

Compression-induced reversible brachial plexopathy: Urgent neurological approach

Handan Uzunçakmak Uyanık, Refah Sayın

Ufuk University, Faculty of Medicine, Department of Neurology, Ankara-Türkiye

ABSTRACT

Brachial plexus injuries are the second most common perioperative peripheral nerve injuries. Malposition is a significant predisposing factor to these injuries. Additionally, some drugs, including tacrolimus, are known to predispose individuals to peripheral neuropathy. Herein, we present the electroneuromyography (EMG) findings within the first 48 hours for a patient who has been under tacrolimus treatment for five years due to liver transplantation and developed compression-induced reversible brachial plexopathy. Through this case, we highlighted that brachial plexus injury may not always result in axonal involvement and discussed the findings that may be encountered in early neurophysiological examinations.

Keywords: Brachial plexus injury; compression; motor conduction block; pseudo-conduction block; tacrolimus.

INTRODUCTION

Trauma is the major cause of brachial plexus injury. The most common cause of traumatic brachial plexus injury is traction injury to the head, neck, shoulder, and upper limb.^[1] The incidence of perioperative peripheral nerve injuries has been reported as 0.03-0.1%, with brachial plexus injuries being the second most common^[2,3] and malposition as a significant predisposing factor. Some drugs are also known to predispose individuals to peripheral neuropathy,^[4] including immunosuppressive drugs such as tacrolimus,^[5,6] which are also included in this group.^[4]

The diagnosis of brachial plexus injury is made by evaluating the clinical history, physical examination, electrodiagnostic tests (EDX) and magnetic resonance imaging (MRI) findings together. Among these, the EDX test provides crucial information about the type (axonal or demyelinating) and prognosis of the lesion.

We present the electroneuromyography (EMG) findings within the first 48 hours for a patient who has been under tacro-

limus treatment for five years due to liver transplantation and developed brachial plexopathy immediately after a percutaneous cholecystostomy due to biliary stenosis.

CASE REPORT

A 49-year-old male patient was referred to us due to a loss of strength in his left arm following a percutaneous cholecystostomy procedure. During the lengthy procedure-approximately 3-4 hours-left lateral decubitus and prone positions were partly utilized. The arm was abducted overhead, and the head deviated from the shoulder in the position for left lateral decubitus. Upon the neurological examination performed at the 22nd hour post-operation, he had muscle strength of grade 2/5 in both shoulder abduction and elbow flexion. Mild paresis was detected in elbow extension. Finger and wrist movements were at full strength. Stylo-radial and biceps deep tendon reflexes were slightly hypoactive compared to the right. There was hypoesthesia on the volar side of the first two fingers and lateral volar side of the hand, lateral forearm, and lateral side up to the middle of the arm.

Cite this article as: Uzunçakmak Uyanık H, Sayın R. Compression-induced reversible brachial plexopathy: Urgent neurological approach. *Ulus Travma Acil Cerrahi Derg* 2024;30:842-844.

Address for correspondence: Handan Uzunçakmak Uyanık

Department of Neurology, Ufuk University, Faculty of Medicine, Ankara, Türkiye

E-mail: h_uzuncakmak@hotmail.com

Ulus Travma Acil Cerrahi Derg 2024;30(11):842-844 DOI: 10.14744/tjtes.2024.26254

Submitted: 13.06.2024 Revised: 26.06.2024 Accepted: 20.09.2024 Published: 04.11.2024

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Possible acute central pathologies were ruled out by imaging methods. Contrast-enhanced MRI of the brachial plexus was performed, and a contrast-enhanced cervical MRI was also performed to rule out the cervical root avulsion. It was determined that the cervical and brachial plexus MRIs were normal. Subsequently, at the 36th hour post-operation, the patient underwent EMG. Electrophysiological data were recorded using a Medelec Synergy EMG machine (MEDELEC Synergy, USA). For sensory and motor nerve conduction studies, the bandpass filter was set at 20 Hz - 2 KHz and 20 Hz - 10 KHz, respectively. EMG revealed motor conduction blocks of stimulation from the Erb point in the left median and musculocutaneous nerves. Conduction block was almost total in the median nerve (98% amplitude loss) and there was a definite partial motor conduction block in the musculocutaneous nerve (76% amplitude loss) (Fig. 1). Left radial and ulnar motor (Fig. 2) and median, superficial radial, ulnar, medial, and lateral antebrachial cutaneous sensory conduction studies were within normal limits. Left biceps and deltoid muscles showed moderately decreased recruitment patterns, while the recruitment of the left triceps muscle was slightly decreased.

The findings were considered as signs of acute involvement of the left brachial plexus. We were faced with either pseudo-conduction blocks, which are early signs of axonal involvement, or compression-induced motor conduction blocks. A

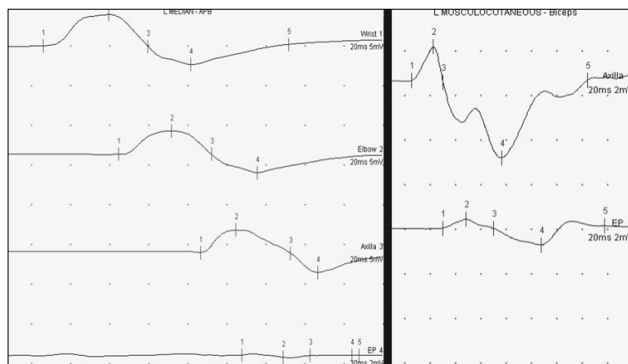


Figure 1. Motor conduction blocks in nerves following stimulation at the Erb point. There was a 98% loss in amplitude in the left median nerve and a 76% loss in amplitude in the left musculocutaneous nerve.

