

ROLE OF SAHA'S PROCEDURE IN CHANGE OF MOVEMENT AT SHOULDER JOINT IN TRAUMATIC BRACHIAL PLEXUS INJURIES

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ABSTRACT

Background: Brachial plexus injuries are difficult to manage situation for surgeons. **Objective:** To assess the effects of saha's procedure on improving the range of movement of shoulder joint with brachial plexus injury. **Methodology:** We conducted a quasi-experimental study of twelve patients with absent or extremely weak shoulder abduction (motor grade 2 or less) due to traumatic brachial plexus injuries (C5-C6-C7/C5-C6 deficit), who had undergone surgical reconstruction of the flail shoulder by tendon transfer (Steindler elbow flexorplasty). The etiology of shoulder weakness in all patients was traumatic brachial plexus palsy (C5-C6-C7/C5-C6 deficit) from 1st January 2011 to 31st December 2014. Shoulder abduction improved or not improved measured in term of range of motion at shoulder joint. Age, gender, preoperative strength (rated on a 0 to 5 scale for the trapezius), previous surgery, length of follow-up, other associated operative procedures, results and complications were recorded. **Results:** We operated on twelve patients and average age at which patients presented was 22.83 in which only one was female. The percentage years of C5-C6 and C5-C6-C7 were 86.66% and 13.33% respectively. Average time elapsed since injury was 23 months. We followed the patients on average of about 2 years. The Average increase (change) in the abduction range was 74.1^o. **Conclusion:** Saha's procedure is good and effective procedure in improving the range of motion (Change) at shoulder joint in traumatic brachial plexus injuries (C5-C6-C7/C5-C6 deficit).

Key word: Saha's procedure, Shoulders, Abduction, Brachial plexus, Injury.

INTRODUCTION

Abduction is the most important functional movement of the glenohumeral joint, and at the same time one of the most complex movements of the entire body.¹ Traction injury of the brachial plexus results in paralysis of the upper limb, which may be partial or total. Hand function is affected if the hand cannot be maintained in a useful position.² Upper trunk lesions of the brachial plexus (C5 and C6 or C5-6-7 injuries) generally occur due to high-energy mechanisms, mainly due to motorbike accidents, falls from heights and sports trauma), mainly affecting people in a young and productive age group.

One of the first goal in the management of the flail arm is to restore arm function by primary direct nerve surgery or nerve transfer or with secondary reconstructive surgery. Indications for trapezes transfer are irreversible absence of active abduction at shoulder, passive abduction of the shoulder greater than 90," with having a strong trapezium muscle, and absence of substantial degenerative changes in the shoulder joint. Mostly nerve reconstruction/transfer is done but in absence of good results or when patients present with lapse of golden period, then muscle transfer

surgeries, are planned. A number of tendon transfers have been described to replace the function of the deltoid.^{2,3,4,5}

Transfer of the trapezium insertion was first described by Mayer,⁵ who used a fascia lat graft to extend its attachment to the deltoid tuberosity. Bateman⁶ modified the procedure by advising resection of part of the spine of the scapula with the trapezium, to allow screw fixation of the transfer to the hummers. This procedure was further modified by Saha.⁷ This study was planned to assess the outcome of Saha's procedure on the improvement of movement at shoulder joint, with brachial plexus injuries.

METHODOLOGY

This quasi experimental study was conducted on 12 patients. The patients selected had traumatic lesions of the upper trunk of the brachial plexus (C5 and C6 with or without impairment of C7) who came between 1st January 2011 to 31st December 2014. All the patients were operated at National Orthopedic Hospital, Bahawalpur. The functional evaluations were carried out in the pre- and postoperative periods after 90 days and in the six month after surgery up to 2 years. The functional evaluation (Clinical) was done

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with MRC grading of shoulder power M_0 to M_5 and shoulder abduction improvement measured in degrees with the help of goniometer. Study Design was quasi experimental study, with total duration of study was 3 years.

Table I : Case wise Description of patients

Case. No	Age	Gender	Time since injury	Level of injury	Previous surgery
1	20	M	2y	C5-C6	NO
2	19	M	12m	C5-C6	NO
3	22	M	2y	C5-C6	Exploration
4	42	M	13m	C5-C6-C7	Wrist arthrodesis
5	36	M	12m	C5-C6	Median nerve parenthesis
6	33	M	18m	C5-C6	NO
7	19	M	4y	C5-C6	NO
8	18	M	4y	C5-C6	NO
9	19	M	3y	C5-C6	NO
10	28	F	2y	C5-C6	NO
11	22	M	12m	C5-C6	Hip surgery
12	20	M	13m	C5-C6-C7	WRIST arthrodesis

Inclusion criteria: Traumatic closed upper trunk lesion of the brachial plexus (C5-C6, with or without C7 lesion); with good hand function with reconstructed or recovered elbow patients with one year or more of lesion; total passive ROM of shoulder greater than 80° .

Exclusion criteria: Open or non-traumatic lesion of brachial plexus upper trunk; complete lesion of the brachial plexus; patients with less than one year of lesion; stiffness upon passive movement of the shoulder.

Surgical technique: We used a technique described by Saha (1967), which was earlier reported by Mayer (1927) and Bateman (1955). The patient in surgery was placed in the lateral position. Y shaped (Cyber-cut) skin incision was given, centered over the acromion. The insertion zone was identified for the trapezius at the acromion and the distal aspect of the clavicle. An osteotomy with an oscillating saw was made at the base of the acromion and through the clavicle. The deltoid was longitudinally sectioned to expose the proximal humerus.

