Clinical Case Reports International

Case Report
Published: 25 Nov, 2023

Medial Head of Triceps Nerve Transfer for Axillary Nerve Palsy after Shoulder Dislocation: Case Report

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Abstract

The most common neurological deficit after glenohumeral dislocation is isolated axillary nerve palsy. It is not always easy to guide treatment of nerve complications after shoulder dislocation, especially with regard to timing and surgical option. Recently the number of complex nerve transfer procedures is increasing. We report a case demonstrating the use of the modified Somsak technique, an innovative treatment used in this context, which consists in the medial head of triceps nerve transfer to the anterior axillary nerve.

This case report reinforces the idea that the modified Somsak technique is an effective method for reinnervating the deltoid and therefore should be considered in patients with isolated axillary nerve damage following anterior shoulder dislocations.

Introduction

Shoulder dislocations account for 50% of major joint dislocations, with the vast majority being anterior dislocations (95%-97%) [1].

A number of shoulder girdle injuries are associated with acute anterior glenohumeral dislocations, namely Bankart lesions, Rotator Cuff Tears (RCT), Hill-Sachs lesions, greater tuberosity fractures or neurological deficits [2].

The prevalence of neurological deficit following primary anterior glenohumeral dislocation is greater than previously appreciated [3]. Although any component of the brachial plexus may be injured, the most common neurological deficit is an isolated axillary nerve palsy (73.8%) [2].

While most axillar nerve injuries recover spontaneously over the next three to four months, some patients experience persistent axillary neuropathy. These injuries can influence immediate recovery of function or reduce functional reserve, leading to upper extremity disability with subsequent injury [4].

In recent years, there has been a paradigm shift in the management of peripheral nerve injuries with the increasing use of surgical neurolysis, direct neurorrhaphy and nerve grafting. With advances in microsurgery, the number of complex nerve transfer procedures is increasing.

The nerve transfer to deltoid muscle using the nerve to the long head of the triceps, described by Somsak et al. [5], is probably the most used nerve transfer procedure. Recently, the modification of the Somsak technique that uses the nerve to the medial head of the triceps instead of the long head has been gaining popularity.

We report a clinical case that demonstrates the use of the later technique for the treatment of axillary nerve paralysis following an anterior shoulder dislocation.

The main objective of this article is to increase the awareness regarding of axillary nerve injuries after anterior shoulder dislocation and to demonstrate an increasingly used treatment strategy, which can have a significant impact on the patient's functional outcome.

Case Presentation

Male, 39 years old, police officer, with a history of motor vehicle accident, resulting in anterior glenohumeral dislocation of the left shoulder. He was observed in the emergency department and underwent successful shoulder reduction with Hippocratic maneuver.

OPEN ACCESS

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Received Date: *10 Nov 2023*
Accepted Date: *21 Nov 2023*
Published Date: *25 Nov 2023*

Citation:
Lacerda D, Teixeira N, Araújo L, Pedro I, Costa J, Martins AI, et al. Medial Head of Triceps Nerve Transfer for Axillary Nerve Palsy after Shoulder Dislocation: Case Report. Clin Case Rep Int. 2023; 7: 1631.

Figure 1: Clinical aspect of the left shoulder at 4 weeks, with marked atrophy of the deltoid muscle and an abduction deficit (maximum 30º).

The patient used the arm sling for two weeks. Upon his first consultation, the patient still presented residual edema, pain in the posterior aspect of the shoulder and significant functional limitation, interpreted as resulting from the traumatic process itself. Therefore, the patient was recommended to keep the suspension for another two weeks and referred to Physical Medicine and Rehabilitation.

Four weeks after the accident, the patient showed an improvement in pain complaints, although with little improvement from the functional point of view. At that time a significant atrophy of the entire left deltoid muscle mass was shown and the patient complained of hypoesthesia in the axillary nerve territory. He was able to abduct the shoulder for the first 30 degrees and external rotation was restricted to 45 degrees. Specific tests showed a negative Jobe test.

Given the presumed axillary nerve injury, an electromyography was performed. Fasciculations and positive sharp waves were recorded and no motor units action potentials were recorded on the deltoid and teres minor muscles.

The MRI showed a Bankart lesion and a Hills-Sachs lesion, without evidence of rotator cuff lesions. The test also unveiled the presence of a neuroma at the infraclavicular level. However, it did not clarify whether it was a continuing neuroma or a neurotmesis.

Three months after the first diagnosis, the patient didn't show any improvement compared to his last evaluation, while undergoing conservative treatment. As a result, was referred to a regional brachial plexus injury center, for eventual surgical exploration and repair of the axillary nerve injury.

After six months, the patient underwent surgery: under general anesthesia, the brachial plexus was explored through an infraclavicular approach, with evidence of neurotmesis and neuroma of the axillary nerve, immediately before the nerve goes around the humerus.

After confirming the complete nerve rupture and the impossibility of performing the neurorrhaphy, it was decided to perform a triceps to axillary nerve transfer. A modification of the Somsak Leechavengvongs technique was used, transferring the nerve for the medial head of the triceps through a posterior approach.

A longitudinal incision was made on the posterior aspect of the arm from the acromion to the mid-arm region. The deltoid was retracted laterally. The axillary sensory branch was identified and traced back toward the quadrilateral space and excluded from the main nerve.

