Orthopedics and Rheumatology
Open Access Journal
ISSN: 2471-6804

Case Report
Volume 19 issue 3 - December 2021
DOI: 10.19080/OROAJ.2021.19.556017

Ortho & Rheum Open Access J

Catastrophic Member. Restoration of Elbow Flexion by Transferring Long Head from Triceps to Biceps

Roberto Mata Cuevas[1], Sergio Virgilio Morales Pineiro[1], Juan Carlos Cedré González[1], Claribel Plain Pazos[2]*, Leonardo Domínguez Plain[3], Luis Crescencio Breton Espinosa[4] and Lázaro Martin Martínez Estupinan[5]

[1]*I and II Degree Specialist in Orthopedics and Traumatology, Provincial General University Hospital "Mártires del 9 de Abril", Cuba*

[2]*Specialist of I and II Degree in Comprehensive General Medicine, Faculty of Medical Sciences of Sagua la Grande, Cuba*

[3]*4th Year resident of Orthopedics and Traumatology, Provincial General University Hospital "Mártires del 9 de Abril" Sagua la Grande, Cuba*

[4]*I Degree Specialist in Orthopedics and Traumatology, Provincial General University Hospital "Mártires del 9 de Abril", Cuba*

[5]*Doctor in Medical Sciences, II Degree Specialist in Orthopedics and Traumatology, Provincial General University Hospital, "Mártires del 9 de Abril" Sagua la Grande, Cuba*

Submission: December 03, 2021; **Published:** December 15, 2021

***Corresponding author:** Claribel Plain Pazos, Specialist of I and II Degree in Comprehensive General Medicine, Faculty of Medical Sciences of Sagua la Grande, Cuba

Summary

Introduction: Catastrophic injuries to the upper limb are devastating injuries that affect many essential structures of the hand, forearm, arm and adjacent organs, which almost always lead to significant disability, directly or through the psychosocial impact that it represents. Therefore, recovering essential limb functions represents a challenge for orthopedists.

Objective: To present a new technique in our environment, which behaved as the most useful variant to regain flexion of the elbow without loss of other functions in this patient.

Case Presentation: 58-year-old male mestizo patient, who is treated at our institution for an occupational accident with a practically disarticulated right upper limb at the elbow and shoulder with avulsive soft tissue lesions including radial nerve and cutaneous muscle. The loss of active elbow flexion because of the neurological injury suffered was restored with the transfer of the long head of the triceps brachii to the distal biceps brachii tendon, recovering flexion against resistance without loss of extension.

Conclusions: The transfer of the long head of the triceps brachii to recover active flexion of the elbow is a not very complex technique with little morbidity and without loss of active elbow extension, which in our patient managed to recover important functions of the injured limb.

Keywords: Catastrophic Limb; Loss of Elbow Flexion; Triceps Brachii Transfer

Introduction

Catastrophic upper limb injuries are devastating injuries that affect many essential structures of both skin and muscle, tendon, vascular, nerve, and bone that generally lead to significant disability, either directly or through the psychosocial impact they produce [1,2]. That is why the return of the essential functions of the limb is fundamental and for this the most important thing is to restore the flexion of the elbow to position the hand in space, performing essential functions such as toilet and bringing the hand to the face or mouth [3]. Nerve transfers or grafts when the muscles are viable may be an option to restore active elbow flexion, but when surgery has had to be delayed and the biceps and brachii muscles are damaged or lost atrophic muscle transfers are the choice and those of the latissimus dorsi and triceps the best options [3]. In 1999, Haninec and Szeder described the unique transfer of the long head of the triceps to the anterior aspect of the ulna to achieve active flexion without losing elbow extension, taking advantage of the independent neurovascular anatomy of this muscle belly [4]. This article presents a surgical technique described in the literature but novel in our setting, being considered the most useful variant to regain flexion of the elbow without loss of other functions in this patient.

