motivation by the patient himself, those patients in Group A showing up to M2 power in within 2 years may show good recovery at 5–6 year follow-up.

DISCUSSION

The direct transfer of SAN to SSN is required for shoulder abduction and stabilization in most patients.

Comparison of advantages and disadvantages

	Group A	Group B
Approach	Familiar approach	Less familiar approach
Surgical time	Shorter	Longer
In case of double injury	Exploration not possible	Exploration possible
Need to change position intra op	Not required	Required
Coaptation to muscle	Farther	Closer
Cosmesis	Better as multiple procedures can be done via same incision	Different incisions required for different procedures

Nerve transfer was adopted as primary surgery, then patient was put on regular physiotherapy and nerve stimulation after 21 days of surgery. Depending on type of results obtained, patient was planned for secondary procedure.

- Some conditions favored transfer of SAN to SSN through posterior approach: (a) Greater proximity to the muscle to be reinnervated; (b) leaving free nerve in an area where it could have been 1 s stretch injuries or direct injury; (c) exclusion of the articular branch reinnervation and preventing waste of axons; (d) preservation of former trapezius muscle without affecting the esthetics and can be used as a second treatment option in the failure of reinnervation of deltoid (the insertion of the trapezius transfer to the humerus).[6-10]

CONCLUSION

The posterior reinnervation of the SSN is presented as a good option to improve functional outcome in patients with traumatic BPI in patients with late presentation, double injuries, and scapular fractures

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