The axillary nerve was divided as far anteriorly as possible. Next,

Figure 2: Infraclavicular surgical exploration of brachial plexus (arrow - posterior cord of brachial plexus; Asterisk- axillary nerve with the corresponding post-traumatic neuroma).

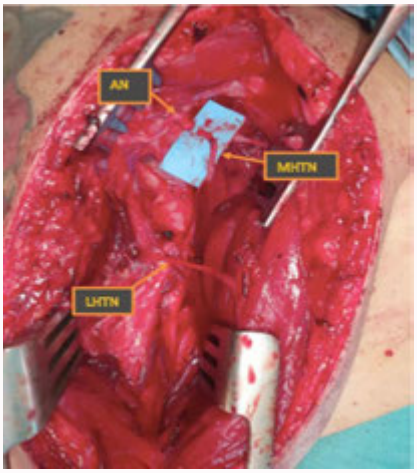

Figure 3: Posterior approach of the quadrangular space, with the view of coaptation of the Medial Head Triceps Nerve (MHTN) with the anterior division of the Axillary Nerve (AN). The modified Somsak technique preserves the integrity of the Lateral Head Triceps nerve (LHT).

the interval between the long and the lateral heads of the triceps was exposed to identify the radial nerve and its branches to the triceps. Running on top of the radial nerve and parallel to it, we identified the motor branch to the lower medial head. Upon electrical stimulation we confirmed nerve identity. We dissected the nerve to the lower triceps medial head and anconeus distally, sectioned it, and flipped it 180 degrees to coaptate it to the anterior division of the axillary nerve. Branches to the lateral and long head of the triceps were carefully preserved during this dissection.

After surgery, the patient used an arm sling for 10 days, and

Figure 4: Clinical result at 11 months, showing 180º abduction.

complete mobility was allowed thereafter.

Eleven months after the operation, the patient presents a significant clinical improvement, without any deficits in joint range of motion, with grade 4 in deltoid and triceps muscle strength, performing 180 degrees of abduction and 50 degrees of external rotation.

Discussion

The frequency of brachial plexus injury associated with acute anterior shoulder dislocation is very common with an incidence based on clinical diagnosis from 3% to 21%, while using Electromyography (EMG) the incidence arises to 9% to 65% [6].

The axillary nerve is easily damaged due to its close association with the glenohumeral joint and its course around the surgical neck of the humerus [6].

The diagnosis of axillary nerve injury can be challenging; therefore, a complete and thorough physical examination should be performed. The best indication to the presence of an axillary nerve lesion is deltoid paresis with patients being unable to fully abduct the shoulder. Additionally, in some cases, the patient may retain abduction in the first degrees secondary to supraspinatus compensation. Sensory examination of the terminal branch of the axillary nerve (the superior lateral brachial cutaneous nerve), which supplies sensory innervation to the lateral aspect of the arm near the distal two-thirds of the deltoid muscle, can reveal sensory changes that are suggestive of severe axillary nerve damage [7].

Although nerve complications are a relatively frequent complication of anterior shoulder dislocations, it is not always easy to guide treatment of these patients, especially with regard to timing and surgical option.

Existing protocols state that injuries which are not recovering, or only partially recovering, by three months after diagnosis and show poor recovery of muscle strength need to be monitored. These represent intermediate or high-grade injuries, which may not progress adequately and will probably require surgical exploration [8].

Nerve transfers are a good option in patients with a high-grade injury, in those whose referrals to specialized centers are made late, in cases where it is not possible to perform a graft and for those who have not improved after a long course of conservative treatment.

Management of persistent axillary neuropathy has traditionally consisted of axillary nerve grafting or nerve transfers. The long head of the triceps to axillary nerve transfer as described by Somsak is a reliable technique with 73% to 88% of patients regaining useful deltoid [4].

In this patient we opted for a modified Somsak technique that uses the branch to the medial head of the triceps. This technique has several potential advantages over the classic technique:

1) The medial triceps branch is longer than the long head of triceps branch which allows reinnervation of the whole of the deltoid as well as the teres minor;

2) The greater proximity to the neuromuscular junction of the deltoid which shortens the time needed for postoperative nerve regeneration;

3) The tension-free neurorrhaphy and non-exclusion of the posterior division of the axillary nerve aids in restoration of external rotation;

4) In a cadaveric study, Khair et al. found an equivalent number of motor axons between the long and the medial head of triceps branches [9];

5) Possibility of avoiding the denervation of the long portion of the triceps which is important to maintain posterior stability on an already limited shoulder.

6) It also minimizes the patient's aesthetic defect.

To our knowledge, there is only one publication with a series of 9 patients using this technique, where they found that the strength, endurance, and volume of the deltoid consistently improved after surgery, sufficiently to eliminate all reports of shoulder pain or fatigability and to earn high satisfaction with outcome ratings from all patients [10].

Another study by Wheelock et al. who retrospectively analyzed 10 patients who underwent triceps nerve transfer to the axillary nerve, the use of the medial branch technique in 7 of these patients, but they didn't specify in detail in which of the patients this technique was used, making it impossible to compare results with the traditional technique [4].

Conclusion

This case report reinforces the concept that the transfer of the nerve branch from the medial portion of the triceps to the anterior division of the axillary nerve is an effective method for reinnervating the deltoid in patients with isolated axillary nerve damage following anterior shoulder dislocations. Therefore, this is a technique that should be considered for these patients.

The optimization of these injuries' prognosis can be achieved through close follow-up and timely referral to specialized centers, in order to increase the range of surgical options available.

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