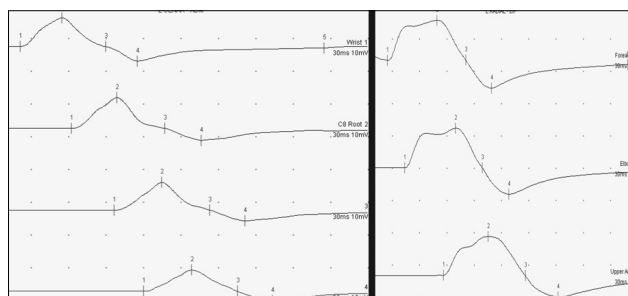


Figure 2. Normal motor conduction studies for the left radial and ulnar nerves.

control EMG was recommended to identify the type of lesion after three weeks. The patient was recommended physical therapy and vitamin B12 replacement for this interim period.

The next day after the EMG session, the patient reported that the numbness in the second finger improved. On the follow-up visit, 16 days after the EMG session, the patient had full proximal and distal motor strength in the left upper extremity, and the hypoesthesia was completely resolved. For this reason, the patient did not want to have a control EMG examination. As a result of the complete clinical recovery in our patient, we concluded that the motor conduction blocks of the brachial plexus were compression induced and not pseudo-conduction blocks. Informed consent was obtained from the patient for publication.

DISCUSSION

Our case was a patient with compression-induced reversible brachial plexopathy due to malposition, and possibly precipitated by tacrolimus. The injury led to damage in the upper trunk of the brachial plexus. In a study including 172 subjects,^[7] it was stated that 92% of brachial plexus injuries were postganglionic injuries, and the most commonly affected segments were the C5-C6 postganglionic segments (42%). Brachial plexus injuries generally occur in the form of axonal involvement. Supporting this, of 57 patients treated in intensive care units due to Coronavirus Disease 2019 (COVID-19), 53 (93%) showed axonal and just 4 (7%) showed neuropraxic findings on EDX studies in a recent report.^[8] An EDX test can determine the degree of denervation and axonal damage. However, a latency period of at least 2-3 weeks is required for signs of axonal damage on an EDX study after the nerve injury. If axonal damage is to develop, an EMG performed in the first 3-4 days before Wallerian degeneration can show the finding of pseudo-conduction block in the proximal part of the lesion. It should be known that this finding is in the differential diagnosis of motor conduction block in demyelinating conditions such as nerve compressions.^[9]

The most common surgical positions in surgery are supine, prone, and lateral decubitus. The prone position is an effective method to support ventilation, as it minimizes the risk of ventilator-induced lung injury.^[10] One of the prone positioning-related side effects is peripheral nerve injury, especially brachial plexopathy.^[8,10] Uribe et al. stated that brachial plexopathy developed in the prone position in 17 and in the supine or lateral position in 44 of 517 patients.^[11]

It has been reported in the literature that tacrolimus, an immunosuppressive agent, may cause Guillain-Barré syndrome, chronic inflammatory demyelinating polyneuropathy, and compressive peroneal neuropathy. However, physicians should also consider the possibility that conditions such as hereditary neuropathy with pressure palsies (HNPP) may underlie any compression-induced neuropathy.^[12]

CONCLUSION

Through this case, we highlighted that brachial plexus injury may not always result in axonal involvement and discussed the findings that may be encountered in early neurophysiological examinations. When a compression-induced motor conduction block is encountered, the patient can be informed and the treatment process can be planned, being aware that this situation can result in complete or almost complete improvement.

Peer-review: Externally peer-reviewed.

Authorship Contributions: Concept: H.U.U.; Design: H.U.U., R.S.; Supervision: H.U.U., R.S.; Data collection and/or processing: H.U.U.; Analysis and/or interpretation: H.U.U.; Literature search: H.U.U., R.S.; Writing: H.U.U.; Critical reviews: H.U.U., R.S.

Conflict of Interest: None declared.

Financial Disclosure: The author declared that this study has received no financial support.

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OLGU SUNUMU - ÖZ

Kompresyona bağlı geri dönüşümlü brakial pleksopati

Handan Uzunçakmak Uyanık, Refah Sayın

Ufuk Üniversitesi Tıp Fakültesi, Nöroloji Anabilim Dalı, Ankara, Türkiye

Brakial pleksus yaralanmaları ikinci sıklıkta görülen perioperatif periferik sinir yaralanmalarıdır. Malpozisyon, bu yaralanmalarda önemli bir predispozan faktördür. Ayrıca takrolimus gibi bazı ilaçların periferik nöropatiye yatkınlık oluşturduğu bilinmektedir. Bu yazıda, karaciğer nakli nedeniyle beş yıldır takrolimus tedavisi gören ve basıya bağlı geri dönüşümlü brakial pleksopati gelişen bir hastanın ilk 48 saatteki elektronöromiyografi (EMG) bulgularını sunuyoruz. Bu olgu aracılığıyla brakial pleksus hasarının her zaman aksonal tutuluşla sonuçlanmayabileceğini vurguladık ve erken nörofizyolojik incelemelerde karşılaşılabilecek bulgulara değindik.

Anahtar sözcükler: Brakial pleksus hasarı; kompresyon; motor iletim bloğu; psödö-iletim bloğu; takrolimus.

Ulus Travma Acil Cerrahi Derg 2024;30(11):842-844

DOI: 10.14744/tjtes.2024.26254