

# The analysis of the intrasurgical view of the obstetric brachial plexus palsy

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*Folia Neuropathol* 2005; 43 (3): 143-147

## Abstract

*The surgical intervention is necessary in about 20% of all cases of the perinatal brachial plexus palsy. In this study the intrasurgical view and the applied microsurgical techniques were analysed. The clinical material consisted of 49 children with the obstetric brachial plexus palsy treated operatively, on which the following changes were found intrasurgically: compression of the brachial plexus in 21 cases and injuries with discontinuity of the elements of the brachial plexus in 28 cases. The following surgical procedures were performed: neurolysis – 31 cases, direct neurorrhaphy – 7 cases, 2 – 4 sural nerve grafting from 2 to 3 cm – 4 cases, extraanatomical extraplexual reconstruction – 6 cases, extraanatomical intraplexual reconstruction – 1 case. In all cases the intrasurgical view motivated the operative intervention. The most important problem in treatment of the obstetric brachial plexus palsy is a separate group of children who need a surgical intervention.*

**Key words:** *obstetric brachial plexus palsy, microsurgical reconstruction, neurolysis, spinal nerve roots avulsion, spontaneous reinnervation, sural nerve grafting, synkinesis*

## Introduction

The obstetric brachial plexus palsy occurs with the frequency from 0.35‰ to 5‰ [7,13,22]. In about 80% of cases the spontaneous, progressive recovery of the upper extremity function is observed due to rehabilitation, whereas in others the surgical intervention is necessary [6, 8, 10, 16]. Indications to the surgical treatment are established based on a detailed clinical examination and results of electromyography, myelography, myelo – KT and myelo – MR [12,20]. The decision about the character of the treatment should be taken about the third

month of the child's life, but yet at the very latest to the 6 month [2,9,18,21].

## Material and methods

The clinical material consisted of 49 children with the obstetric brachial plexus palsy (28 boys, 21 girls) treated surgically (Department of Trauma and Hand Surgery, Medical University of Wrocław), in the period of 1999-2003. The age of the children at the moment of operation was: to 3 months – 11 cases, from 3 to 6 months – 16 cases, from 6 to 12 months – 8 cases, more than 12 months – 14 cases. The

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**Table I.** The character of the injuries with discontinuity of the brachial plexus

Character of the injury	Number of cases
rupture of the spinal nerve ventral branches or trunks of the brachial plexus	21
spinal nerve roots avulsion	4
mixed injuries (rupture + avulsion)	3

intrasurgical view and the applied microsurgical techniques were analysed.

### Results

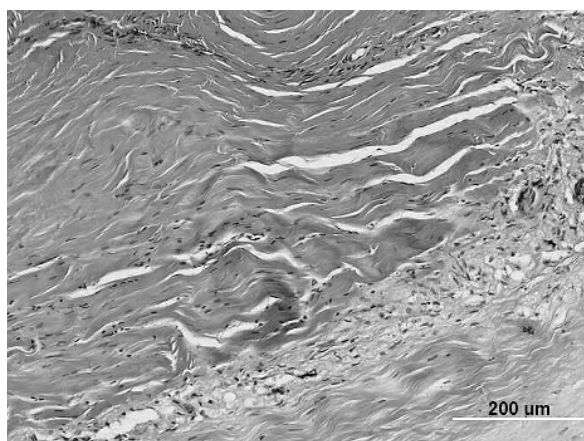
Intrasurgically, we found: A – compression of the brachial plexus due to proliferation of the fibrous tissue (with continuity of the elements of the brachial plexus) – 21 cases, B – injuries with discontinuity of the elements of the brachial plexus – 28 cases. The character of the injuries with the discontinuity of the brachial plexus is shown in table I. Localization of the rupture injuries is shown in table II. Localization of the avulsion lesions is presented in table III. The following surgical procedures were carried out during treatment: neurolysis – 31 cases, reconstruction (direct neuro-rhaphy) – 7 cases, reconstruction (2-4 sural nerve grafting from 2 to 3 cm) – 4 cases, extraneuronal extraplexual reconstruction (neurotisation) – 6 cases, extraanatomical intraplexual reconstruction – 1 case.

### Discussion

In all cases the intrasurgical view motivated the operative intervention. The compression of the brachial plexus due to proliferation of the fibrous tissue was observed in 21 cases – fig. 1a, b. The neurolysis allowed to accelerate the regeneration



**Fig. 1a.** Intrasurgical view: compression of the brachial plexus due to extensive perineural fibrous tissue proliferation



**Fig. 1b.** Histopathological specimen result – fibrous tissue proliferation, necrotic degenerated muscles and chronic inflammation. Stain. HE. Magnification x 160

**Table II.** Localization of the rupture injuries

Localization of injury	General number of cases	Spontaneous reinnervation – number of cases	With discontinuity – number of cases
superior trunk rupture (C5-C6)	12	8	4
superior and medial trunk rupture (C5-C6-C7)	7	1	6
superior (C5-C6) and inferior (C8-Th1) trunk rupture	1	1 (inferior trunk)	1 (superior trunk)
inferior trunk rupture (C8-Th1)	1	1	–

