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Case Report

Tearing of the left iliac vessels in lumbar surgery revealed by multiphase post-mortem CT-angiography (MPMCTA)

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ABSTRACT

Lumbar surgery is regularly applied in cases of discal hernia and acquired lumbar stenosis. In this report, we present a case of a laceration in the left common iliac artery and iliac vein during a lumbar surgery and discuss the literature concerning this kind of event. In the present case, the surgical procedure was followed by a sudden decrease in blood pressure, and the surgeon discovered an intra-abdominal haemorrhage that led to the patient's death. Postmortem investigation confirmed the intra-abdominal haemorrhage and revealed a laceration of the proximal portion of the left common iliac artery and left iliac vein. The source of bleeding could be detected especially thanks to multi-phase postmortem CT angiography (MPMCTA), which was performed prior to autopsy. We also found a haemorrhagic path through the intervertebral disc between the L4–L5 vertebrae, caused by the surgeon's instrument (pituitary rongeur). To date, a few cases have been described of iatrogenic death resulting from a tear in the iliac vessels during lumbar surgery, but not from the postmortem perspective. Such investigations have recently been modernized thanks to the introduction of forensic imaging. In particular, MPMCTA offers new possibilities in postmortem investigations and can be considered the new gold standard for investigating deaths related to medical intervention. Here we describe the first case of a death during lumbar surgery using this new method.

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1. Introduction

Every surgical procedure carries risks, even a standard procedure as the lumbar disc surgery. The most frequent lesion is damage to the large blood vessels, intestinal tract, and ureters, with an incidence of about 3.8 per 10,000 cases [1]. In 1945, Linton and White reported the first case of vascular injury, an arteriovenous fistula [2]. Iliac vessels are particularly vulnerable during this surgery because of their anatomical localization with their bifurcation at the level of the fourth lumbar vertebral body. The particularity of this surgical event is that symptoms, if not immediate, are delayed and often misdiagnosed [1].

In most countries, cases of medical intervention with fatal outcome are referred to the local prosecuting attorney for a determination of whether or not a medical error was responsible. To answer this question, medico-legal investigations are required and performed by forensic pathologists, and examination of cases

in which a medical error is suspected is a growing field in legal medicine [3–5]. The forensic pathologist has to determine the cause of death, analyse the medical reports, and pronounce whether death was the result of medical intervention, an absence of appropriate intervention, or unavoidable circumstances [3]. To address these issues, a medico-legal autopsy is performed, and forensic imaging is carried out, if available. In fact, the multi-detector computed tomography (CT) scanning are perfectly suited for documenting the exact position of surgical material inside of a body, which is one of the most important issues in such cases. To detect or exclude lesions of the vascular system, postmortem angiography can be performed. The recently developed technique of multi-phase postmortem CT angiography (MPMCTA) can help in identifying the exact source of bleeding [5–7], which is very important for answering legal questions regarding medical responsibility. The combination of this imaging technique with conventional autopsy has already been called a new gold standard for investigating cases of fatal outcome after surgical intervention [6–8].

In this article, we describe a case of fatal iatrogenic laceration of the proximal portion of the left common iliac artery and left iliac

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vein during lumbar surgery in a 60-year-old woman suffering from symptomatic L5–S1 sciatica. The patient rapidly developed an intra-abdominal haemorrhage. MPMCTA detected the source of bleeding, and macroscopic examination of the lumbar section allowed identification of the exact trajectory of the surgical instrument.

2. Clinical presentation

A 60-year-old woman was admitted to the neurosurgical unit for symptomatic L5–S1 sciatica with motor deficiency in the extensor muscles of the right hallux, decreased ankle jerk reflex, impaired proprioception of the right foot, and decreased sensitivity of the right hallux and the lateral side of the right foot. She also presented with a right foot drop and a steppage gait. Peripheral pulses were all present. Magnetic resonance imaging showed a narrowed lumbar canal, predominantly in L4–L5, associated with a circumferential bulging of the L4–L5 disc and compression of the right L5 nerve root (Fig. 1). An emergency surgery was decided. The medical records did not mention any bleeding disorder, clotting issue or if the INR (International Normalized Ratio) was checked prior to the intervention.

