LUMEN ET VIRTUS

Peripheral branch of the radial nerve injury after venipuncture and sedation for surgical intervention

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ABSTRACT

In May 2024, DATASUS recorded 6,334 hospitalizations for surgical complications in the SUS, with 21% related to ulnar nerve injuries, according to the literature. Nerve injuries are classified into neuropraxia, axoniotmesis, and neurotmesis, according to severity. The radial nerve, located in the upper limb, can be affected by injuries during surgery or the patient's positioning. The American Society of Anesthesiologists emphasizes the importance of positioning and anatomical knowledge to avoid these injuries. Peripheral venous access, which is widely used, can result in nerve injuries, which are often underdiagnosed. Although peripheral venipuncture can cause complications, injuries are usually treatable and full recovery is possible with conservative treatment.

Keywords: Radial nerve, Peripheral puncture, Venous access, Surgery.

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INTRODUCTION

Currently, the highest prevalence of surgical procedures is related to neurosurgery, heart surgery, and orthopedic surgery. Intraoperative complications may be common, but some are rarely listed. Depending on the patient's profile and the type of surgery, the incidence of intraoperative peripheral nerve injuries varies impermanently. Some patients are more predisposed than others, however, nerve injuries arise in a multifactorial way, which includes factors related to surgery, anesthesia and the patient himself1.

According to the DATASUS2, there were 6,334 hospitalizations to treat surgical complications by the Unified Health System in May 2024 alone. Of the complications related to peripheral nerve or nerve plexus injury, most of which 21% are associated with ulnar nerve injury, whether by section, compression, traction or ischemic injury1.

Nerve lesions can be classified into three levels according to the Seddon classification: neuropraxia, axoniotmesis, and neurotmesis, from mildest to most severe, progressing with motor alterations, sensory dysfunction, and alterations in the myelin sheath staggered between the definitions, and may present complete regeneration or permanent loss of functions3.

The radial nerve is one of the terminal branches of the posterior cord, as is the axillary nerve. It is formed by branches from C5 to T1 and runs through the upper limbs around the humerus, passing through the lateral epicondyle, running along the forearm and ending in deep and superficial peripheral branches for the wrist, hands and phalanges. Radial neuropathies can be a significant hindrance to well-being, leading to paresthesias, pain, and motor dysfunctions3,4.

In clinical practice, the radial nerve can be injured through venipuncture, surgical positioning, and even compression by the sphygmomanometer to measure blood pressure. Radial neuropathies have a better prognosis than their ulnar and median anatomical neighbors. The site of venipuncture is directly related to the specificity of the affected nerve. The cubital fossa is commonly used, the risk of which involves the median nerve1.

For the *American Society of Anesthesiologists* (ASA), the positioning of patients in surgical situations is extremely important to avoid peripheral neurological injuries, as well as good knowledge about anatomy, trauma mechanisms, nerve functions, and corroboration with the clinical history, helping the diagnosis of nerve injuries in an assertive manner and proposing the establishment of an appropriate treatment1,5.

Peripheral intravenous therapy is widespread and indispensable in clinical practice. It is important in the literature that the materials used to manufacture its components directly influence the events of its complications, which include infiltration, extravasation, hematomas, infection, occlusion, etc., whose associated factors involve knowledge of the type of catheter, the speed of infusion of medications, and length of stay, among others6.

The positive outcomes regarding unexpected adverse effects are directly correlated with the knowledge of the entire multidisciplinary team, not only the physician, being able to assist the community regarding the obstacle exposed in the form of a scientific case report.

METHODOLOGY

This is a case report study, whose information was collected through a review of medical records. In parallel, to support the ideas discussed in this article, a literature review was carried out in scientific databases such as PubMed and Scielo. The production of this scientific article followed the regulations proposed by the National Research Council (CONEP).

CASE REPORT

A 37-year-old female patient with no comorbidities was admitted to a tertiary hospital to undergo elective plastic surgery for liposuction and reduction mammoplasty with the use of a prosthesis. The surgery was uneventful over a period of 4 hours, with peripheral venous access on the posterior aspect of the left hand with sedative infusion, and the patient was discharged from the hospital 24 hours after the procedure in good acceptance of the diet.

In the postoperative follow-up, the patient complained of paresis and paresthesia in the left upper limb, where puncture was performed for peripheral venous access. The complaint became important in a period of 7 days, with no change in motor skills. The orthopedics team was called and the clinical diagnosis was concluded for a lesion of the peripheral branch of the radial nerve. Treatment was initiated with local massage associated with medication (Etna) for 30 days, with full recovery of nerve functions 90 days after the event.

