Evaluation of elbow function following bipolar latissimus dorsi flap in late partial brachial plexus injury: A case report

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Case Report

Evaluation of elbow function following bipolar latissimus dorsi flap in late partial brachial plexus injury: A case report

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ABSTRACT

The goals the treatment of brachial plexus palsies or traumatic loss of upper extremity function are including hand reanimation, protective hand sensation, shoulder stability, and elbow function as the first ority in upper extremity reconstruction. One method that has been developed to solve this problem is bipolar transfer of the latissimus dorsi muscle. We present a case of 37-years-old male with late case of partial brachial plexus injury treated with bipolar latissimus dorsi flap. Aim for this research is to report a long term satisfying elbow and shoulder clinical function outcome after performed bipolar latissimus dorsi muscle transfer. Seven years post-surgical follow up showed active shoulder abduction at 180°, active shoulder external rotation at 45°, active shoulder forw flexion at 90°, extend shoulder until 20°, active elbow flexion at 120°, active elbow extension until 0°. Elbow flexion strength was measured using the MRC grading system-with elbow flexed at 90° was M5.

We concluded that bipolar latissimus dorsi muscle flap provides a good outcome in elbow reanimation following late brachial plexus injury. Preoperative donor muscle strength evaluation will predict satisfactory postoperative result.

1. Introduction

Elbow function should be the first priority in upper extremity reconstruction along with hand reanimation, protective hand sensation and shoulder stability. Elbow flexion is required for daily living activities such as hand to mouth for feeding and hand to chest for dressing. Thus, patient with complete loss of active elbow flexion will be severely disabled [1]. [2,3].

Several procedures have been described to restore elbow flexion, including unipolar or bipolar transfer of the pectoralis major, Steindler flexorplasty, unipolar or bipolar transfer of latissimus dorsi, triceps to biceps transfer, pectoralis minor transfer, and sternocleidomastoid transfer [3]. Among some methods has been performed, bipolar latissimus dorsi muscle transfer is a reliable method to restore functional elbow flexion regarding range of motion (>90° elbow flexion) and strength (at least antigravity strength M3) with acceptable donor morbidity and complication rate [4]. The transfer can be either unipolar or bipolar [5].

The latissimus dorsi muscle is a wide flat muscle extending from dorsal and lumbosacral regions to the humeral shaft. It is triangular in shape, with its base at the spine and the apex at the axilla. Its blood supply comes from the thoraco dorsal artery, branches off the subscapular artery arising from the distal axillary artery. The thoracodorsal nerve (roots C5, C6, C7) is responsible for the innervation of the muscle [1]. [6] It participates in arm adduction, retropulsion and internal rotation [6].

We report a clinical case with satisfying elbow and shoulder function after performed bipolar latissimus dorsi muscle transfer.

2. Case report

A 27 year old male was admitted to hospital due to inability to move his right shoulder and elbow following traffic accident 1 year before his admission. Initial strength of his right shoulder and elbow was graded as M0 according to the Medical Research Council (MRC) grading system, while his right hand was not affected (Fig. 1). Sensory loss involves the lateral aspect of the arm and forearm. Preoperative latissimus dorsi strength was assessed by asking the patient to perform arm adduction and extension against resistance, graded as M5.

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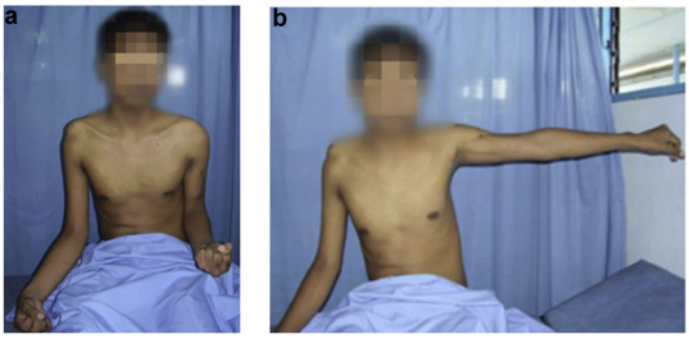

Fig. 1. Preoperative motoric assesment. a, b. Patient was unable to move his right shoulder and elbow, initial strength of his right shoulder and elbow was graded as M0.

Informed consent of surgery was obtained and patient underwent bipolar latissimus dorsi muscle transfer, 1 year after the initial injury. The origin of the muscle was released by cutting across its musculo-fascial junction inferiorly and its muscle fiber superiorly. The transfer was swing without twisting its vessels or nerve and the aponeurotic origin of the muscle was stitched to the bicep tendon. The insertion was released and sutured to the coracoid process (Fig. 2).

Post operatively, the arm was splinted with the elbow flexed to 90°, starting from full time splinting for the first three months, following overnight splinting for the next three months. Active flexion and extension were begun at six weeks, but passive extension was avoided for the first three months.

