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Clinical case / Cas clinique

Complications arising after thoracic aortic surgery: A case report on an unusual spinal cord infarction. Physiopathological and clinical considerations

Complications de la chirurgie de l'aorte thoracique : à propos d'une forme anatomoclinique rare d'ischémie médullaire. Considérations physiopathologiques et cliniques

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Abstract

Even though new prevention techniques have been developed and are being used during thoraco-abdominal aortic repairs, spinal cord infarction remains a severe and relatively frequent complication of aortic surgery. Infarctions in the territory of the anterior spinal artery are considered the most common. Different clinical pictures related to spinal cord transverse extension wounds are drawn up. In this paper, we present a case report of a subject having presented an isolated motor deficit of the lower limbs and a favorable prognosis, suggesting selective involvement of the anterior horns of the spinal cord subsequent to surgical repair of an aortic dissection. We wish to review the relevant anatomical, clinical and diagnostic characteristics along with current techniques of spinal cord ischemia prevention during and after surgery.

Keywords: Thoracic aorta; Surgery; Complication; Spinal cord infarction

Résumé

L'ischémie médullaire reste une complication sévère et relativement fréquente de la chirurgie aortique malgré le développement des techniques de protection de la moelle épinière en peropératoire. Les infarctus dans le territoire de l'artère spinale antérieure sont les plus classiques. Suivant l'extension transverse de la lésion médullaire, différents tableaux sémiologiques sont décrits. Nous rapportons ici l'observation d'un patient ayant présenté un déficit moteur pur et de pronostic favorable, évoquant une atteinte isolée des cornes antérieures de la moelle dans les suites de la chirurgie d'une dissection aortique. Nous proposons une mise au point sur les caractéristiques anatomiques, sémiologiques, diagnostiques et sur les techniques de prévention des ischémies médullaires per- et post-chirurgicales.

Mots clés : Aorte thoracique ; Chirurgie ; Complication ; Ischémie médullaire

1. English version

1.1. Introduction

Even though new prevention techniques have been developed and are being used during thoraco-abdominal aortic repairs, spinal cord infarction remains a common and frequent complication of aortic surgery.

Estimates of the prevalence of paraplegia through spinal cord infarction following treatment for aneurysm of the thoracic or abdominal aorta have been highly variable, ranging from 2.3 to 23% [4].

A prospective study involving 571 patients has estimated the occurrence of paraplegia or paraparesis subsequent to aortic surgery, whatever the causes, at 8.3% [28].

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The nature and relative severity of the neurological damage depend on the height location of the infarction, its transversal extension and individual anatomical variations regarding vascularization of the spinal cord.

Onset of the complications may be acute, sub-acute or chronic, and the neurological deficit may arise immediately (secondarily to spinal cord hypoperfusion) or belatedly (as a result of the consequences of prolonged hypoxia) [8].

Different neurophysiological characteristics have been described according to the anatamoclinical form of the infarction: anterior spinal artery syndrome is the most clinically frequent. Its severity depends on the transversal extension of the infarction. At most the anterior two-thirds of the spinal cord are involved, with massive motor deficit below the lesion, constant vesico-sphincter disorders, and reduced sensitivity to pain and temperature below the wound [15,16]. Cases of the Brown-Séquard syndrome, with a more favorable prognosis, have likewise been reported [11]. At the minimum, the lesions may be limited to ''grey matter'' structures, particularly the anterior horns being most exposed to ischemia. These lesions are consequently responsible for predominantly proximal [2] or distal [22] hypotonic, areflexic, pauci- or plurisegmental motor deficits in the upper or lower limbs, without sensory disorder. Longitudinal extension of the infarction is determined by the quality of the anastomoses of the anterior spinal artery. In the lumbosacral area depending on the Adamkiewicz artery, damage to the conus medullaris and the cauda equina, which is the factor determining the degree of severity of the vesico-sphincter and sexual disorders, varies according to anastomotic compensation caused by the 5th anterior lumboradicular artery.