Patient presentation

58-year-old male patient, mestizo, industrial worker who suffers a work accident and is brought to our institution for emergency care in shock with a large avulsive lesion of the right elbow, arm and shoulder that also affects the region of the right hemithorax with injuries by traction and tearing (Figure 1A). Damage control and shock stabilization measures are taken, proceeds to the intervention where reduction and osteosynthesis of the open dislocation of the unstable elbow is performed (Figure 1B & 1C), with repair of the entire avulsed muscular apparatus but an approximate segment 15 cm of the radial nerve was lost. At the level of the shoulder and axillary region, there is an avulsive injury with exposure of the nervous vascular bundle, tears of the anterior and internal muscular apparatus of the shoulder and thoracic region that includes multiple rib fractures (Figure 1D). Reconstruction of all lesions was performed, but the musculocutaneous nerve was also pulled out of its muscular insertion and repair was not possible. In subsequent interventions, musculocutaneous coverage of the shoulder and elbow defects was performed with rotational and free dermoepidermal partial thickness grafts. The patient is reevaluated in a multidisciplinary consultation fifteen months after having undergone an intense rehabilitation program, concluding in the need to restore elbow flexion and improve limb functionality.

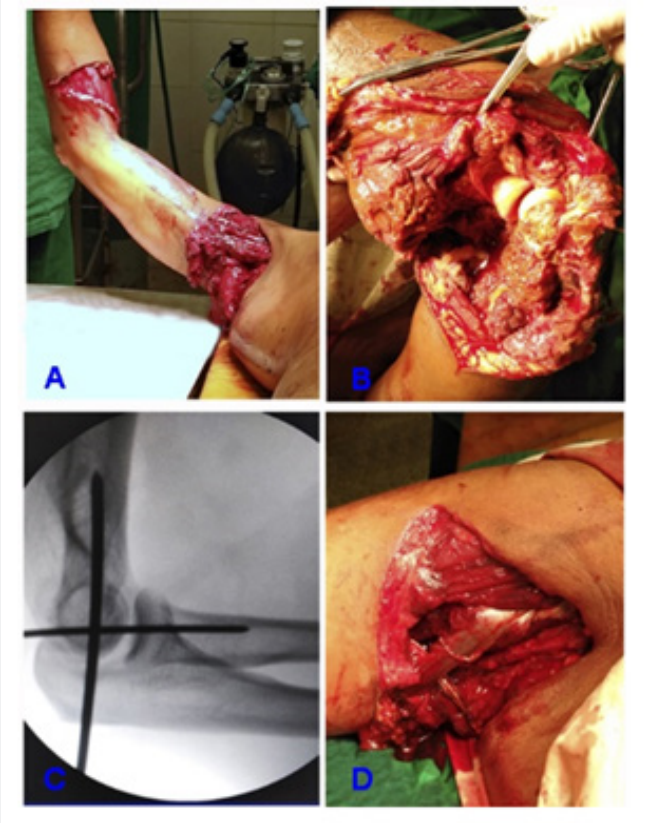

Figure 1: An Upper limb with catastrophic injury; B and C Reduction and osteosynthesis of unstable elbow dislocation and fluoroscopic image; D Large avulsive traction injury to the shoulder.

Physical examination 15 months after the accident

Normolineal patient Weight: 72 Kg Height: 1.78 cm

Shoulder: Scar with complete skin coverage at the expense of rotational flap and free graft. Active and passive non-painful movements with abduction ± 90º flexion ± 110º extension ± 30º external rotation ± 45º.

Elbow: Scar with complete skin coverage at the expense of free dermal epidermal graft. Passive flexion extension movements: complete and not painful. Active movements in flexion: not present, full extension. Passive supination movements not painful and limited to 50º, complete pronation. Active movements in supination not present, complete pronation.

Wrist and hand: active wrist and finger extension movements not present, other movements preserved. The muscular strength of the muscle groups near the elbow was evaluated, finding:

Triceps 5/5 brachial biceps: 0/5 pronators: 4/5 supinators: 0/5 wrist extensors and finger.

Extensors: 0/5 wrist flexors and fingers: 4/5.

