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## Brachial Plexus Lesions in Breast Surgery. Recommendations for Prevention<sup>☆</sup>



## Lesiones del plexo braquial en la cirugía mamaria. Recomendaciones para su prevención

Dear Editor,

In a recent article in your journal, Colsa Gutiérrez et al.<sup>1</sup> reviewed intraoperative injuries to peripheral nerves in colorectal surgery. As in abdominal surgery, breast surgery can lead to neurological injuries during the immediate postoperative period that are not related with the surgical technique but instead with the positioning of the patient on the operating table. Therefore, a critical analysis of each case is necessary for the prevention of these adverse effects and to improve patient safety, which are the responsibility of medical professionals. In this Letter to the Editor, we will describe our experience in neurological lesions after breast surgery in order to discuss possible causes and, above all, recommendations to avoid them.

Between January 2000 and June 2015, 1501 surgical procedures were performed in women with breast cancer. During the immediate postoperative period, 4 neurological deficits were observed secondary to injury to the brachial plexus, which was an incidence of 0.002% (Table 1). The surgical techniques performed were mastectomy with axillary lymph node dissection, bilateral vertical mammoplasty, latissimus dorsi flap reconstruction and replacement of breast expander with definitive prosthesis. The mechanisms related with neurological injury were diverse and included the use of retractors on the brachial plexus, hyperabduction of the upper extremity and its elongation in lateral decubitus (Fig. 1). In one case, axillary fibrosis secondary to radiotherapy predisposed the patient to functional limitation prior to surgery, which

conditioned the appearance of postoperative paralysis in spite of the correct placement of the limbs during the intervention. The neurological deficits affected the sensitivity and mobility of the upper limb, and recovery was variable (between 6 and 28 weeks). The patients were evaluated by the rehabilitation unit, and all were diagnosed with injury to the brachial plexus (neurapraxia), with no evidence of distal nerve injury in any of the cases. The 4 patients recovered their neurological function, although one presented chronic sensory neuropathy in the proximal region of the upper extremity.

Iatrogenic injury to the brachial plexus is an uncommon occurrence in breast surgery, and its exact incidence is unknown because most authors have published isolated cases of neurological injury.<sup>2</sup> Breast surgery presents factors for the appearance of paralysis of the brachial plexus; oncological and reconstructive procedures are characteristically long in duration and involve postural changes as well as the need for positioning the upper limbs in abduction.<sup>2-4</sup> This predisposition affects not only oncological procedures but also later reconstructive surgeries, where manipulation of patient position is also required.<sup>5</sup> The explanation of this predisposition lies in the vulnerability of the brachial plexus due to its anatomical factors: its attachment between fixed points (foramen and axillary fascia), its passage through a narrow canal between the clavicle and first rib, its relationship with bony protuberances (head of the humerus and ulna),<sup>2-4</sup> and the fibrosis of the axillary canal after radiation.<sup>6</sup>

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**Table 1 – Clinical Characteristics of the Patients With Neurological Injury After Breast Surgery.**

Age	Sex	Appearance of symptoms	Surgery	Surgery duration	Precipitating factors	Neurological deficit	Type of neurological injury	Time until stabilisation	Sequelae
55	Female	Immediate	Mastectomy and axillary lymphadenectomy	150 min	Placement of separator over brachial plexus	Sensory and motor	Neurapraxia of the brachial plexus	10 weeks	None
50	Female	Immediate	Latissimus dorsi flap	300 min	Stretching of the upper extremity	Sensory and motor	Neurapraxia of the brachial plexus	28 weeks	Sensory deficit in the proximal upper limb
36	Female	Immediate	Mammoplasty vertical	140 min	Hyperabduction of upper extremity	Sensory and motor	Neurapraxia of the brachial plexus	6 weeks	None
47	Female	Immediate	Replacement of breast expander	100 min	Axillary and supraclavicular radiotherapy	Sensory and motor	Neurapraxia of the brachial plexus	7 weeks	None

**Fig. 1 – Elongation of the nerves of the left upper extremity (arrows) during placement in lateral decubitus for the dissection of a latissimus dorsi muscle flap.**

