

World Bulletin of Public Health (WBPH) Available Online at: https://www.scholarexpress.net Volume-11, June 2022 ISSN: 2749-3644

MICROSURGICAL TREATMENT OF POST-TRAUMATIC INJURIES OF THE BRACHERIC PLEXUS

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Article history:	Abstract:					
Received:March 26th 2022Accepted:April 26th 2022Published:June 8th 2022	Of all trauma to the nervous system, the proportion of damage to the peripheral nervous system is 6%. Of this number, injuries to the brachial plexus and its branches account for 70%. This topic is relevant, since inadequate treatment of traumatic injuries of the brachial plexus leads to permanent disability. Neurosurgeons, traumatologists, reconstructive and plastic surgeons deal with surgical treatment of brachial plexus injuries. This paper presents the most effective methods of surgical treatment of injuries of the brachial plexus.					

Keywords: brachial plexus; neurotization; traumatic injury to the brachial plexus; neurolysis.

INTRODUCTION

Injuries of the brachial plexus (BP) are considered one of the most serious types of injuries of the musculoskeletal system due to severe irreversible functional disorders. These disorders consist a decrease in the sensitivity of the hand skin up to anesthesia, muscle atrophy, the formation of joint contractures, which leads to the complete loss of the hand as a labor organ on the side of the injury [2]. BP injuries most often occur as a result of traffic accidents - 74%, the remaining 26% are other types of injuries such as industrial and household injury [4]. Injuries to the BP trunks are rare in the form of isolated ones, more often they are combined with polytrauma - 78.3%. [1] Unlike the central nervous system, the peripheral nervous system has a higher ability to regenerate, but this does not mean that the clinical recovery of the peripheral nerves will meet expectations. The best clinical prognosis is observed once the integrity of the neural sheath is spared, compared with neurothemesis and nerve root avulsion. Despite the great interest to the problem of traumatic BP injury and some success in the treatment of this pathology, nosology remains as a serious medical and social problem. This is, firstly, due to ever-increasing frequency of BP lesions among the working-age population, and secondly, because of long periods of temporary disability of patients and a high percentage of deep invalidity. [3] At this stage of the examination, it is important to study the most effective methods of microsurgical manipulations for injuries of the brachial plexus.

PURPOSE OF THE STUDY.

To explore the results of microsurgical treatment of patients with post-traumatic lesions of the brachial plexus.

MATERIAL AND METHODS.

The material of the study is presented by 47 patients with injuries of the brachial plexus. In 2021, 47 patients with injuries of the brachial plexus were operated at the RSSPMCN. Of the 47 patients, 29 were men and 18 were women. The age of the operated patients ranged from 15 to 55 years.

The average age of operated patients was 27 years. The diagnostic complex included: clinical and neurological examination, MRI - study and electroneuromyography (ENMG).

The symptoms of motor disorders varied greatly in degree and extent. In case of the prevalence of movement disorders in the proximal or distal parts of the injured limb, a picture of the Duchenne-Erb type disorder was revealed. However, in severe traction injuries of the brachial plexus, total paralysis of the limb was often observed. The most significant indication for surgery according to nerve condition is the classification in the table below [4]:

Table 1. The degree of nerve damage, the possibility of its spontaneous regeneration and need for surgery

Degree o damage	Tinel sign / its dynami cs	Spontane ous regenerat ion	Recov ery	Surgery
I Neuropra ia	-/-	Complete	Rapid (from 1 day up to 12 weeks)	Not necess ary



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II Axonotm sis	+/+	Complete	Slow (1 mm p day)	Not necessary
III	+/+	Varies great exten	Slow (1 mm p day)	Not needed c neurolysi
IV	+/-	Absent	Absent	Suturin g or nerve plastic surgery
V Neurotm sis	+/-	Absent	Absent	Suturing or nerve plastic

Neurotization is the best method for damaged nerve reconstruction. In order to perform neurotization in the primary trunks of the brachial plexus, neurotizer nerves were used, such as an accessory nerve and intercostal nerves. The choice of surgical approach for neurotization of the brachial plexus primary trunks was based on the anatomical location of the primary trunks in the supraclavicular region.

RESULTS AND ITS DISCUSSION

Considering that the results after operations in peripheral nerves is obtained average in 4-5 months, the effectiveness of operations is observed after a certain period of time. The analysis of the results showed that the recovery of the nerves of the brachial plexus after operations depended on choice of the nerve-neuroticator. Since in our studies we chose 2 nerves as neuroticizers: the accessory nerve and the intercostal nerve, results below show the these 2 nerves. Possibility effect of of electroneuromonitoring in patients with an MRI studies allows correct verification of disputable cases in study of the functional nerve state. [6]

According to the results of the study, it became clear that the choice of the accessory and intercostal nerves as neuroticizers for neurotization of the primary trunks of the brachial plexus, taking into account their anatomical location, was appropriate.





Figure. 1. Restoration of the functions of the muscles of the right hand: a - abduction of the right shoulder; b - flexion in the right elbow joint.

The photo shows the patient's the state after neurotization of the primary trunks of the right brachial plexus. What shown in the photo is the result after 6 months from the day of the operation. Unfortunately, there were also patients for whom neurotization of the primary trunks of the brachial plexus did not give results. In these patients were found damage of the distal nerves of the upper limb in addition to damage to the brachial plexus. Clinical results have shown that, in addition to the choice of the nerve-neuroticator, the reasons for obtaining different results are postoperative care: receiving a long time of physiotherapy manipulations (electrophoresis, darsonval current along the nerve fibers), receiving electrical stimulation, as well as appropriate therapy to improve the recovery of the nerve sheaths and conduction generally. Thus, patients who received minimum results were elderly patients with a history of bad habits (smoking, drinking, etc.), who did not undergo postoperative manipulations (therapy, physiotherapy, etc.) and patients with concomitant chronic diseases.

CONCLUSION.



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Performing neurotization is one of the most effective methods in the surgical treatment of peripheral nerves. Indications for surgery are the presence of neurological symptoms, findings from ENMG and MRI studies. Since brachial plexus neurotization can be performed under local anesthesia, the anesthetic risk is minimal. In neurotizations of BP primary trunks by means of accessory nerve, positive results were obtained up to 87.5%. Of these, 75% account for the maximum positive result; almost complete restoration of limb functions, and 12.5% is the minimum positive result; partial restoration of limb functions. No results were observed in 12.5% of patients. In neurotizations of BP primary trunks by means of intercostal nerve, positive results were obtained up to 83.3%, and the ineffectiveness of neurotization was observed in 16.7% patients. According to the results obtained, it also became clear that after neurotization of the nerves of the brachial plexus, in order to fully restore the functions of the limb, there may be a need for the 2nd and even 3rd stages of operations. The need to carry out the 2nd and 3rd stages of operations appeared in patients with whom we conducted a study and who did not receive results from neurotization. The need for several stages of operations is associated with polytrauma. Along with this, also the reason for the need for several stages of operations is posttraumatic damage to the peripheral nerves in two or more parts of the limb.

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