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Short Communication

Fatal hemorrhage following sacroiliac joint fusion surgery: A case report

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ABSTRACT

Threaded pins and wires are commonly used in orthopedic practice and their migration intra- or post-operatively may be responsible for potentially serious complications. Vascular and visceral injury from intra-pelvic pin or guide-wire migration during or following hip surgery has been reported frequently in the literature and may result in progression through soft tissues with subsequent perforation of organs and vessels. In this report, we describe an autopsy case involving a 40-year old man suffering from chronic low back pain due to sacroiliac joint disruption. The patient underwent minimally invasive sacroiliac joint arthrodesis. Some intra-operative bleeding was noticed when a drill was retrieved, though the patient died postoperatively. Postmortem investigations allowed the source of bleeding to be identified (a perforation of a branch of the right internal iliac artery) and a potentially toxic tramadol concentration in peripheral blood to be measured.

1. Introduction

The sacroiliac (SI) joint is a common though under-recognized source of chronic low back pain. Despite recent efforts to characterize the role of the sacroiliac joint in chronic low pain back, no definitive conservative, interventional, or surgical options exist for managing chronic pain originating from this joint. In patients suffering from sacroiliac joint degeneration or disruption with unsuccessful non-surgical care, joint arthrodesis has been reported to relieve pain and improve quality of life [1–3]. Traditional open arthrodesis via large anterior or posterior surgical approaches is limited by high complication rates, significant iatrogenic neurovascular and muscular injury risks, additional surgical procedure needs and unsatisfactory long-term patient outcomes. Recently developed, minimally invasive SI joint fusion techniques have thus gained interest. The advantages of these techniques include minimization of soft-tissue trauma, less operative blood loss, faster rehabilitation and reduced length of hospital stay [2–5]. Prospective studies have revealed minimally invasive procedures as safe and effective with mid-term follow-up indicating clinically significant improvement in pain, function and quality of life in patient populations [3].

Vascular and visceral injury from intra-pelvic pin or guide-wire migration during hip surgery has been reported frequently in the literature. Here we present a fatal case of abdominal, retroperitoneal and pelvic hematoma from a minimally invasive SI joint arthrodesis in a patient suffering from chronic SI joint pain. Some intra-operative bleeding was noticed when the drill was retrieved, though the patient died postoperatively after being transferred to a normal hospital unit. Postmortem investigations (postmortem angiography and toxicology) allowed the source of bleeding to be identified and a potentially toxic tramadol concentration in peripheral blood to be measured.

2. Case report

A 40-year-old Caucasian man diagnosed with right SI joint disruption was admitted to hospital for minimally invasive SI joint arthrodesis using the iFuse Sacroiliac Joint Fusion system®. His past medical history was significant for lumbar discal herniation surgery (L4–L5), lumbosacral spondylolisthesis (L5–S1), lumbar laminectomy (L5), vertebral fixation L4–L5 and L5–S1, surgical removal of fixation material (L4–L5 and L5–S1) and former drug addiction (cocaine, ecstasy, amphetamine). The patient did not have a history of any bleeding disorders, coagulopathies or thrombocytopenia, nor had he ever received anticoagulant or anti-platelet medication. SI joint pain management included analgesics and non-steroidal anti-inflammatory drugs beyond attempts to correct the underlying biomechanical pathology via physical therapy and intra-articular steroid injections. Medical treatment consisted of diazepam, clonazepam, citalopram, and oxycodone, though the patient was described as non-compliant.

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All laboratory results were unremarkable during preoperative assessment.

Surgical procedure was performed in prone position under general anesthesia. The entire procedure was monitored using lateral, inlet and outlet views on fluoroscopy. A 4 cm longitudinal incision was carried out using radiographic coordinates. The skin and subcutaneous tissues were incised down to the gluteal fascia. The fascia was penetrated bluntly and the muscle split longitudinally in order to gain access to the outer ilium table. No abnormal, surgical site bleeding was observed. A Steinmann pin was inserted through the ilium across the SI joint and into the lateral portion of the sacral ala, lateral to the S1 neural foramen. Fluoroscopic views confirmed that the pin was within the sacrum. A cannulated drill was used through a soft tissue protector in order to prepare and widen the bone through the ilium and sacrum. Proper intra-osseous trajectory and depth were confirmed via pelvic inlet and outlet views on fluoroscopy. Significant bleeding was noticed (200 ml) when the drill was retrieved. Again, inlet views on fluoroscopy confirmed that the pin was within the osseous envelope of the sacrum, hence this bleeding was interpreted as originating from the sacral bone of a young patient. The anesthesiologist did not notice any significant changes in blood pressure or other parameters and the surgery proceeded. The first implant (7 mm diameter) was placed at the S1 level. No hemodynamic instability was noticed and two more implants were introduced with no apparent hemorrhage at the surgical site. No further abnormal, intra-operative bleeding or blood pressure fall was reported during the remainder of the surgical procedure.

