

A RETROSPECTIVE COMPARATIVE ANALYSIS STUDY OF ANTERIOR AND POSTERIOR APPROACHES IN SHOULDER FUNCTION OUTCOMES IN BRACHIAL PLEXUS INJURY.

Sanjay Kumar^a, Ankita Jain^b, Ravi Bilunia^{a,*}

^a Senior Resident, Department of Plastic and Reconstructive Surgery, Seth Sukhlal Karnani Memorial Hospital and Institute of Post-Graduate Medical Education and Research (SSKM & IPGMER), Kolkata, West Bengal, India

^b Senior Resident, Department of Plastic and Reconstructive Surgery, Institute of Post-Graduate Medical Education and Research, Kolkata, West Bengal, India

Abstract.

Background:

Brachial plexus injuries are associated with shoulder dislocation and nerve damage. The transfer of the nerve from the spinal accessory nerve to the suprascapular nerve is the preferred mode of reviving the nerves. Posterior and anterior approaches can be applied for the same. This study aims to compare the posterior and anterior methods and evaluate their outcomes

Method:

Data from 68 patients were studied retrospectively, and among them, 32 patients underwent surgery by anterior method and 36 patients underwent surgery by posterior surgery. Evaluation of the patient's rotation of motion and muscle power grading was done.

Result:

The recovery of the patients with posterior surgery was earlier in the 6-month follow-up itself, and the difference was statistically significant. Whereas, when compared for 18 months, the difference in the grading of muscle and rotation of the motion was not statistically significant.

Conclusion:

The recovery time was observed to be earlier in the posterior group as compared to the anterior group. However, when considering the 18-month follow-up period, the observed difference in recovery time between the two groups did not reach statistical significance. However, it is imperative to acknowledge the significance of the posterior approach in the context of clavicle injury and the associated impairment of the suprascapular nerves.

Recommendation:

To obtain a better shoulder function, reinnervation of both the Suprascapular Nerve and Axillary Nerve is recommended.

Keywords: Brachial plexus injury, suprascapular, spinal accessory, nerve transfer, posterior, anterior, Submission: 2023-09-29, Accepted: 2023-09-29

1. INTRODUCTION.

When an injury of the neck region that is the brachial plexus area occurs it usually leads de-

*Corresponding author.

Email address: drravibilunia@gmail.com (Ravi Bilunia)

crease in the motion of abduction of the shoulder and its rotation [1]. When such an injury occurs the most favorable option is the nerve donation from the accessory region to the suprascapular region. This helps the restoration of the shoulder function [2]. This nerve transfer aids the nerve supply to the trapezoid muscle which is responsible for movement in the lateral and posterior regions of the neck.

To facilitate the nerve donation from the accessory nerve to the supracapsular nerve an incision is made on the clavicle region anteriorly. Often it happens so that injury of the brachial plexus is associated with the injury of the supracapsular nerve [3]. Identifying the damage of the supracapsular nerve with the naked eye is not possible and, in such cases, when such a transfer of nerve from the accessory nerve to the supracapsular nerve occurs it cannot restore the function of the shoulder appropriately [4].

Another method used in many studies is the method of nerve transfer that occurs posteriorly [3-5]. Here the target muscle, which is the trapezoid muscle, is approached directly with available nerve donors, such as the nerve from the deltoid region or phrenic nerve [5]. It has been found that the anterior approach causes paralysis of the trapezoid muscle owing to nerve damage of the supracapsular nerve. Therefore, the method of posterior neurotization is preferred [6]. There is a limited number of studies based in India.

This study aims to compare the transfer of the accessory nerve to the supracapsular nerve posteriorly and anteriorly. Also, the procedure is evaluated for outcomes such as rotation of the shoulder towards the midline and external rotation.

2. METHODS.

2.1. Study Design and Participants.

Patients with brachial plexus injuries over a year at a tertiary care center in West Bengal, India were included in this retrospective study. The type of injury, whether it was a partial or total injury, was recorded.

2.2. Inclusion Criteria.

The data of those patients were only included if they did the operative procedure of nerve transfer within three to six months of the trauma, followed up for a year and a half, did not undergo any other shoulder reconstruction procedure, and had clear lesions on the nerve due to trauma.

2.3. Data Collection and Analysis.

In the follow-up period of six, twelve, and eighteen months, the movement of the shoulder towards the midline of the body and the external rotation of the shoulder were measured. The trapezoid muscle was also evaluated before and after eighteen months of the procedure. The muscle power grading was given to the trapezoid muscles; the muscle with a grade of more than 3 did a satisfiable recovery whereas the muscle with grading of less than 3 did not do a satisfiable recovery.

The steps of the procedure were as follows:

- *Transfer of accessory nerve to the suprascapular nerve*
- *Transfer of the radial nerve to the axillary nerve in case of nerve injury there*
- *Transfer of the ulnar nerve to the biceps nerve to improve the stretching of the elbow*
- *In cases of injury to the intercostal nerves of the cervical region, it is transferred to the musculocutaneous nerve.*

Two groups were formed from the data of the patients, namely, an anterior group in which the anterior approach was used for nerve transfer and a posterior group in which the posterior approach was used for nerve transfer. For the patients in the posterior group, the supra-vascular nerve was cut and the accessory was attached without any force.