How to cite this article: Roberto M C, Sergio V M P, Juan C C G, Claribel P P, Leonardo D P, et al. Catastrophic Member. Restoration of Elbow Flexion by Transferring Long Head from Triceps to Biceps. Ortho & Rheum Open Access J. 2021; 19(4): 556017.
DOI: 10.19080/OROAJ.2021.19.556017

Complementary

i. **Hb:** 13.5 g / l

ii. **Hematocrit:** 0.45 vol%

iii. **Glycemia:** 4.5 mmol / l

iv. **Creatinine:** 81 mmol / l

v. **Erythrosedimentation:** 12 mm / h

vi. **Blood group and factor**: A+

vii. **X-ray of the elbow:** normal, no signs of myositis ossificans

viii. **Chest X-ray:** multiple consolidated rib fractures with depressed right hemithorax compared to the contralateral one.

ix. **EKG:** normal

x. **Surgical Decision:** Perform Transfer of Long Head from Triceps to Biceps

Surgical technique

Patient under general anesthesia and with the limb on the thorax, in the first stage, an incision is made in the center of the posterior aspect of the arm from the junction of the upper and middle third of the arm to the tip of the olecranon (Figure 2A). triceps brachii in its middle and distal part. Isolation of the long head of the triceps is performed from the proximal to distal part because the separation between the muscle bellies is better defined (Figure 2B) and it is then released from its insertion distal to the olecranon, obtaining a muscular pedicle of the long head of the triceps that we kept in a wet compress (Figure 2C).

Figure 2: An Incision on the posterior aspect of the arm; B Identification and separation of muscle bellies; C Long head triceps flap; D Incision at elbow flexure exposing distal biceps tendon.

The space between the medial and lateral muscle bellies of the triceps is then closed with the elbow in full extension and a subcutaneous tunnel is created in the medial margin of the posterior skin incision, respecting the neurovascular structures and with enough space to reorient the head. length of the triceps released in an antero-medial direction towards the elbow flexure. It is at this time (second stage) that the limb is placed on a hand table with the elbow extended and an incision is made on the medial border of the distal portion of the biceps, targeting the elbow flexure to expose the tendon aponeurosis. bicipital and once open expose the distal biceps tendon (Figure 2D) to make a transverse incision in it that allows the tendon end of the triceps transferred to the biceps to pass at maximum tension and anchor it according to the Pulvertaft technique with the elbow

How to cite this article: Roberto M C, Sergio V M P, Juan C C G, Claribel P P, Leonardo D P, et al. Catastrophic Member. Restoration of Elbow Flexion by Transferring Long Head from Triceps to Biceps. Ortho & Rheum Open Access J. 2021; 19(4): 556017.
DOI: 10.19080/OROAJ.2021.19.556017

in 70º flexion. The two wounds are closed with the placement of drainage tubes that are removed at 72 hours, the stitches at 10 days being immobilization for four weeks with the elbow at 90º [4,5]. Once the immobilization is removed, a rehabilitation plan is started with flexion exercises in favor of gravity and then exercises against gravity resistance. At the sixth month, the patient had an elbow flexion range from 0º to 130º. At one year the patient maintained the same flexion arc and with a force of 4/5. The extension remained the same with a force of 4/5 (Figure 3).

Figure 3: Results one year later.

Discussion

In loss of elbow flexion due to traumatic injury to the brachial plexus or its multiple trunks, early or palliative direct nerve surgery is indicated; but muscle transfers are the first choice in late cases or for those patients who are not suitable for direct nerve surgery, or the second choice if the result is insufficient [6,7]. In our case, this is a patient who, due to the size of his injury, required a long recovery period, therefore the treatment of his functional sequelae had to be postponed and direct nerve surgery for neurotization or nerve grafting was necessary. technically impossible. In, the presence of transferable muscles and the muscular strength of the elbow flexors is zero (M = 0), a strong pedicle transfer is needed using muscles such as the pectoral, latissimus dorsi or triceps [6].

