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CARPAL TUNNEL SYNDROME VERSUS VASCULAR ACCESS INDUCED HAND ISCHAEMIA

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Abstract: *Hand pain is a common complaint in the hemodialysis patient on arteriovenous fistula. The problem is related to its etiology: nervous or vascular, which requires different therapeutic solutions. Ischaemic etiology involves a deviation of the distal flow in the anastomosed vein, with the decrease of the distal flow and the installation of distal ischaemia. Nerve etiology involves compression of the median nerve in the carpal tunnel. The purpose of the paper is to present a case study of diagnosis and treatment of median nerve compression in hemodialysis patient.*

INTRODUCTION

The presence of hand pain in the patient with chronic hemodialysis raises complex issues regarding the etiology and treatment. Vascular etiology involves the presence of distal ischaemia, produced by vascular access (steal), while nerve etiology involves compression of the median nerve in the carpal tunnel, these being the most common. In the case of hemodialysis patient, the pain is localized especially in the limb with functional arteriovenous fistula.(1)

Chronic hemodialysis is performed through arteriovenous fistula. This is a communication between the arterial system and a superficial vein in the forearm or arm. This results in a vein with an average diameter of 6 - 8 mm with a flow rate of at least 300 ml / min which can reach 1-2 liters / minute. This is the arterialized vein. There is a vascular steal at the level of the arteriovenous anastomosis, a hemodiversion of the blood from the distal sector.(2) There is a reversal of the flow from distal to proximal side, in diastole, the result being the appearance of a vascular deficit with the appearance of distal ischaemia, also called ischaemia induced by the presence of vascular access.

It can have different degrees of hand ischemia, as follows:

Table no. 1. Degree of Vascular Access Induced Hand Ischemia (VAIHI)

Degree	Symptoms	Treatment
0	Without arterial steal	N/A
1	Cold fingers and hand, with improvement of distal flow after compression of arteriovenous anastomosis	N/A
2	intermittent ischaemic pain only during the dialysis session	depending on the clinic
3	Rest pain/necrosis	mandatory

The Duplex examination (Module B and Color Doppler) highlights the flow of the arteriovenous fistula (in the upper 1/3 of the arm), as well as the flow from the palmar arches. It can highlight the reversal of blood direction in the palmar arches, with the bloody "aspiration" in the arteriovenous anastomosis.(3)

If the ischaemic etiology of hand pain is denied, then the patient is sent to the plastic surgeon for evaluation. Carpal tunnel syndrome involving compression of the median nerve is diagnosed based on symptoms, clinical tests and samples, as well as by electrodiagnosis (study of conduction in the median nerve), electromyography (EMG).(4)

Carpal tunnel syndrome is the set of neurological manifestations caused by compression of the median nerve in the carpal tunnel.

The carpal tunnel is located in the lower 1/3 of the forearm, being limited antero-externally by the transverse ligament of the posteriorly by the tendons of the long flexor muscle of the thumb and of the deep flexor muscle of the fingers. Internally, the carpal tunnel is delimited by the tendons of the superficial flexor muscle of the fingers.(5)

AIM

Surgical decompression of the median nerve is the standard treatment in cases of carpal tunnel syndrome (pain and paresthesia in the fingers). It can be performed in an open or endoscopic manner, the technique used being the open one.

The purpose of this paper is to present the diagnosis and treatment of carpal tunnel syndrome in chronic hemodialysis patient.

CASE REPORT

We present a 54-year-old patient who underwent chronic hemodialysis on left distal arteriovenous fistula for eight years. Clinical findings consist of left fingers pains with paresthesis.

Past medical history presented arterial hypertension (arterial pressure 190 mm Hg), anemia (31 % Ht).

Pulseoximetry was normal (96 %), so the ischemic etiology of fingers pains was precluded. EMG (electromiography) showed a compression of left median nerve and the patient was referred to plastic surgeon. The surgical

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procedure was performed under local anesthesia, first day after the hemodialysis session.

After removing the cutaneous edges, the transverse ligament of the carpus was released, which was then sectioned (tenotomy). The median nerve was thus released, which was adherent to the posterior face of the transverse ligament of the carpus. Neurolysis took place with the complete release of the median nerve. Proximally dissection extended to the level of the deep forearm fascia. After hemostasis, the skin was closed with separate threads of Nylon 4 - 0. The dressing was thick, "fluffy", covered with an elastic band, which allowed early mobilization of the hand.

The patient was discharged the next day, hemodialysis following to be performed in the center the patient belonged to, under normal conditions. The skin threads were suppressed 14 days postoperatively.