All the data for the evaluation of the patient was statistically analyzed and the evaluation results of both groups were statistically compared.

3. RESULTS.

The data from 68 patients was studied retrospectively; there were 32 patients in whom the anterior approach was utilized and 36 patients in whom the posterior method was employed. All the patients except 2 had the injury due to a road accident, and the remaining 2 had it because of a fall from a height. Other details, such as the age, type of injury, and duration of the surgery, were also recorded.

All the patients had dislocation of the shoulders, and reports to evaluate the nerve damage showed that there was nerve damage in all the patients. The type of injury was either a partial injury of the brachial plexus or a total injury to the brachial plexus.

The follow-up data was studied thoroughly, and an 18-month follow-up evaluation was compared for both groups. The comparison of 18 months after the procedure for both groups for movement of the shoulder towards the midline is illustrated in Table No. 1, and a similar comparison after 18 months for external rotation of the shoulder is shown in Table No. 2.

When both groups are compared for movement of the shoulder towards the midline, the anterior group had 4 patients with muscle grading of 4 whereas the posterior group had 10. The number of patients with grading 4 was numerically higher but not statistically significant. The difference in the degree of rotation in both groups was also not significant. Recovery was good for 26 patients in the posterior group, which was numerically more than 20 patients had a good recovery, but again, the p-value was greater than 0.05 indicating the difference was not significant.

The same results were observed when the external rotation of the shoulder was compared. Although the patients had a good recovery and the muscle grading was numerically higher in the posterior group, the p-value was greater than 0.05 indicating the difference was not significant. As for the degree of rotation and also for the degree of rotation with partial injury, the difference was statistically significant.

4. DISCUSSION.

Transfer of the nerve during brachial plexus injury has played a substantial role in the recovery of the shoulder dislocation in most of the cases and recovery is generally good enough. Considering the anterior method, the position is supine for conducting the operative procedure, which is again preferable, and there are more axons available from the accessory nerves. Comparing it to the posterior method of surgery, the disadvantage here is surgery should be conducted in the prone position while conducting the procedure, the trapezoid muscle is detached from the scalpel, and the axons are not enough from the accessory nerve [7, 8]. However, the advantages supersede the disadvantages; this surgery can be performed even if there is a clavicle injury. If the nerves of the suprascapular region are damaged, the neurotization done here is close to the trapezoid muscle, and hence the probability of recovery is greater [9, 10].

When the two movements were compared for both groups, that is the movement of the shoulder towards the midline and the external rotation of the shoulder. Numerically, there were always more patients who had better muscle grading and recovery in the posterior group. Although, when statistically compared, the difference in any of the cases was not significant. The studies conducted in this area are consistent with the findings of our study, whereas some of them indicate a significant difference in the posterior and anterior procedures [11, 12].

In contrast to the statistically no significant difference observed during the 18 months, the follow-ups of 6 months and 12 months showed that the recovery was better in the posterior group. This could be explained by the fact that the surgeries performed posteriorly had innervation close to the trapezoid muscle, and hence, recovery among this group of patients was quicker comparatively.

When the partial type of brachial plexus injury is compared to the total injury, it is found that patients with the partial type of injury recover faster than those with the total type of injury. The shortcoming of this study is that it had a

Table 1: Comparison of motion of shoulder towards the midline.

Sr no.	Parameters	Anterior group	Posterior group	P-value
1.	Muscle power gradings (no. of patients)			
	0	00	00	
	1	00	02	
	2	12	08	0.52
	3	16	16	
	4	04	10	
2.	Final movements (no. of patients)			
	Good	20	26	0.72
	Poor	12	10	
3.	Average degree of Rotation of motion with partial injury	72.1	77.8	0.38
4.	Average degree of Rotation of motion	52.4	58.2	0.47

Table 2: Comparison of external rotation of the shoulder.

Sr no.	Parameters	Anterior group	Posterior group	P-value
1.	Muscle power gradings (no. of patients)			
	0	04	02	
	1	04	10	
	2	18	12	0.53
	3	06	10	
	4	00	02	
2.	Final movements (no. of patients)			
	Good	06	12	0.47
	Poor	26	24	
3.	Average degree of Rotation of motion with partial injury	23.2	33.7	0.36
4.	Average degree of Rotation of motion	14.7	22.3	0.36

limited population sample and all the differential variables could not be included here

5. CONCLUSION.

The recovery was earlier in the posterior group compared to the anterior, but when an 18-month follow-up is considered, the difference is not statistically significant. Nevertheless, the usefulness of the posterior method during clavicle injury and the damaged lesion of the supra-vascular nerves cannot be ignored.

6. LIMITATIONS.

The limitations of this study include a small sample population who were included in this study. The findings of this study cannot be generalized for a larger sample population.

7. RECOMMENDATION.

To obtain a better shoulder function, reinnervation of both the Suprascapular Nerve and Axillary Nerve is recommended.

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10. CONFLICT OF INTEREST.

The authors report no conflicts of interest in this work.

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