CIRUGÍA ESPAÑOLA

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Review article

Intraoperative Peripheral Nerve Injury in Colorectal Surgery. An Update☆

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ARTICLE INFO

Article history:
Received 25 December 2014
Accepted 8 March 2015
Available online 10 March 2016

Keywords:
Brachial plexus injury
Femoral neuropathy
Peripheral nerve injuries
Colorectal surgery

ABSTRACT

Intraoperative peripheral nerve injury during colorectal surgery procedures is a potentially serious complication that is often underestimated.

The Trendelenburg position, use of inappropriately padded armboards and excessive shoulder abduction may encourage the development of brachial plexopathy during laparoscopic procedures.

In open colorectal surgery, nerve injuries are less common. It usually involves the femoral plexus associated with lithotomy position and self-retaining retractor systems.

Although in most cases the recovery is mostly complete, treatment consists of physical therapy to prevent muscular atrophy, protection of hypoesthetic skin areas, and analgesics for neuropathic pain. The aim of the present study is to review the incidence, prevention and management of intraoperative peripheral nerve injury.

Lesión intraoperatoria de nervio periférico en cirugía colorrectal. Revisión de conjunto

Palabras clave:
Lesión del plexo braquial
Neuropatía femoral
Lesión de nervio periférico
Cirugía colorrectal

RESUMEN

La lesión de nervio periférico durante procedimientos de cirugía colorrectal constituye una complicación potencialmente grave a menudo infravalorada durante el postoperatorio.

La posición de Trendelenburg, la colocación de topes y las abducciones de los brazos han demostrado favorecer el desarrollo de plexopatía braquial durante los procedimientos laparoscópicos.

☆ Please cite this article as: Colsa Gutiérrez P, Viadero Cervera R, Morales-García D, Ingelmo Setién A. Lesión intraoperatoria de nervio periférico en cirugía colorrectal. Revisión de conjunto. Cir Esp. 2016;94:125–136.

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2173-5077/

En cirugía colorrectal abierta las lesiones nerviosas son menos frecuentes, afectan preferentemente al plexo femoral y se asocian a la posición de litotomía y al uso de autorretractores.

Aunque en la mayoría de los casos la recuperación es completa, el tratamiento consiste en fisioterapia para prevenir la atrofia muscular, protección de las zonas con hipoestesia y analgésicos frente al dolor neuropático. El objetivo del presente artículo es realizar una revisión de la literatura existente sobre incidencia, prevención y manejo de la lesión intraoperatoria de nervio periférico.

Introduction

Intraoperative peripheral nerve injury (IPNI) is an important complication that has not been mentioned very often in the context of perioperative morbidity. Although some papers cite an incidence of from 0.3%[1] to 1.5%,[2] its actual incidence is unknown due, on the one hand, to the fact that it may vary depending on its position and the surgical speciality, and on the other, that it is rarely mentioned in the literature, where it is limited to a heterogeneous series of cases. In spite of this, it is a potentially serious complication with the risk of chronic neurological damage[1,3–5] and major medical-legal costs.[2,5–12] In colorectal surgery the range of approaches and surgical positions mean that knowledge and publication of the mechanisms that cause neurological damage is especially important. The purpose of this paper is to revise the current evidence for IPNI in colorectal surgery using an open or laparoscopic approach. To this end we analyse the factors associated with IPNI as described in the literature, as well as its diagnosis, and evolution.

Method

The literature was searched in MEDLINE, PubMed, and EMBASE using the following keywords: Peripheral Nerve Injury, Positioning Colorectal Surgery, Laparoscopic Colorectal Surgery, Brachial Plexus Injury, and Femoral Neuropathy. Papers in English and Spanish were selected which included adult patients operated on using open or laparoscopic colorectal surgery from 1993 to 2014. Of a total of 78 papers, 19 were selected for this revision. These include 3 systematic revisions, 12 case series, and 4 original papers. Case data and aspects in connection with their diagnosis, treatment, and prevention were extracted from all of these papers. 59 studies were excluded because they covered patients operated on for other specialities, had different subjects or dealt with direct injuries to the nerves during surgery.

Results

Aetiology

Since Herbert Seddon systematised damage to the peripheral nerves in 1942,[13,14] these injuries have been classified into 3 types according to their morphological characteristics. Neuropraxy is the blockage of the nerve connection without structural damage, and it usually recovers in 4–6 weeks. Axonotmesis consists of the breakage of the axon, while the perineuronal conjunctive tissue remains intact. Although in the majority of cases spontaneous regeneration occurs within a few weeks, surgical treatment may be required.[15] Neurotmesis involves the complete sectioning of the axon and elements of conjunctive tissue, preventing it from regenerating spontaneously. These patients lose the nerve function (motor or sensitive) and require surgical repair for their recovery.[16,17]

The chief mechanisms which cause IPNI are the position of the patient and the duration of the surgery.[17,18] The duration of surgery is a time during which muscle relaxation and the absence of pain facilitate injuries due to stretching and slackening.[19] Although the peripheral nerves are elastic[20,21] and can withstand stretching to 6%–10% of their length,[22–25] greater traction causes dysfunction due to blockage of axon transmission, reduction of the intraneural blood flow, and histological damage.[22,26–30] Nevertheless, IPNI may even occur in patients who have been subjected to the necessary postural measures during the intervention. Previous diabetic neuropathy, peripheral vascular disease[11,17,31,32] and malnutrition with the absence of subcutaneous fat cushioning are preoperative factors that make patients more liable to IPNI due to compression or stretching.[31,33] Other contributing factors are nicotinism, alcoholism, and vitamin B12 deficit,[4,11,34] or intraoperative factors such as hypotension, hypothermia,[11,31] and heparinization.[1,35]

Laparoscopic Surgery

Laparoscopic colorectal surgery has been associated with a higher risk of IPNI than open surgery (3.2% vs 0.2%).[1] The main reason is that the use of laparoscopy in inframesocolic surgery often requires the Trendelenburg position during a long time to facilitate the descent of the small bowel loops into the supramesocolic compartment.

In left colon and rectal surgery the patient is placed with the hips semi-extended, the knees flexed at about 45° and with the calf on leg supports to prevent compression of the popliteal fossa.[35] Due to the lateral inclination and the Trendelenburg position, head and side restraints are required at shoulder level to prevent the patient from descending down the operating table. Some published cases refer to the injurious effect due to compression of the restraint on the brachial plexus.[36] The arms