Long term result follow-up comprised the elbow flexion strength measurement and active elbow range of motion (Fig. 3). At 7 years follow up, patient had fully active shoulder abduction with range of motion at 180°, active shoulder external rotation at 45°, active shoulder flexion at 90°, shoulder extension until 20° active elbow flexion at 120° and active elbow extension until 0°. Elbow flexion strength was measured by using the Medical Research Council grading system with elbow flexed at 120° is 3–5 kg. Patient has fully active forearm supination and pronation, wrist extension and finger flexion.

3. Discussion

Although most of upper extremity functions are carried out by the hand, normal use of hand largely depends on well-functioning elbow joint for proper positioning in reaching or holding object [7]. Mobility and stability of the elbow joint are of prime importance for recreational, professional, and daily activities [8].

Patients with complete loss of elbow flexors (biceps brachii and brachialis) are deeply frustrated by their inability to perform daily activities such as eating, shaving, combing, and most of occupational and recreational activities, even though the function of the wrist and the hand is still well-preserved. Reconstructive procedures to restore elbow flexion will greatly please the desperate patients as well as the surgeon [7].

Numerous ingenious methods have been developed for elbow flexion restoration: Steindler flexorplasty, anterior transposition of the triceps tendon, transfer of the pectoralis major to the biceps, shoulder arthrodesis and sternocleidomastoideus, transfer with extension of a fascia lata graft and unipolar or bipolar transfer of the latissimus dorsi [7]. While the latissimus dorsi muscle transfer to the biceps brachii provides satisfactory elbow flexion without severe contractures [9]. Vekris et al. [10] preferred the pedicled latissimus dorsi transfer for elbow flexion due to its early return to function and larger donor size. Moreover, it provides more functional elbow motion and lift strength than flexorplasty does [9]. [11].

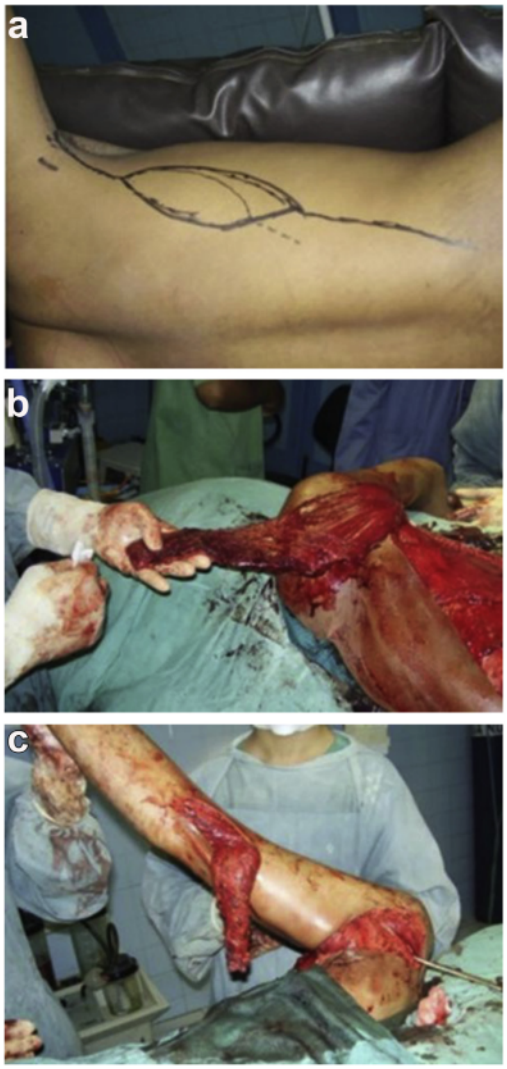

Fig. 2. Bipolar Latissimus Dorsi Flap Surgical Procedure. a) Planned incision for lattisimuss dorsi muscle. b) Release the lattisimuss dorsi from its origin and insertion. c) After transferred to right arm. Its origin sutured to coracoid processes and its insertion to biceps tendons.