**Table III.** Localization of the avulsion lesions

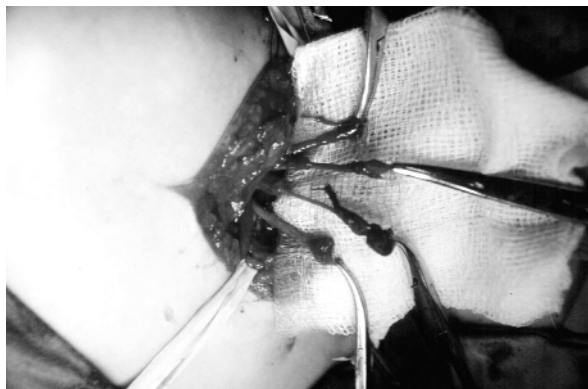
Localization of injury	General number of cases	Coexistent injuries
avulsion C5-C6-C7	2	–
avulsion C6-C7-C8	1	rupture C5
avulsion C6	1	rupture C5, C7
avulsion C7	1	–
avulsion C7	1	rupture C5, C6
avulsion C5-C6-C7-C8	1	–

**Fig. 2a.** Intrasurgical view: rupture of the superior trunk of the brachial plexus requiring microsurgical reconstruction**Fig. 2b.** Intrasurgical view: status after microsurgical reconstruction of the superior trunk

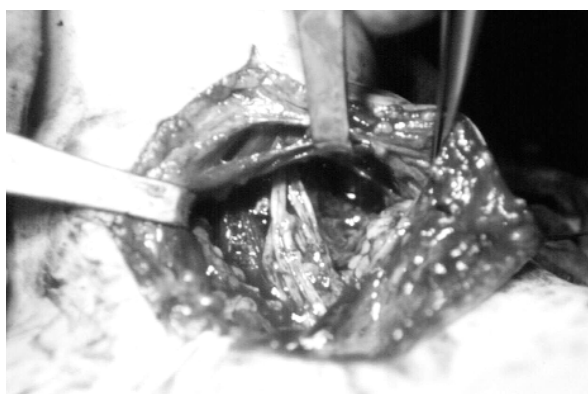
process and the prognosis in this type of lesions is good [4,17]. Injuries with discontinuity of the elements of the brachial plexus require microsurgical reconstruction in the first months of the child's life [4,16,18,21]. In this group, the age of the treated surgically children varies from 2 to 6 months, and only in two cases the operations were delayed (9 months, 3 years). In cases of brachial plexus trunks ruptures the continuity of the neural elements was reconstructed with direct neurorrhaphy or sural nerve grafting [4] – fig. 2a, b. The particular kind of lesion is rupture of the trunk with secondary, spontaneous reinnervation. Usually, this process has a correct direction. However, in some cases the course of the reinnervation may be chaotic. The secondary reinnervation of the antagonistic groups of muscles from the one source is in danger and can lead to synkinesis (co-contractions) [1,3]. In our own material we observed 11 cases of spontaneous recovery after rupture of the neural trunks. The most frequent localization was the superior trunk – fig. 3. The

**Fig. 3.** Intrasurgical view: status after rupture of the superior trunk with secondary, spontaneous recovery

surgical treatment consisted in delicate neurolysis and then in an assessment of the conductivity after intrasurgical electrical stimulation. The correct motor



**Fig. 4a.** Intrasurgical view: spinal nerve roots avulsion (C5 – Th1) of the brachial plexus



**Fig. 4b.** Intrasurgical view: status after extraneuronal extraplexual microsurgical reconstruction

reaction in the muscles confirmed the rightness of the used surgical procedure. The preganglionic injuries like spinal nerve roots avulsion are a difficult diagnostic and therapeutical problem – fig. 4 a, b. The avulsed spinal nerve may be pulled out from the intervertebral foramen or stay intraforaminally [5,15,19]. In the first situation, ventral (motor) and dorsal (sensory) roots of the spinal nerve could be identified, which allowed to perform a selective neurotisation [14]. In the second situation, the decision about resection of the remaining intraforaminally, most probably avulsed, spinal nerve or leaving it should be taken. This kind of decision ought to be taken based on the preoperative clinical examination and electromyography, imaging diagnostics (the possibility of false – positive findings), intrasurgical exams (electrical stimulation, SEP) and also evaluation of the tension of neural elements [11].

The preganglionic lesions have a significantly worse prognosis, but they are rather rare. In our own material their frequency was 14.3% (7 from 49 cases) and they include avulsion from 1 to 4 spinal nerve mainly C5, C6, C7. High percentage of these spinal nerves avulsion was observed in the other authors' materials [5,19]. Reconstructions in the perinatal brachial plexus palsy need experience and master microsurgical techniques. They are performed under the microscope with the use of the suture material 8–10/0. The most important problem in treatment of the obstetric brachial plexus palsy is a separate group of children who need surgical intervention.

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