The patient described intermittent pain or paresthesias in the fingers 1, 2, 3 that might have radiated to the arm and shoulder. The complaints woke him up, and the patient had to shake the hand to lessen them. They cannot be related to the time of hemodialysis.

The Durkan's test consists of the appearance of paresthesias / pain after the digital compression of the carpal tunnel for at least 30 seconds (figure no. 1).

Figure no. 1. Durkan's test



The Phalen's maneuver consists of the appearance of symptoms after the simultaneous contact of the dorsal faces of the hands in dorsiflexion at 90 degrees, for at least 1 minute (figure no. 2).

The Tinel's sign is represented by the appearance of paresthesias / pains at the level of the fingers innervated by the median nerve after the percussion of the carpal ligament.(4)

Figure no. 2. Phalen's Maneuver



The intervention was performed under local anesthesia. The patient's position on the operating table was in dorsal decubitus, with the upper limb in abduction at 90 degrees and in supination. The preparation of the skin was usually done from the tip of the fingers to the armpit. Attention was paid to puncture marks for hemodialysis, which were adherent crusts present at the level of venous dilatations with or without thin skin. In these conditions, the preparation of the skin in these areas should not be done by rubbing, but by pouring the preparation directly on the skin, otherwise when a crust takes off, a significant hemorrhage may occur (the flow of the fistula depending on location and age may be between 600 ml / min and 2 - 3 liters / min.

1. Avoid using a tourniquet that can compromise the functioning of the vascular access. The surgeon should be aware that the patient will be hemodialyzed the next day.
2. Hemostasis must be extremely rigorous (heparinized patient the next day).

The skin incision (blue line) was 2-3 cm long, aligned on the direction of the finger 4, offset 2 mm to the ulnar pole (blue T) in order to avoid damage to the cutaneous palmar nerve branches (figure no. 3).(5)

Figure no. 3. Skin incision



This case had a simple postoperative evolution, with the disappearance of nocturnal painful symptoms, paresthesias, with improvement of the muscle strength.

Hemodialysis patients are evaluated 3 times a week during the hemodialysis session by a nephrologist, so their progress has been strictly monitored clinically. They did not repeat the postoperative electromyographic examination. The particularity of the case is the presence of clinical manifestations on the same limb with arteriovenous fistula.(6)

DISCUSSIONS

The diagnosis of ischaemia secondary to the presence of arteriovenous fistula is given according to clinical and paraclinical data (pulse oximetry and Duplex examination).

Clinically, there may be paresthesias up to skin necrosis, with slow or brutal onset, which may be related to the time of arteriovenous fistula. In cases of ischaemia, SaO2 can reach values of 70%, being quickly corrected by compression of the arteriovenous anastomosis (near the operative skin scar).

The Duplex examination (Module B and Color Doppler) highlights the flow of the arteriovenous fistula (in the upper 1/3 of the arm), as well as the flow from the palmar arches. It can highlight the reversal of blood direction in the palmar arches, with the bloody "aspiration" in the arteriovenous anastomosis.(3)

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Strict monitoring of these patients allowed diagnosis and treatment before the nerve damage became irreversible (median nerve palsy).(7,8,9,10)

The definite diagnosis is given by the electromyographic examination (EMG), which can highlight the transmission disorder at the level of the median nerve (conduction block). The presence of symptoms and the EMG result provide the operative indication. Chronic hemodialysis patients have some peculiarities:

3. Perform chronic hemodialysis sessions three times a week, 4 hours each (Monday, Wednesday, Friday or Tuesday, Thursday, Saturday). Due to the hypocoagulant stage (the patient is systemically anticoagulated) the intervention cannot be performed on the day with the hemodialysis session.
4. The patient is hospitalized on the day without hemodialysis, prepared and operated on the same day. The tests collected are represented by hemoleukogram, glycaemia, renal samples, coagulation evaluation, ionogram.
5. Stop the antiplatelet therapy 7 days before, continuing with the anticoagulant therapy with fractionated heparin.
6. Most hemodialysis patients are anemic.
7. The usual antihypertensive medication is administered, as well as the one for associated diseases (diabetes).

The interventions were performed under local anesthesia, without the use of a tourniquet in the days without hemodialysis. Postoperative evolution of the case was simple.

CONCLUSIONS

Clinical symptoms (hand pain, finger paresthesias, decreased muscle strength) are complaints that frequently affect the hemodialysis patient, their etiology being different.

The hemodialysis patient is a patient who must be examined by an approved team composed of nephrologist, vascular surgeon, neurologist and plastic surgeon, ideally in the same hospital.

Access to the dialysis center during hospitalization should be easy, and the nephrologist who controls the hemodialysis session should be warned about anticoagulation during the session.

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