In this patient with flexor elbow strength of M = 0 and in which a large part of the muscles of the shoulder and elbow region had suffered some damage, the muscle options only targeted the triceps with strength evaluation M = 5, so it was the muscle used and that according to some authors the one with the best results as well as the latissimus dorsi [8]. Transfers of this muscle can be performed completely, but with the drawback of the loss of active extension [4,5,8] or using the long head of the triceps only, since it has independent innervation and vascularization and even authors in studies of cadaveric dissection suggest that this muscle belly is innervated in many cases by the axillary or ulnar nerve and not by the radial nerve exclusively [4,5,9-12]. For this reason, the long head of the triceps can not only be used to perform a free muscle flap without creating great local morbidity, but it can also be used with good results to regain flexion of the elbow without losing the extension of this joint and using a relatively easy technique to execute [4,13]. In this case, the transfer achieved an active flexion of 130º and the active extension was complete.

Conclusion

The transfer of the long head of the triceps brachii to regain active flexion of the elbow is a slightly complex technique with little morbidity and without loss of active elbow extension. When used in this patient, it was able to recover important limb functions.

References

1. Muñoz CD, Cabrera ME (2018) Reconstrucción de miembro superior posterior a lesión catastrófica por quemadura. Cambios rev méd 17(2): 77-82.
2. Hundeshagen G, Wurzer P, Forbes A, Voigt C, Collins V, et al. (2017) The occurrence of single and multiple organ dysfunction in pediatric electrical versus other thermal burns. J Trauma Acute Care Surg 82(5): 946-951.
3. Loeffler BJ, Lewis DR (2016) Restoration of Elbow Flexion. Hand Clin 32(3): 311-321.
4. Vergara Amador E, Vela Rodríguez F (2016) Transferencia de la cabeza larga del tríceps para la flexión del codo en secuela de lesiones del plexo braquial. Acta Ortopédica Mexicana 30(6): 326-28.
5. Rao PD, Rao RV, Srikanth R (2017) Triceps to biceps transfer for restoration of elbow flexion following upper brachial plexus injury. Indian J Plast Surg 50(1): 35-42.
6. Chammas M, Coulet B (2015) Parálisis de la flexión y de la extensión del code. EMC Técnicas Quirúrgicas Ortopedia y Traumatología 7(1): 1-23.
7. Yi Lee TM, Sechachalam S, Satkunanantham M (2019) Systematic review on outcome of free functioning muscle transfers for elbow flexion in brachial plexus injuries. J Hand Surg Eur 44(6): 620-627.

How to cite this article: Roberto M C, Sergio V M P, Juan C C G, Claribel P P, Leonardo D P, et al. Catastrophic Member. Restoration of Elbow Flexion by Transferring Long Head from Triceps to Biceps. Ortho & Rheum Open Access J. 2021; 19(4): 556017.
DOI: 10.19080/OROAJ.2021.19.556017

8. Aponte Arrazola F (2001) Flexoplastia del codo. Rev Asoc Arg Ortop y Traumatol 66 (1): 22-26.

9. Gogola GR, Ezaki M, Oishi SN, Gharbaoui I, Bennett JB (2010) Long head of the triceps muscle transfer for active elbow flexion in arthrogryposis Tech Hand Up Extrem Surg 14(2): 121-124.

10. Erhardt A J, Futterman B (2017) Variations in the Innervation of the Long Head of the Triceps Brachii: A Cadaveric Investigation. Clin Orthop Relat Res 475(1): 247–50.

11. Darshan Kumar AJ, Kumar ST, Shetty N (2019) Ulnar Nerve Innervation to Triceps: A Cadaveric Study and a Technical Note on Partial Triceps to Biceps Transfer Indian J Orthop 53(2): 353-356.

12. Wade MD (2018) Innervation of the Long Head of the Triceps Brachii in Humans-A Fresh Look. The Anatomical Record 301(3): 473-483.

13. Lim AY, Pereira BP, Kumar VP (2001) The long head of the triceps brachii as a free functioning muscle transfer. Plast Reconstr Surg 107(7): 1746-1752.

DOI: 10.19080/OROAJ.2021.19.556017

How to cite this article: Roberto M C, Sergio V M P, Juan C C G, Claribel P P, Leonardo D P, et al. Catastrophic Member. Restoration of Elbow Flexion by Transferring Long Head from Triceps to Biceps. Ortho & Rheum Open Access J. 2021; 19(4): 556017.
DOI: 10.19080/OROAJ.2021.19.556017