Surgeons are responsible for preventing neurological injuries, and they should therefore ensure correct placement of these patients during surgery. There are 4 basic recommendations for the prevention of these injuries. The first is to avoid direct injury with surgical instruments, especially during manipulation in axillary lymph node dissection,<sup>7</sup> using separators that are not in contact with the brachial plexus or limiting thermocoagulation during lymph node dissection. A second recommendation is to limit the abduction of the upper limb to 90°, and in this situation to maintain the head in a neutral position, with no lateral displacement, since cadaveric studies have demonstrated a greater tension of the brachial plexus when the head is turned.<sup>3</sup> We should also take greater care during limb abduction in patients with prior radiation of the lymph node chains, because in these cases the local fibrosis and direct toxicity on the nerve entail a greater risk of appearance of neurapraxia, as we observed in one of our patients. The third recommendation is related with the traction of the shoulder in the position of lateral decubitus during the dissection of a latissimus dorsi muscle flap. In these cases, we should take care that the shoulder traction is not excessive or creates elongation of the nerve structures. Finally, we should use cushioned arm supports to prevent injury to the peripheral nerves.

In conclusion, the presence of a lesion to the brachial plexus during the postoperative period of breast surgery is caused by the concomitance of several factors, including hyperabduction of the upper extremity, hyperextension/external rotation of the upper extremity, rotation of the head or the presence of axillary fibrosis secondary to radiotherapy. The identification of these risk factors by medical professionals is necessary to prevent this complication during the postoperative period.

### Conflict of Interests

The authors declare that there were no conflicts of interest in the elaboration or publication of this manuscript.

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## Gastric Hernia After Tubular Gastropasty<sup>☆</sup>



### Hernia gástrica secundaria a gastroplastia tubular plicada

Dear Editor,

We have read with interest the original article published in your journal by Dr. Pujol Gebelli et al.,<sup>1</sup> which reviewed the cases of patients treated at their hospital with laparoscopic gastric plication. We have recently treated a patient with a gastric hernia that resulted as a complication of this technique.

The patient is a 51-year-old patient who had undergone gastric plication for obesity (BMI: 36) and also presented arterial hypertension treated with valsartan. The postoperative period transpired without incident. In the first month, the patient's blood pressure levels had normalised and antihypertensive treatment was suspended. Five months after surgery, the patient presented a weight loss of 32 kg.

Also five months post-op, and after having been asymptomatic previously, the patient came to the emergency room of our hospital with abdominal pain and vomiting that had been progressing for several hours. During the examination, the abdomen was soft, painful in the epigastrium, with no guarding or signs of peritoneal irritation. Abdominal CT showed evidence of a herniated stomach through the gastropasty suture (Fig. 1).

Given these radiological findings, urgent surgery was indicated, at which time we observed the gastric fundus

herniated through the gastropasty in the greater curvature. We released the herniated tissue, completely disassembled the gastropasty, and were able to clearly observe the area of the fundus that presented vascular compromise. We performed a sleeve gastrectomy with mechanical sutures (Fig. 2) and reinforced the staple line with Prolene<sup>®</sup> 3/0. The postoperative period was uneventful and the patient was discharged on the 5th day post-op.

Gastric plication is one of the new restrictive techniques within the arsenal of bariatric surgery that is still in the validation period and the process of defining its indications as well as perioperative management.<sup>2-4</sup> It is a variation of vertical sleeve gastrectomy with the theoretical advantage of presenting a lower possibility for complications as it does not require resection<sup>3,4</sup> and thus avoids the much-feared leakage in the proximal gastric suture. It is also a potentially reversible technique. Complications, if they appear, are usually early-onset and can include sialorrhea, nausea and vomiting, which generally recede in the first few days.

In our case, we were faced with a severe late-onset complication that required urgent reoperation that was resolved with a reconversion to sleeve gastrectomy.

The particularity of this case, unlike the case published by Dr. Pujol and other publications reviewed in the literature, is that the complication occurred 5 months after surgery, and the patient had experienced a postoperative period with no

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