

CLINICAL OUTCOME OF STEINDLER FLEXORPLASTY AND SAHA PROCEDURE INTREATING SUPERIOR TRUNK BPI

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Abstrak

Cidera pleksus *brachial* salah satu cidera yang paling parah dari sudut pandang penderita. Prosedur *saha* umumnya menjadi pilihan yang digunakan dalam rekonstruksi abduksi bahu, dan prosedur *steindler* menjadi pilihan rekonstruksi fleksi siku dalam kasus cidera pleksus *brachial*. Kami melaporkan seorang laki laki muda datang dengan ketidakmampuan menggerakkan bahu dan siku kanan nya setelah kecelakaan bermotor 5 minggu sebelumnya. Pasien tidak mampu menggerakkan siku dan bahu, tetapi tangan dan pergelangan tangan tetap berfungsi dengan baik. Dari hasil *x-ray* bahu kanan nya terdapat fraktur *humerus proximal*. *Steindler flexorplasty* telah dilakukan setelah 3 bulan program penguatan. 6 bulan setelah *Steindler flexorplasty*, prosedur *Saha* dilakukan untuk meningkatkan pergerakan bahu nya. Bahu nya dapat abduksi $20^{\circ} - 55^{\circ}$ dan siku nya dapat fleksi $20^{\circ} - 80^{\circ}$ setelah operasi. Pada kasus ini, *trunk superior* pada *plexus brachialis* cidera karena bahu dan leher terkena trauma langsung pada bahu. Diakukan prosedur *Saha* setelah *Steindler flexorplasty* sangat baik untuk cidera *plexus brachialis* bagian *trunk superior*, prosedur yang sederhana dengan perdarahan yang sedikit, serta dapat meningkatkan fungsi dari pergerakan tubuh yang cidera. *Steindler flexorplasty* dan prosedur *Saha* adalah dua prosedur yang sangat bermanfaat untuk pasien yang mengalami cidera *plexus brachialis* bagian *trunk superior*.

Kata Kunci : Cidera *plexus brachialis*, *Steindler flexorplasty*, Prosedur *Saha*

Abstract

Brachial plexus injury (BPI) is one of the most devastating injuries from the point of view of the patient. The *Saha* procedure was commonly used for a reconstructive option for shoulder abduction, and the *Steindler* procedure for a reconstructive option for elbow flexion in case of brachial plexus injury. We report a teenager male presented with inability to move his right shoulder and elbow after a motor vehicle accident 5 weeks before. He was unable to move the elbow and shoulder, but the hand and wrist still had a good function. From the right shoulder X-Ray there is proximal humerus fracture. *Steindler flexorplasty* was performed after 3 months strengthening program. 6 months after *Steindler flexorplasty*, *Saha's* procedure was performed to improve the shoulder movement. The shoulder can abduction $20^{\circ}-55^{\circ}$ and the elbow can flex $20^{\circ}-80^{\circ}$ after the surgery. In this case, the superior trunk of the brachial plexus was injured due to the shoulder and the neck forcibly widens after direct shoulder trauma. *Saha's* procedure after *Steindler flexorplasty* is best for superior trunk brachial plexus injury, a simple procedure with minimal blood loss, which provided functional improvement. *Steindler flexorplasty* and *Saha's* Procedure are two procedures very beneficial to the patients who experienced superior trunk brachial plexus injury.

Keyword : Brachial plexus injury, *Steindler flexorplasty*, *Saha* procedure

1. INTRODUCTION

Brachial plexus injury (BPI) is one of the most devastating injuries from the point of view of the patient. 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. Brachial plexus injury can be classified into upper plexus type (C5, C6, with or without C7), lower plexus (C8 & T1), and global (C5, C6, C7, C8, T1). ¹In

this case, muscle transfer was performed to reconstruct shoulder and elbow function. According to a literature study, the *Saha* procedure was commonly used for a reconstructive option for shoulder abduction, and the *Steindler* procedure for a reconstructive option for elbow flexion.^{2,3} We're reporting a 16-year-old male with neglected proximal humeral fracture and superior trunk of brachial plexus injury which the elbow was treated with the Steindler flexorplasty and the shoulder function with the SAHA procedure.