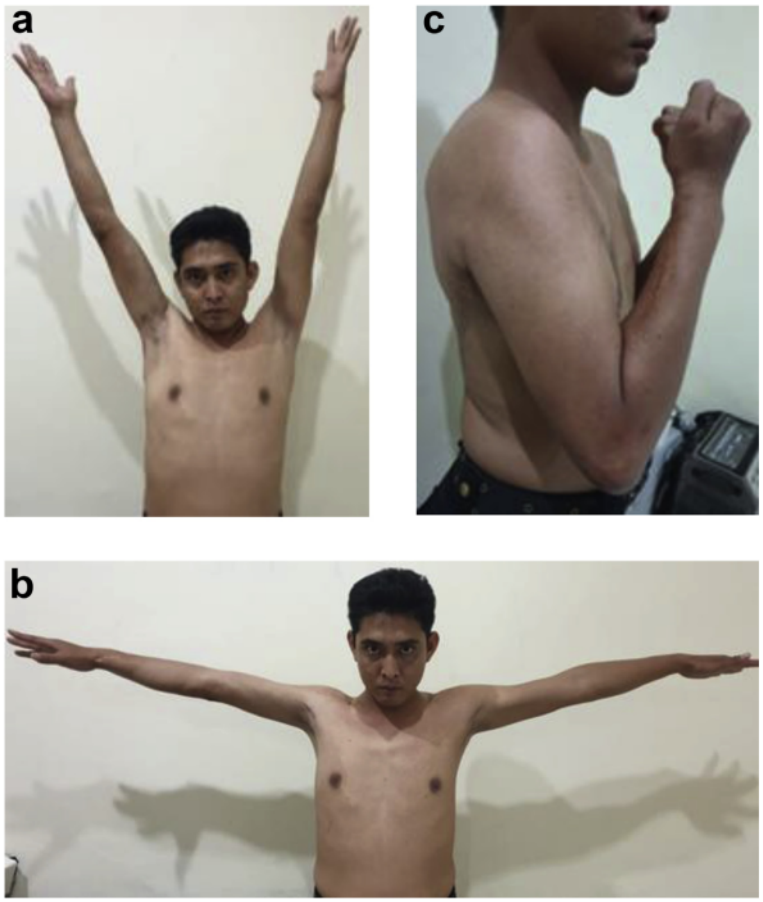

Fig. 3. After 7 years follow up. a) patient has active shoulder adduction 180°, b) active elbow flexion 120°, c) active elbow extension 0°.

Latissimus dorsi is a reliable donor because of its large size and shape that become our first choice. Additional advantages of latissimus dorsi free vascularised flap including a large pedicle with diameter of 2–3 mm and length of 8–12 cm from a single motor neuron and relatively large area of skin can be harvested with the muscle to ease the skin closure and improve the arm contour. Replacement of biceps brachii muscle action thus enabling active supination-in addition to-elbow flexion and may achieve a functional range of motion and useful muscle power [7]. [10] The disadvantages including more extensive surgical dissection, longer operation time compared to Steindler flexorplasty.

This patient can performed active elbow flexion at 135° and active elbow extension until 0°. The strength of elbow flexion was measured by using the Medical Research Council grading system is M5 with elbow flexed at 90° is 3–5 kg. While most of patient's activity require an active excursion from 30° to 120°, and 120° of flexion of the elbow are required to reach the mouth with affected hand. An excellent (3–8 kg) and good (0.5–3 kg) were rated as a functional success and was sufficient for most of the activities of active daily life [7]. [12].

The preoperative muscle power is the most notably influencing postoperative functional outcome. A normal-strength latissimus dorsi muscle is needed for satisfying result. Kawamura et al. *(14)* reviewed 17 patients who underwent latissimus dorsi myocutaneous flap transfer for functional reconstruction of elbow flexion or extension. Three patients showed unsatisfactory restoration of flexion or extension strength had associated preoperative weakness of the latissimus dorsi muscle. In this patient preoperative latissimus dorsi strength was assessed as M5.

Seven years after surgery, we evaluate the functional outcome using QDASH Score and Medical Research Centre grading scale. This patient obtained MRC grading score M4 and good clinical outcome. Patient can perform daily living activities without disability or pain and satisfied with the result.

4. Conclusion

Bipolar latissimus dorsi muscle flap provides a good outcome in elbow reanimation following late brachial plexus injury in our case. Preoperative donor muscle strength evaluation will predict satisfactory postoperative result.

Ethical Approval

Written informed consent was obtained from the patient for publication of this case report and accompanying images.

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This study was funded independently.

Author contribution

M. Ruksal Saleh: concepts, design, surgeon, definition of intellectual content, literature research, clinical studies, data collections, data analysis, manuscript editing & review.

Idrus A Paturusi: concepts, design, surgeon, definition of intellectual content, literature research, clinical studies, data collections, data analysis, manuscript editing & review.

Muhammad Sakti: concepts, design, surgeon, definition of intellectual content, literature research, clinical studies, data collections, data analysis, manuscript editing & review.

Padlan Pasallo: concepts, design, definition of intellectual content, literature research, clinical studies, data collections, data analysis, manuscript writing.

Qariah Maulidiah: literature research, clinical studies, experimental studies, data collections, data analysis, manuscript writing.

Padlan Pasallo: literature research, clinical studies, experimental studies, data collections, data analysis, manuscript writing.

Conflict of interests

The authors declare that they have no competing interests.

Guarantor

Padlan Pasallo. Astrawinata Guatama.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ijso.2019.05.002.

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