

# Brachial plexus injury after a left-side modified radical mastectomy associated with patient positioning in the operating room

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## Abstract

We present a rare case of brachial plexus injury related to the positioning of the patient on the operating table during the radical breast surgery of a 65-year-old female. The specific risk factors of the plexus injury were: excessive abduction, external rotation of the arm, dorsally extension of the shoulder; head flexed and also in a counter-lateral excessive rotation. We describe the clinical presentation of a lesion of the upper (posterior cord) and middle trunk of the brachial plexus with preserved continuity.

**Keywords:** brachial plexus injury, breast mastectomy, patient malpositioning

## Introduction

The perioperative brachial plexus injury (BPI) associated with patient positioning in the operating room has a frequency of 0,02-0,06%<sup>(1,2,3)</sup>. The risk factors associated with this type of lesion are: the concomitant diseases (diabetes, neuropathies, peripheral vascular diseases), the anatomical predispositions, the surgery (malposition, prolonged operative time), hypothermia and hypotension<sup>(1,3,4,5)</sup>.

The injury appears when the nerve is damaged by single or combined action of the stretch or compression<sup>(4)</sup>. When the plexus is stretched the vasa nevorum is injured resulting in ischemic lesion of the nerve<sup>(1)</sup>. A temporary compression on the small blood vessels that supply nerves causes interruption of the vascularisation with subsequently nerve conduction dysfunction until the reversal of the blood supply. A more severe compression increases the venous pressure in vasa vasorum and the vessels of the connective tissue surrounding resulting in endoneurial edema and long term block of the axonal transports<sup>(1,4)</sup>. Prolonged compression or stretch is followed by the loss of the axonal conduction process and Wallerian degeneration.

## Case report

We report a case of a 65-year-old female presented at our service with a left breast tumor mass measuring 3 cm in its largest diameter, located behind the nipple. The patient had no significant comorbidities, she only used medication to treat her anxiety.

The ultrasound and the mammogram confirmed the lesion and it appeared to be malignant. True-cut biopsy

and the histopatology revealed the tumor to be an invasive ductal carcinoma that was preoperative staged as a T2N0M0. She had surgery in the supine position with the ipsilateral arm in 90° abduction and her forearm in 90° flexion, supported by an arm board placed perpendicular to the operating field. With the help of a rolled sheet the ipsilateral hemithorax and shoulder were lifted. Because of the location of the tumor in the retroareolar region and due to the patient's refusal of a conservative surgery, we performed a left-side modified radical mastectomy (with complete axillary lymph node dissection). The operative time was prolonged up to 150 minutes.



Figure 1. Restrain of the shoulder abduction and elbow extension. Forearm in pronation

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At the time of daily examination we observed motor deficit of the ipsilateral upper arm. The neurologic physical examination of all motor and sensory functions supplied by the brachial plexus (BP) was done with voluntary muscle testing and testing of the threshold for sensibility. The examination on the first postop day showed: paresthesia in the left radial nerve territory ("pins and needles"), restrain of the shoulder abduction and elbow extension, forearm in pronation (Figure 1), impossibility of wrist extension with limited fingers extension ("hand drop" aspect) and limited abduction of the thumb. Apart from the above referenced effects, the neurological exam was normal. Electromyoneurographic examination of the BP in postoperative day 2 showed normal nerve conduction speed.

EMNG was repeated seven days later. Electroneurography showed dysfunction of the sensory nerve conduction for the median, ulnar, radial nerves and also lateral and medial antebrachial nerves of the forearm. It also indicated abnormal motor nerve conduction for the median, ulnar, radial, axillary and muscle-cutaneous nerves. The electromyography showed denervation of the upper limb muscles: first dorsal - interosseous and abductor digiti minimi muscles, ulnar nerve, abductor hallucis brevis muscle - median nerve, extensor digitorum communis - radial nerve, biceps brahii muscle - muscle-cutaneous nerve, deltoid muscle - axillary nerve.

After excluding all the possible causes and a retrospective analysis, a lesion of the upper (posterior cord) and middle trunk of the BP with preserved continuity is highly probable, associated with patient positioning in the operating room. The patient was feeling anxious and depressed after this episode and refused the magnetic resonance imaging (MRI) exam.

She was managed conservatively. Active and passive physical therapy were conducted. The patient also went through a full range of passive motion exercises that were performed more times a day during the course of two months in order to avoid any contractures and maintain proper joint functionality. Clinical examination and electroneurography were repeated 1 month after operation. They showed progressive improvement of the deficit with positive motor conductivity, suggesting minimal nerve damage and indicated spontaneous recovery. After two months the patient showed full degree of recovery, with no lasting muscle or sensory problem.

## Discussion

The traumatic postganglionic lesions of the BP are represented by the section (rupture) and the less severe

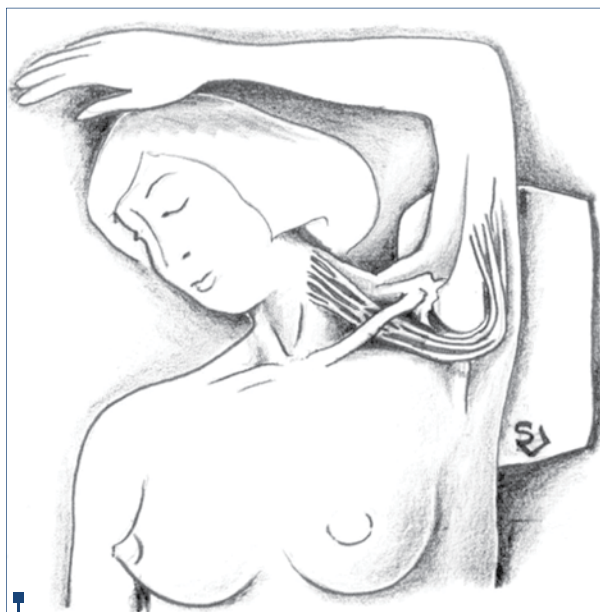


Figure 2. The risk factors for the brachial plexus injury associated with malposition of the patient

lesion in continuity (as encountered in our case as well). If the nerve structure is intact, spontaneous recovery can be expected with conservative management<sup>(6,7)</sup>.

A series of factors can cause BPI in breast cancer treatment: metastatic invasion, neurotoxicity of the chemotherapy, radiotherapy, fibrosis due to the surgery, direct intraoperative lesions, improper patient positioning in the operating room<sup>(8)</sup>. Before the surgery, an assessment of the patient needs to be conducted in order to identify any predisposing factors to allow immediate precautionary actions if identified<sup>(1,4,5-10)</sup>.

## Conclusions

The absence of sensory recovery by 3-4 weeks and motor recovery by 6-8 weeks are negative prognostic factors and patients will suffer residual deficit<sup>(3,11)</sup>. If nerve section is confirmed on MRI the patient needs to undergo immediate surgery<sup>(7,9)</sup>. When surgical exploration of the BP is indicated, the diagnosis is confirmed with direct visualization and intraoperative electrophysiologic examinations. If also no sign of recovery is seen after 3 to 6 months following nerve injury, surgery is usually recommended. ■

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