2. METHODOLOGY

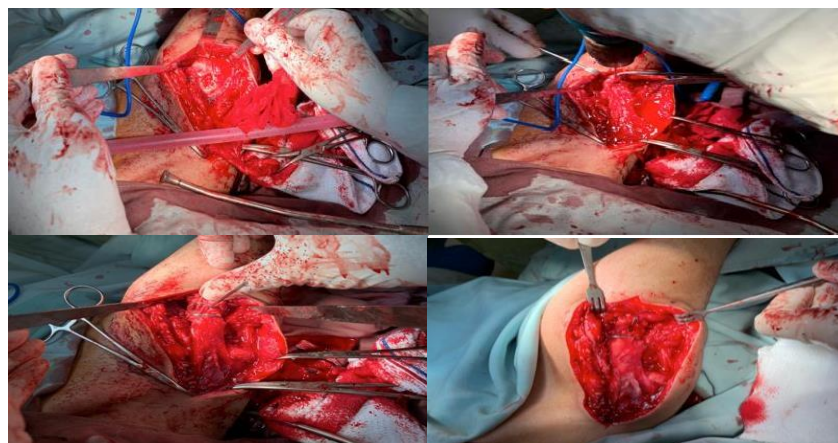
A teenager male (16 years old) came to the orthopedic clinic with the inability to move his right shoulder and elbow for the past 5 weeks after a prior motor vehicle accident. He was falling from a motorcycle and his right shoulder directly bumping to the ground. His right shoulder was bruised and it felt painful when he moved the shoulder and elbow. Then, he was immediately to the emergency room. The shoulder X-Ray showed a comminuted fracture of the proximal humerus but he refused to be performed thorough examinations and treatment. The patient later went to the bonesetter sought for help, but the result wasn't good.

Clinical finding showed the asymmetry in the right shoulder with deformed contour and atrophy of the right deltoid muscle. The patient felt

pain when his right shoulder palpated. The shoulder and elbow were unable to move with M0 on a motoric scale, but the wrist still has a good flexion and extension with the power of M4, and so did the hand gripping. The sensory was also assessed with no deficit in sensation on the innervation of each specific nerve.

The patient was performed Steindler flexorplasty to regain the elbow flexion and after three months after the surgery and physical therapy, the patient can flex the elbow to 80° with the power of M4. Six months after Steindler flexorplasty we offer the Saha procedure to the patient to regain the shoulder abduction and asked for the patient's informed consent to perform the surgery. The Saha procedure was performed under general anesthesia. The patient is placed supine. The shoulder abducted 90 degrees and the shoulder rotated internally. The right shoulder, the neck, and the right whole arm are prepared and free. Skin incision is made from posterior approach medial to lateral over the lateral of trapezius muscle to deltoid muscle. Y shape (Cyber-cut) deltoid muscle incision was given. The insertion zone was identified for the trapezius at the acromion and the distal aspect of clavicle. The deltoid was longitudinally sectioned to expose the proximal humerus. The deltoid muscle was fixed to the proximal humerus with cortical screw and Kirschner wire.

Figure 1. Saha's Procedure



Postoperative management, the shoulder was immobilized with an

abduction spica at 90° during five weeks.



Figure 2. Abduction Spica Post Operative

The patient to do some gradual active exercise at rehabilitation therapy clinic to strengthen the muscles that had been

transferred. Two weeks after therapy the patient can abduction the shoulder to 55° with the power of shoulder is M4.