The incision was closed in layers with absorbable suture material and steristrips. After extubation the patient was able to breathe spontaneously and was transferred to the post-anesthesia care unit under analgosedation for continuous vital sign monitoring. The patient stayed in this unit for 4 h and appeared conscious, oriented and cooperative. However, he did complain of extremely severe abdominal pain. Mild tachycardia was noted, though not further investigated. Hemoglobin was not monitored. The patient received morphine via a morphine pump for the pain and was transferred to the ward where he was found unconscious 2 h later. Attempted manual cardiopulmonary resuscitation was performed to no avail.

Postmortem examination was requested by the inquiring authorities since the death had occurred in hospital and a correlation between SI joint fusion surgery and the fatal outcome could not be formally excluded.

Unenhanced computed tomography (CT)-scan and multi-phase postmortem CT angiography were performed prior to autopsy. Unenhanced CT-scan revealed the presence of fluid within the peritoneum with extension to the pelvis. The arterial phase of the postmortem angiography revealed an extravasation of contrast material from a branch of the right internal iliac artery. The CT study excluded other diseases or bleeding involving intra-abdominal organs (Fig. 1).

The deceased was 167 cm tall and weighed 63 kg (body mass index 23 kg/m^2). External examination was unremarkable except for cardio-pulmonary resuscitation marks on the chest, fresh injection marks due to medical intervention on the upper and lower limbs, and a fresh, 4 cm surgical incision, longitudinally oriented, next to the right sacral region. Internal examination revealed rib fractures and intercostal space hemorrhagic infiltrations consistent with cardio-pulmonary resuscitation marks. The heart weighed 390 g. The myocardium did not exhibit fibrosis or ischemic areas. The lungs were relatively edematous and congested (right lung 680 g, left lung 530 g). Pulmonary embolism was not observed. The stomach contained an estimated 265 g of greenish liquid material. Examination of the abdominal cavity showed hemoperitoneum (150 ml of blood and clots). A fresh, large retroperitoneal hematoma was found, more pronounced on the right side, as well as a hematoma involving the soft tissues of the lesser pelvis. No extensive hemorrhage was noted at the surgical site, though subcutaneous and muscular tissues surrounding the surgical incision revealed mild hemorrhagic infiltrations. The exact source of the bleeding could not be precisely identified at autopsy. The implants appeared to be positioned as the surgeons described without going beyond the bone. They were near to the site of the extravasation of the contrast material identified by postmortem angiography. The spleen, liver and kidneys did not show any significant, macroscopic changes. The brain weighed 1650 g and displayed edema with slight flattening of the gyri and mild cerebellar tonsillar grooving.

Sections of most organs were examined microscopically (hematoxylin–eosin stain). Oil Red O stain of lung tissue samples was performed during autopsy without preliminary tissue fixation. The heart revealed no evidence of subendocardial hemorrhage or acute myocardial ischemia. Pulmonary fat embolism was not detected. Neuropathology was unremarkable. Histology of the vertebral bone did not reveal osteoporosis.

Toxicology included blood ethanol and other volatile compound determination as well as general screening for common drugs and illegal substances by gas chromatography–mass spectrometry (GC–MS) using commercial mass spectrum libraries, high-performance liquid chromatography with diode-array detection (HPLC–DAD), headspace-gas chromatography flame ionization detection (HS-GC-FID) and liquid chromatography coupled to tandem mass spectrometry (LC–MS/MS). Toxicological analysis failed to detect ethanol, revealing the presence of diazepam, nordiazepam, clonazepam, 7-aminoclonazepam, citalopram, oxycodone, morphine and morphine glucuronides in femoral blood within therapeutic ranges. In addition, a potentially toxic concentration (1 mg/l) of (unprescribed) tramadol and its main, active metabolite O-desmethyltramadol were measured in femoral blood. Tramadol and O-desmethyltramadol were also found in the gastric content. Hair analysis confirmed tramadol use during the months preceding death though it revealed no other recreational drugs.

Based on clinical information as well as the results of all postmortem investigations, the cause of death was determined to be abdominal, retroperitoneal and pelvic hemorrhage due to a lesion or perforation of a branch of the right internal iliac artery. The potentially toxic blood tramadol concentration was considered as having significantly contributed to the death.

3. Discussion

SI joint-generated low back pain remains an under-diagnosed and under-treated condition. Indeed, there are no therapeutic options known to offer excellent outcomes pertaining to patient safety and long-term pain effectiveness. Traditional surgical options for chronic low back pain such as inter-body fusion and decompression focus on the inter-vertebral disk or the vertebral column itself. The possible contribution of the SI joint to this kind of pain has been largely ignored, potentially leading to under-diagnosis, misdiagnosis or misdirected surgical intervention on the lumbar spine [6,7].

Minimally invasive SI joint arthrodesis was developed specifically to fill the therapeutic gap between ineffective conservative care and invasive open surgery. The latter is associated with complication rates of 22–65%, including re-operation, deep wound infection, iliac crest fracture, and pulmonary embolism. Minimally invasive SI joint arthrodesis techniques yield lower complication rates compared to those of open surgery. Technical advantages include small surgical incisions, relatively short operative times, minimal blood loss, decreased soft tissue disruption, shorter hospital stays and relatively short immobilization periods [2–6,8–10].