DISCUSSION

The superficial branch of the radial nerve (RSNR) is a sensory branch of the radial nerve, which originates from fibers from C5 to T1, runs along the distal third, at the lateral margin of the humerus, originating the RSNR near the lateral epicondyle or distally to it. Not knowing its anatomical characteristics compromises invasive procedures due to total or partial injury to its branches, triggering pain for the patient and difficult therapy for the physician. The literature describes some anatomical variations, but it is known that it commonly causes symptoms such as paresthesia, since the motor skills are in charge of deeper branches7. The patient in this case evolved with a local tingling sensation, without impairment of motor skills, which concludes the lesion having been of her superficial sensory branch.

Peripheral venous access (AVP) is performed in veins of the lower or upper limbs, providing rapid and practical infusion of substances related to systemic actions, used in the unavailability of the

oral route, as was the case in this report, in which the patient needed intraoperative fluid infusions, which includes the solid indication for this. Contraindications for AVP include phlebitis, local hyperemia, vein sclerosis, previous venous infiltration, arteriovenous fistula, and local trauma8.

Vascular puncture for drug infusion or blood collection is an indispensable practice in daily medical practice. The cephalic vein, the cubital vein, and the basilic vein are the most prevalent venous variants in clinical practice as puncture sites, referencing dorsolateral forearm, cubital fossa, and medial arm, respectively10. There are few literatures that encourage peripheral nerve injury as a complication of venipuncture. The studies evaluated in this report instigate the understanding of phlebitis, infiltrations, extravasations and hematomas, the first being the most common6. Understanding the anatomy not only of the radial nerve branch, but of all those in the perimeter of attachment helps us understand the risks of parenteral access sites.

The study by RENATA, S. (2023)[6] It brings together several meta-analyses regarding these complications in the elderly, all of which agree that phlebitis is the most common, but none mentions peripheral nerve injury due to needle section. On the other hand, KANG, MIN SEOK et al (2023)[10] brings to light that the rate of nerve injuries in peripheral venous accesses ranges from 0.0015% to 3.489%, varying among countries, also highlighting the accurate information that although it seems to be rare in view of the high rate of punctures performed in the world, one should not discard the fact that they are, in most cases, neglected and underdiagnosed.

Nerve injuries are more observed in arterial punctures, due to the depth of needle insertion. In this case, the median nerve is more affected when the brachial artery is punctured9. Although the mechanism of trauma due to needle section is highlighted, it is not possible to conclude exactly what led to the injury at the puncture site in this report, since the medications, their actions and side effects can also pose risks to their patients.

The substantial and increasing use of medicines poses an ever-increasing risk of harm to their users. Parenteral handling of a drug, which includes intravenous, intramuscular, subcutaneous and intradermal, should be carried out carefully on the prescription, prepared immediately before application. It is necessary to pay attention to the dosage and pharmacokinetics of the substance, since errors in preparation and infusion speed can lead to reduced pharmacological activity, formation of toxic compounds, obstruction of accesses, and others. In other words, it is concluded that the routine administration of chemical compounds can also damage perimeter tissues through extravasation and increased toxicity of the drug in the face of administration error11. In the case of this report, the patient in question presented clinical evolution after hospital discharge, which makes us reason more in favor of chemical injury, since a local trauma would be felt immediately after the return of sedation.

In mild cases, the nerve damage does not become permanent as its myelin sheath recovers completely. In more severe cases, the loss of the sheath can lead to persistent deficits. Most patients respond well to conservative treatment when the lesions fall under neuropraxia and axoniotmesis according to the Seddon classification, with rest relative to offensive activities, non-steroidal anti-inflammatory drugs can be used in case of pain, but surgical repair may be necessary in cases of neurotmesis. In cases of neuropraxia and axoniotmesis, recovery can vary from 2 to 8 weeks; For neurotmesis, the process is slower3,12. Fortunately, the patient in this case presented a low-grade lesion in the classification, and her recovery was as described in the literature, with a return of 100% of functions in 90 days.

Complications of the injury, stretching of the nerve and complete section of the same with total loss of its functions should be considered12. According to the evolution of the case, none of these are expected.

CONFLICTS OF INTEREST

The authors state that there is no potential conflict of interest that could compromise the impartiality of the information presented in this scientific article.

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