Figure 3. The Result After Surgery and Rehabilitation Therapy

3. DISCUSSION

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.^{4,5}

The brachial plexus is a network of intertwined nerves that control movement and sensation in the arm and hand. As we know, upper limb extremities play an important role in activities of daily living such as using hands to eat, buttoning clothes, writing, and other activities.⁶ A traumatic brachial plexus injury involves sudden damage to these nerves, and may cause weakness, loss of feeling, or loss of movement in the shoulder, arm, or hand. Mild brachial plexus injuries may heal without treatment. More severe injuries may require surgery to regain function of the arm or hand.⁷

There are several treatments for brachial plexus trauma, and the time between the trauma and the surgical intervention is an important factor and determines a functional outcome.⁸

Surgery is indicated if there is no substantial spontaneous recovery within three months and is necessary for exploration or for further recovery.⁹ Surgical management is divided into two categories: Primary and secondary procedures. Secondary procedures are performed after primary procedures, the nerve repair whenever primary repair fails or it is done to augment primary repair, or in very late cases as a replacement for recovery function.¹⁰

The reconstruction performed earlier, less than four months, showed a better functional performance than reconstruction 8-12 months after trauma. In trauma between 3-6 months, primary reconstruction measures can be carried out in the form of nerve repair

and exploration. In case of brachial plexus injury that occurs for more than one year or is neglected, secondary reconstruction can be carried out, including tendon or muscle transfer, arthrodesis, tenodesis, or functional free muscle transfer.¹¹⁻¹³

There are many techniques available for the restoration of elbow function.⁸ The armamentarium of options include nerve transfers to restore function to the biceps and brachialis muscle transfers, including *Steindler* flexorplasty, unipolar or bipolar pectoralis transfers, and free functioning muscle, latissimus transfer, and triceps to biceps transfer.⁸

Several muscle transfers have been advocated to restore movement and stability of the shoulder after brachial plexus palsy. Including trapezius to deltoid, transfer to restore abduction of the shoulder.^{3,14-15}

Severe injuries to the brachial plexus cannot always be successfully repaired, sometime secondary surgery is needed to improve the stability and function of the shoulder.¹⁶

In shoulder restoration function, we prefer to use *Saha* procedure compare to other muscle transfer techniques because several studies recommend trapezius muscle transfer for shoulder restoration. Aziz et al. stated that trapezius transfer for flail shoulder after brachial plexus injury is a simple procedure with minimal blood loss, which provided functional improvement.¹⁷

However, there are some complications from this trapezius transfer. Ruhmann et al. reported that from 38 patients, there were several complications, including loosening of screws in 9.7% of patients, wound infection in 6.5% of patients, and bony deformities after fracturing with difficulty in fixation in 38.7% of patients.¹⁸

Chen, *et al.*, in their study, reported weaknesses in this *Steindler* procedure, including flexion contracture of the elbow, a pronation contracture of the forearm, and flexion contracture of the wrist.¹⁹

Trapezius transfer for flail shoulder after brachial plexus palsy, finding it a simple procedure with minimal blood loss, which provided functional improvement.¹⁷ This gives a best result to regain the function of shoulder abduction. Monreal R, *et al.*, reported The transfer improved function of the shoulder.

Postoperatively, the average gain in shoulder abduction was 46.2° (p < 0.001, Fisher exact test); the gain in shoulder flexion average 37.4° (p < 0.001). All patients had stable shoulders.²⁰ Syam AD, *et al.*, reported after the operation procedure (*Steindler* flexorplasty & *Saha* procedure), there are several improvements in the patient's range of movement. The patient can perform active shoulder abduction 30°, and elbow flexion at 90°.²¹

4. CONCLUSION

Trapezius transfer using Saha's procedure was safe and significantly improving functional of the shoulder abduction. Postoperatively, after physical therapy the patient can abduction the shoulder (20° - 55°) with the power of shoulder is M4. Saha's procedure combined *Steindler* flexorplasty gives a best result to regain the functional of arm to help the patients in carrying out their daily activities

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