

Peripheral nerve injury

Nerve damage often disables the patient, so it is important to prevent permanent damage with early treatment. These are microsurgical operations with the possibility of bridging the nerve with an autograft. These operations have good results (up to 90% function returns).

Classification of nerve injuries

Based on **Seddon's classification**, we distinguish degrees of nerve injury:

- **neurapraxia** – the lightest injury, reversible impairment, the nerve and axons are not severed, it is only nerve compression, there is no Waller degeneration, adjustment of nerve function within hours to 2 weeks
- **axon termination** – axons are severed, the nerve as a whole is continuous, Wallerian degeneration occurs, spontaneous regeneration
- **neurotmesis** – anatomical interruption of the nerve, Wallerian degeneration occurs, spontaneous regeneration is not possible, for regeneration the nerve must be sutured or the defect filled with a transplant (usually some superficial skin nerve, e.g. suralis nerve)

Depending on the extent of the injury – partial or complete interruption of the nerve. According to the cause of injury – open, traction, compression and contusion of nerves; and neurovascular and iatrogenic injuries

Degeneration and regeneration of the nerve

- **Waller's degeneration** – without a connection with the body, the processes cannot exist independently; distal breaks up after interruption.
- **Waller's regeneration** – the body of the neuron reacts to the interruption of the axon with a massive production of proteins; small projections grow from the proximal stump, if one of them finds the myelin sheath, it begins to grow into it and the rest of the projections disappear; if the nerve is not connected after interruption, a tangle of axons forms at its end – **amputation neuroma** (a tangle of ligaments and axons), the neuroma is sensitive to percussion- the so-called *Tinel's sign* (see also SKK).
 - only nerves without interruption are capable of spontaneous regeneration, interrupted ones must be stitched together
- **time factors** – the nerve regenerates max. 1mm/day (more precisely 5 mm per week), i.e. 2 cm per month
 - we have to add the delayed regeneration time in the suture area – 4-6 weeks (if the nerve is transplanted, there are two sutures!)
 - from the above **the reinnervation time can be calculated** – this is important, because for a good functional result, the muscle should be reinnervated within one year (later, muscle atrophy is irreversible due to degeneration of the neuromuscular plate)
 - sensitive reinnervation takes place faster

Injury diagnosis

- clinical neurological examination of motor skills, hearing disorders, trophic changes
- EMG and neurography
- intraoperative neurography – it shows directly on the nerve whether regeneration is taking place or whether the damaged section needs to be replaced with an autotransplant; used for unbroken nerves or to check the suture

Principles of operative technique

- exclusively by microsurgical technique, very thin monofilament atraumatic material (8/0 – 10/0), perineuriepineural suture
- an alternative way is gluing with tissue plasma glue
- **principles of a successful connection** – the nerve ends must be resected up to the healthy part of the axon (removal of neuromas, fibrosis, etc.)
 - the connection must not be under voltage (leads to ischemia)
 - correctly recognize and sew individual types of nerve bundles together
 - the nerve defect must be bridged with an autograft
 - a ligament must not be interpolated into the suture (mainly from the epineurium or perineuria, which is why this ligament is resected)
 - axons must not be kinked in the suture
- **procedures on the nerve:**
 - neurolysis – nerve release, dissection

- suture behind the epineurium (nerve sheath)
- suture behind the perineurium (covering the fascicle)
- autotransplant - we use less important skin nerves (n. suralis - we do not treat the severed nerve in any way)

Links

Related articles

- Waller degeneration and regeneration

Source

- BENEŠ, Jiří. *student material* [online]. [cit. 2010-12-04]. <<http://www.jirben.wz.cz/>>.

References

- ZEMAN, Miroslav. *special surgery*. 2. edition. Galén, 2004. 575 pp. ISBN 80-7262-260-9.
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