Neurolysis: Is it beneficial or harmful?

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Summary

The term internal neurolysis means removal of fibrotic tissue inside a nerve trunk. Unfortunately the term was used for procedures with complete isolation of fascicles with all consequences like damage of links between the fascicle and impairment of blood supply. The conclusion based on some negative experiences that all surgery within a nerve trunk has to be avoided cannot be accepted.

Neurolysis within a nerve trunk, id est within the epineurium, is a step-wise procedure to decompress fascicles from a constricting fibrosis. It stops immediately if this aim is achieved or continues with resection and reconstruction if an irreparable damage is present. It is better to use terms that describe exactly what was done and abandon the ill-defined term “internal neurolysis”.

Fibrosis of the paraneurium remains outside the epineurium but causes the same consequences as fibrosis of the epineurium.

Keywords: Neurolysis; internal; nerve trunk.

Introduction

Neurolysis outside of the nerve itself is a common and frequently very successful procedure in order to remove an external compression like a bony fragment, scar tissue or a foreign body. A second very important indication is to liberate a nerve from adhesions and provide the possibility of passive motion for adaptation to the different position of an extremity.

The nerve itself must be intact if a good result is to be expected.

If the nerve is damaged and fibrosis of the different connective tissue layers has developed, external decompression alone is not able to produce functional recovery. It was therefore discussed for long (Babcock 1907, 1927, Lehmann 1936, John B. Murphy 1916) whether in such a case surgery within the nerve (internal neurolysis) to remove the fibrotic tissue which causes compression of the fascicles could solve the problem. The rather crude surgical techniques of those days might however have caused more damage than benefit.


Consequently, when microsurgical techniques became available, surgeons applied these techniques to operate within the nerve, convinced that the atraumatic procedure would minimize the surgical trauma. Without much hesitation fascicles were isolated, connections between the fascicles destroyed, and the circulation within the nerve impaired.

Curtis and Eversman (1973) applied internal neurolysis to all cases of carpal tunnel syndrome based on electromyographic criterias in regard to the severity of the case rather than on the local situation.

In the following years cases were observed in whom – after an internal neurolysis – a pain syndrome developed and internal neurolysis was condemned.

I have personally studied this problem intensively since 1975 and provided definitions and criterias to be followed to avoid problems. The results were summarized in 1995 (Millesi 1995).

Many surgeons are still afraid to enter a nerve trunk. At a recent meeting I was asked whether I still do internal neurolysis or whether I have abandoned this procedure. My answer was that I still do surgery within a nerve trunk as I always did but I suggest to abandon the term “Internal Neurolysis”.

For this reason I think it is necessary to outline again my approach to surgery within the nerve. In recent years fibrosis of the paraneurium has gained more and more significance especially in cases of brachial plexus lesions.
Therefore some information about this tissue is included in this paper.

**Connective tissue components of a nerve trunk:**

**Endoneurium**

The endoneural space is filled with a very delicate connective tissue framework, which is vulnerable and may become collagenized. We called this situation a fibrosis of type C. The involved fascicles are shrunken and hard. Regeneration is not possible in such an environment.

These fascicles have to be resected and the defect bridged by nerve grafts.

**Perineurium**

The perineurium surrounds the endoneural space and delineates it to the outside world. Fibrosis of the perineurium I have seen in cases of direct damage e.g. by injection of a toxic substance into the nerve. A perineuriotomy may be considered but I think it is the better solution to resect the involved fascicles and bridge the defect by nerve grafts.

**Epineurium**

This is the connective tissue which envelopes the fascicles and extends between the fascicles. It contains the vessels, provides space for movement of the fascicles within the nerve trunk and surrounds all the fascicles of a nerve trunk. Consequently we have to distinguish between an interfascicular (internal) and an epifascicular (external) epineurium. This is not specialized connective tissue like the endoneurium or the perineurium. It reacts easily against a traumatic damage of different kind with fibrosis. The fibrotic tissue shrinks and the fascicles within this tissue are compressed.

If the interfascicular tissue is involved (fibrosis of type B), it is more difficult to achieve decompression. If however the epifascicular epineurium alone is shrunken, the whole nerve is compressed like a too tight stocking (fibrosis of type A). The shrinkage of the epineurium is mainly directed in transverse direction.

![Fig. 1. Histological section of normal paraneurium. HE.Magn.:20x. Loose connective tissue with many vessels and fat lobules](image1)

![Fig. 2. Histologic section of a thickened fibrotic segment from a patient with a brachial plexus lesion. HE,Magn.:20x](image2)

Fig. 3. Traumatic brachial plexus lesion. One of the structures of the brachial plexus with intact epineurium surrounded by a thick layer of fibrotic paraneurium. Paraneuriotomy has already been performed. Fibrosis of the paraneurium forms a subgroup of fibrosis of type A. We use the term fibrosis of type A*.