The inferior part of the acromion and the lateral part of the proximal humerus were buried. In 90° of abduction and 20° external rotation, the acromion was fixed to the proximal humerus with two 4.5 mm malleolar screws but before deltoid transfer. Two muscles from the steering group were restored. The deltoid was sutured over the transferred trapezius. Postoperatively, the shoulder was immobilized with an abduction

brace preformed before operation at 90° during 6 weeks. After this, progressive adduction of the shoulder was allowed in the splint during 2-3 weeks and a rehabilitation program for 2 months was started.

Goniometry was performed using a standardized goniometer. The active range of motion of the shoulder was evaluated with measurements in degrees mainly abduction.

The muscle test was carried out to scale the evolution of shoulder abduction force. Muscle strength was scaled as ; grade 5 : Normal, Grade 4: active movement against gravity with ruses Fannie, Grade3 : active movement against gravity without resistance, Grade2 : active movement without gravity without gravity Grade 1: Only flickev movement and Grade 0 no movement.

RESULTS

We operated on twelve patients and average age at which patients presented was 22.83 ± 8 years in which only one patient was female. The percentage of C5-C6 and C5-C6-C7 were 86.66% and 13.33% respectively. Average time elapsed since injury was 1.9 ± 1 years' months. We followed the patients on average of about 2 years. Our 75% patients (nine) got M4 power and 25% got M3 power respectively. The Average increase (change) in the abduction range was 74.1° (postoperative abduction and forward flexion with some minor differences) from 4° Preoperatively .

Figure I: Patients pictures before and after surgery

Case II



(Case 6)



(Case 10)



Table II: Case wise outcome of range of movements pre and postoperatively.

CASE No.	Trapezius /Deltoid power		Length of follow up (Years)	Associated procedures	Power (MRC)	Range of movement pre op and post op (Abduction & forward flexion)
	T	D				
1	5	0	2	Steindler Flexoplasty	3	5 ⁰ 30 ⁰ 30 ⁰
2	5	0	1.5	Wrist arthrodesis and Steindler Flexoplasty	4	10 ⁰ 110 ⁰ 100 ⁰
3	5	0	1.5	Steindler Flexoplasty	3	0 ⁰ 45 ⁰ 40 ⁰
4	5	0	1.5	Steindler Flexoplasty	4	5 ⁰ 90 ⁰ 90 ⁰
5	5	0	2.5	Steindler Flexoplasty	4	7 ⁰ 100 ⁰ 100 ⁰
6	5	0	3	Steindler Flexoplasty	4	5 ⁰ 80 ⁰ 80 ⁰
7	5	0	1.5	Steindler Flexoplasty	3	0 ⁰ 50 ⁰ 30 ⁰
8	5	0	2.5	Wrist arthrodesis, Steindler Flexoplasty	4	5 ⁰ 100 ⁰ 100 ⁰
9	5	0	2	Steindler Flexoplasty	3	5 ⁰ 30 ⁰ 30 ⁰
10	5	0	2.5	Steindler Flexoplasty	3	0 ⁰ 45 ⁰ 45 ⁰
11	5	0	1.5	Steindler Flexoplasty	4	10 ⁰ 110 ⁰ 110 ⁰
12	5	0	3	Steindler Flexoplasty	3	5 ⁰ 100 ⁰ 100 ⁰

DISCUSSION

In brachial plexus palsy, sometime secondary surgery is needed to improve the stability and function of the shoulder.¹³ and tendon transfer are needed depending upon lesion.¹³ Saha's⁷ logical modification of the trapezius transfer described by Bateman⁶ provides a more distal fixation of the transfer after a more proximal release. This gives a greater lever arm, and fracture of the bony insertion transferred from the acromion allows better fixation to the narrow cylindrical shaft of the humerus. An important modification was to consider transfer for paralysed muscles of the rotator cuff, to improve control of the humeral head and prevent subluxation. Careful assessment of muscles at shoulder joint is necessary deltoid and clavicular head of pectoris's major are prime movers subscapularis, supraspinatus and infraspinatus were considered as steering group which stabilise the humeral head in the glenoid. Additionally, sternal head of pectoralis major, latissimus dorsi, teres major and teres minor pull the humeral head downwards during the last few degrees of abduction.

Saha confirmed that when any two of the steering group of muscles were paralysed a single muscle transfer to replace the deltoid would not provide abduction beyond 90°. Saha describes principles to restore function of shoulder by the transfer of pectoralis minor, the upper two digitations of serratus anterior, latissimus dorsi and teres major in various combinations, with levator scapulae, sternocleidomastoid, scalenus anterior, scalenus medius and scalenus capitis.⁷

Some of the authors preferred shoulder arthrodesis for palliation of the posttraumatic flail shoulder.^{8,9,10}

There are some disadvantages with arthrodesis, as well like limited range of abduction. Arthrodesis makes the passive mobility of the joint difficult.^{8,12}

Narakas¹⁴ achieved abduction of 120° in few patients with combined transfers of teres major, levator scapulae and latissimus dorsi. Chun-lin and Yong-hua¹⁵ reported seven cases of pectoralis major transfers with additional trapezius transfer in three.

CONCLUSION

This study showed that Saha's procedure is good and effective procedure in improving the range of motion at shoulder joint in traumatic brachial plexus injuries (C5-C6-C7/C5-C6 deficit).

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