



## Original Article

# Correlation between the elbow flexion and the hand and wrist flexion after neurotization of the fascicles of the ulnar nerve to the motor branch to the biceps<sup>☆</sup>

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### ABSTRACT

**Objective:** Gain in elbow flexion in patients with brachial plexus injury is extremely important. The transfer of a fascicle from the ulnar nerve to the motor branch of the musculocutaneous nerve (Oberlin surgery) is a treatment option. However, in some patients, gain in elbow flexion is associated with wrist and finger flexion. This study aimed to assess the frequency of this association and the functional behavior of the limb.

**Methods:** Case-control study of 18 patients who underwent the Oberlin surgery. Group 1 included patients without disassociation of range of elbow flexion and that of the fingers and wrist; Group 2 included patients in whom this disassociation was present. In the functional evaluation, the Sollerman and DASH tests were used.

**Results:** It was observed that 38.89% of the patients did not present disassociation of elbow flexion with flexion of the wrist and fingers. Despite the existence of a favorable difference in the group with disassociation of the movement, when the Sollerman protocol was applied to the comparison between both groups, this difference was not statistically significant. With the DASH test, however, there was a statistically significant difference in favor of the group of patients who managed to disassociate the movement.

**Conclusion:** The association of elbow flexion with flexion of the wrist and fingers, in the group studied, was shown to be a frequent event, which influenced the functional result of the affected limb.

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## Correlação da flexão do cotovelo com a flexão da mão e do punho após neurotização dos fascículos do nervo ulnar para ramo motor do bíceps

### R E S U M O

#### Palavras-chave:

Plexo braquial/lesões  
Plexo braquial/cirurgia  
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**Objetivo:** O ganho da flexão do cotovelo em pacientes com lesão no plexo braquial é de suma importância. A cirurgia de transferência de fascículo do nervo ulnar para ramo motor do nervo musculocutâneo (cirurgia de Oberlin) é uma opção de tratamento. Contudo, o ganho da flexão do cotovelo, em alguns pacientes, vem associado à flexão do punho e dos dedos. O objetivo deste trabalho é avaliar a frequência dessa associação e o comprometimento funcional do membro.

**Métodos:** Estudo tipo caso-controle de 18 pacientes submetidos à cirurgia de Oberlin. No Grupo 1 foram incluídos os pacientes que não apresentavam dissociação do ganho da flexão do cotovelo com a dos dedos e do punho; no Grupo 2, os pacientes em que havia dissociação. Os testes de Sollerman e *Disabilities of the Arm, Shoulder and Hand* (Dash) foram usados na avaliação funcional.

**Resultados:** Observou-se que 38,89% dos pacientes não dissociavam flexão de cotovelo de flexão de punho e dos dedos. Apesar de existir uma diferença favorável ao grupo que dissociava o movimento quando aplicado o protocolo de Sollerman na comparação entre os pacientes dos dois grupos, essa não se mostrou estatisticamente significativa. Já no teste Dash, observou-se diferença estatisticamente significativa, favorável ao grupo de pacientes que consegue dissociar o movimento.

**Conclusão:** A associação da flexão do cotovelo com a flexão de punho e dos dedos no grupo estudado mostrou ser um evento frequente, teve influência no resultado funcional do membro acometido.

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## Introduction

Brachial plexus injury has received special attention in the last decades because it mainly affects young patients. Treatment of these injuries is challenging.<sup>1,2</sup> Currently, the leading cause of brachial plexus injury is a result of high energy trauma in traffic accidents and main victims are motorcyclists.<sup>3,4</sup> The injury occurs by a traction force applied in the shoulder and neck areas, leading to temporary or permanent loss of movement and of upper limb sensitivity.

As recommended by Hentz and Doi,<sup>5</sup> restoring active elbow flexion in brachial plexus injuries is a priority, regardless of the type of injury. To achieve this goal, several surgical approaches have been described.

Initially, neurological procedures should be prioritized, through nerve reconstruction with or without grafts and nerve transfers (neurotization).<sup>5,6</sup> The first report of neurotization using a motor fascicle of the ulnar nerve was published in 1994 by Oberlin et al.,<sup>7</sup> for elbow flexion gains. This procedure consists of transferring a motor fascicle from the ulnar nerve to the biceps motor branch. In general, a fascicle related to the flexor carpi ulnaris and flexor digitorum is chosen, to avoid denervation of the intrinsic muscles of the hand. The Oberlin procedure gained notoriety due to excellent results in elbow flexion, tested and demonstrated by several authors. Currently, it is routinely used in high partial lesions of the brachial plexus, i.e., lesions that do not affect the roots of C8 and T1, which account for approximately 40% of the lesions.<sup>8,9</sup>

In the literature, the assessment of elbow flexion gain after nerve reconstruction has been done mostly by using the British Medical Research Council (BRMC) scale. This type of evaluation, although widely used, provides little or no information about the quality of muscle recovery in terms of functionality in work life.<sup>7,10,11</sup>

In the evaluation of the present patients, who presented recovery of elbow flexion with force greater or equal to M3 after Oberlin surgery, we observed that some patients presented flexion of the elbow associated with flexion of the wrist and fingers. Despite the effectiveness of elbow flexion, this co-contraction phenomenon leads to flexion of the fingers and wrist, which damages the limb's functionality, especially for the execution of grip movements.

Therefore, this study aimed to assess the frequency with which co-contraction of the elbow flexion/wrist and fingers flexion occurs and its functional repercussions.

## Material and methods

Patient records with high brachial plexus lesions who were submitted to distal neurotization by the Oberlin technique, associated or unassociated with the C7 root lesion, were analyzed. Only patients who had elbow flexion with a motor force degree greater or equal to 3 on the BMRC scale were included in this study. Minimum follow-up time was at least 12 months after Oberlin surgery.

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