Peculiarities of upper limb’s peripheral nerves recovery in patients with Volkmann’s ischemic contracture

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The development of microsurgery technique has considerably extended the possibilities of functional recovery in case of severe injury of upper limb. Particularly, tactics of treatment of peripheral nerves’ damages against the background of ischemia has been modified.

During the period of 11 years 25 patients operated with injuries of peripheral nerves and posttraumatic ischemia of upper limb. Depending on the stage of ischemia process, the patients were subdivided into 3 clinical groups. The first clinical group included 9 (36%) patients with compartment syndrome and neurovascular injuries. The second group - 10 (40%) patients with injured peripheral nerves of upper limb in reactive-recovery period of ischemic contracture. The third group – 6 (24%) patients with Volkmann’s ischemic contracture in residual period and injured peripheral nerves of upper limb. Patients of all clinical group underwent precise clinical and instrumental examination to exclude sensitive and functional disorders of upper limb as well as sonography and MRI examination in dynamics.

**Results**
Among the 9 patients of the first group the most frequent was the suture n.medianus and/or n.ulnaris in the middle and lower part of forearm 6 (66.7%). In 2 (22.2%) patients the suture was performed at the edge of the middle and lower parts of shoulder. In one case (11.1%) there was a suture of finger nerves at the level of palm. Special conditions for recovery of these nerves were adjustment of performance of fasciotomy wounds with approaches to neurovascular batches. In 5 (55.5%) patients with compartment syndrome the damage of peripheral nerves was combines with comminuted fractures of bones of upper limb. In these patient’s recovery of nerves has been performed after elimination of acute ischemia signs (3 weeks) and osteosynthesis by external fixation. Among 10 patients of the second group in 5 (50%) cases we performed neurolysis of n.medianus and/or n.ulnaris. In 3 (30%) the suture of the abovementioned nerves was performed. Plastic by n.suralis has been performed in 2 (20%) cases. Peculiarity of neurolysis of the abovementioned nerves was that it has been performed almost along the whole ischemic compartment. In some cases, the area of neursis exceeded 9-12cm. While suturing the peripheral nerves we observed big areas (over 4cm) of intra-stem neurems. In process of nerve plastics we tried to put the transplants of n.suralis out of limit of ischemia diseased compartments. In the third group all 6 patients underwent plastics of peripheral nerves. It should be mentioned that even if a size of an initial defect of nerves was up to 2cm, after resection of neurems in proximal and distal parts the size increased to 4-6cm, requiring plastics by transplants of n.suralis.

**Conclusions**
- The specificity of upper extremity peripheral nerves recovery for patients with Volkmann’s ischemic contracture lies in the coordination of fasciotomy performance with access to neurovascular fascicles.
- The specificity of the performed neurolysis of nerves of the upper extremity is the fact that it was performed over almost the whole ischemic compartment, in some cases the area of neurolysis was more than 9-12 cm.
- By stitching peripheral nerves, big areas (over 4 cm) of intraneuromas were observed. By plastics of nerves, transplants n. suralis were removed beyond the damaged ischemic compartments.
- Necrotomy and neurolysis in a reactive-restorative period of the ischemic contracture allows to eliminate trophic and neurological deficits of the ischemic extremity and prepare the tissues for further reconstructive-restorative intervention.
- In a residual period, the usage of the whole spectrum of orthopaedic reconstruction methods including tenotomy of muscles and free active flaps transplantation helps solve the problems of biomechanic trophism improvement, lost function of ischemic extremity restoration, soft tissues defects elimination etc.
- The suggested therapeutic approach to patients with posttraumatic hand ischemia has led to function increment by 27.2% thus leading to successful medical and social adaptation of these patients.

**Materials**: Total 25 patients

<table>
<thead>
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<th>Treatment of patients with moderate case of compartment syndrome</th>
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<tr>
<td>Subfascial pressure &gt; 60 mm. Hg</td>
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<tr>
<td>Subfascial pressure 45 - 60 mm. Hg</td>
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<tr>
<td>Subdermal fasciotomy</td>
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<td>recovery of damaged nerves</td>
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**ACTIVE THORACODORSAL FLAP TRANSPANTATION**

1. Preparation for reconstructive-restorative treatment
2. In case of compressive ischemic neuropathy of n.medianus
3. Neurolysis in the ischemic area
4. The result of free thoracodorsal flap transplantation (12 months after transplantation)

AVERAGE TERMS OF TRANSIENT ISCHEMIA OF THE FLAP – 2h 14 ± 27 min

**Preparation for reconstructive-restorative treatment**