From an overall standpoint, prognosis for these types of infarction is severe. In a study of 36 patients [9], mortality during hospitalization was 22.2%; at the time of discharge 57.1% of the surviving patients were confined to a wheelchair, 25% walked with assistive device, and 17.9% walked normally. The most pejorative functional prognosis pertained to dorsolumbar infarction [10].

In this paper, we report on our observations of a patient having presented an isolated motor deficit of the lower limbs and benefiting from a favorable prognosis following surgical repair of an aortic dissection, and we wish to review the relevant anatomical, clinical and diagnostic characteristics along with prevention techniques of spinal cord ischemia during and after surgery.

1.2. Observation

Mr. C., 66 years of age, a retired cellar master, was hospitalized on 11/18/2008 in the physical medicine and rehabilitation (PMR) unit of the Bordeaux hospital for treatment of paraplegia that occurred subsequent to surgical repair of a type I aortic dissection.

Mr. C. presented several cardiovascular risk factors: android obesity with BMI higher than 30, high blood pressure, type 2 non insulin-dependent diabetes.

Initial chest pain on 10/27/2008 was rapidly followed by diagnosis of a type I aortic dissection with grade 2 to 3 aortic insufficiency associated with moderate pericardial effusion. A chest scan revealed the aortic dissection with an entranceway in the ascending aorta: it extended to the iliac arteries. The false lumen was permeable throughout the dissection without visualized thrombosis, particularly at the anastomosis of the intercostal arteries. The patient underwent emergency surgery the same day and benefited from replacement of the ascending aorta and the anterior portion of the aortic arch up to the brachiocephalic arterial trunk (BCAT) with conservation of the aortic valve. The operation was conducted under extracorporeal circulation with multisite cannulation involving cannulation of the femoral vessels and selective cerebral perfusion via the right axillary artery. The operation was conducted under hemodilution and moderate general hypothermia (28 °C).

Given the emergency context, monitoring of the motor and somatosensory evoked potentials (MEP and SEP) was not carried out during the operation.

Upon awakening, isolated motor paraparesis was noted at the upper lumbar level (ASIA motor score 70/100, level L1, AIS score C). This early neurological complication justified draining the cerebrospinal fluid with spinal cord ''decompression'' in mind.

Spinal cord MRI was carried out within 24 hours of the operation and considered as normal.

At the 72nd hour, aggravation was observed with the occurrence of subtotal paraplegia (ASIA motor score 60/100, level T12, AIS score C). The patient presented urinary and fecal retention, and neuroperineal tests showed sensory sparing and areflexia, even though contraction of the anal sphincter was still perceived.

Over the following 2 weeks the paraplegia regressed asymmetrically, while monoplegia of the lower right limb persisted. Spontaneous urination resumed on the 10th post-operative day without any post-micturition residue. Mr. C. was admitted to the PMR unit 3 weeks after surgical repair of the aortic dissection.

Clinical examination on admission to the PMR unit yielded the following findings:

- monoplegia of the lower right limb, which was flaccid, associated with overt quadriceps muscle atrophy. Initial functional muscle strength (MRC scale) was: hip flexor and extensor; 1/5, knee flexor and extensor; 2/5, foot extensor; 1/5, foot flexor; 1/5 (ASIA motor score 80/100, level L1); there remained some hypotonia in comparison with the other lower limb, which had fully recovered;
- absent right Achilles tendon reflex and clear diminution of the right rotulian reflex;
- wholly normal results in sensitivity tests at the level of the two lower limbs (ASIA ''touch'' score, 112/112; ASIA ''pinprick'' score, 112/112); there was no neuropathic pain;
- no vesico-sphincter disorder, normal neuroperineal testing results;
- cutaneoplantar reflexes in flexion.

Concerning the patient's functional incapacity at the time of admission, the Barthel index yielded a score of 50/100.