The intervention for the acquired lumbar stenosis was made according to standard rules in a lumbosacral approach with a removal of the spinous processes and a laminectomy of the L4 and L5 vertebrae. The yellow ligament was resected, and the dural sac was decompressed. Surgeons found two extra-ligamentary fragments that were compressing the L5 nerve root and removed them using a hook. They also discovered a hole in the left longitudinal posterior ligament and proceeded to a sectorial discectomy. The surgery was successful, but as they were closing the wound, the blood pressure dropped to 72/40 mmHg with a decreasing heart rate to 60 beats/min. The patient was positioned in the dorsal decubitus position and external cardiac massage was started. An abdominal ultrasonography showed an increased aortic diameter, and the surgeons proceeded to a xipho-pubic exploratory laparotomy. They discovered a hemoperitoneum and an extensive haematoma of the retroperitoneal space. The aorta was clamped and the haematoma evacuated. A tear in the left common iliac artery was discovered. During all of these procedures, the patient never recovered from pulseless electrical activity, and she died despite more than one hour of resuscitation that included an internal cardiac massage. Because the death occurred during a surgical

intervention, the local prosecutor requested a medico-legal autopsy in order to evaluate an eventual medical error.

3. External examination

The external examination revealed signs of medical interventions (fresh injection marks, signs of laparotomy, and surgical operation in the back). Rigor mortis was present in the major and minor joints. Rare pale reddish postmortem lividity was present on the body posteriorly and could be slightly eliminated by finger pressure. Height was 158 cm and weight 73 kg (BMI 29 kg/m²).

4. Forensic imaging

Prior to any manipulation of the corpse, a native postmortem CT scan was carried out on an eight-row CT unit (CT Lightspeed Ultra; GE Healthcare, Milwaukee, WI, USA; field of view: 50 cm; slice thickness: 1.25; reconstruction interval: 1 mm; 120 kv and 300 mA; tube rotation 1 s; pitch 1.375). After the external examination, MPMCTA was performed according to the standardized protocol described by Grabherr et al. [6] with the following scan parameters: field of view: 50 cm; slice thickness: 1.25; interval of reconstruction: 1 mm; 120 kv and 280 mA; tube rotation 0.8 s; pitch: 1.375 for the arterial phase and field of view: 50 cm; slice thickness: 2.5; interval of reconstruction: 2 mm; 120 kv and 280 mA; tube rotation 0.8 s; pitch: 1.375 for the venous and dynamic phase. Cannulation of the femoral vessels was achieved using 16- or 18-Fr cannulae (MAQUET GmbH & Co. KG, Rastatt, Germany) for the artery or vein, respectively, with collection of blood and fluid samples. A pressure-controlled perfusion device (Virtangio[®], Fumedica AG, Muri, Switzerland) was used to inject a mixture of contrast agent (Angiofil[®], Fumedica AG, Muri, Switzerland) with paraffin oil (paraffinum liquidum, obtained in local pharmacy). The arterial phase of the angiography is carried out after the injection of 1200 ml of contrast-agent mixture (6% Angiofil[®]) retrograde during 90s into the arterial system. The venous phase needs the injection of 1800 ml of contrast-agent mixture anterograde into the femoral vein during 135 s. The last phase is dynamic, with injection of 500 ml of the contrast-agent mixture into the femoral artery with a flow of 3 ml/s during 150 s. The images were viewed by two board-certified radiologists, one specialized in vascular radiology and the second specialized in neuroradiology, as well



Fig. 1. Magnetic resonance imaging, T2 TSE-weighted images: (a) sagittal and (b) axial acquisitions showing circumferential bulging disc of the L4–L5 level (arrow), posterior interarticular hypertrophic arthrosis, with a narrowed dural sac (acquired lumbar stenosis), and a lumbarization of S1 (star).

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