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Anesthetic challenges in patients with ankylosing spondylitis requiring lower limb surgery – A case report and literature review

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ABSTRACT

Ankylosing spondylitis is one of the global top health burdens and patients affected by it frequently require surgery related to disease progression, such as orthopedic surgery. These patients may prove difficult to manage from an anesthetic standpoint, regardless of the anesthetic technique employed, mainly given the potential for difficult airway access and related comorbidities. We present the case of a 52-year-old male posted for urgent cemented total hip arthroplasty with associated bilateral pulmonary fibrosis and an anticipated difficult airway in whom regional anesthesia was performed with satisfactory results, with a favorable intraoperative and postoperative course. The literature review explores the anesthetic techniques employed when a tailored approach is required in managing patients with ankylosing spondylitis.

Keywords: ankylosing spondylitis, general anesthesia, spinal anesthesia, hip surgery

INTRODUCTION

Ankylosing spondylitis (AS) is a chronic inflammatory disease that mainly affects the axial skeleton, but also the peripheral joints and associated entheseal structures. Occasionally it may present as a multisystemic disease, sometimes manifesting significant cardiovascular and pulmonary dysfunction. AS belongs to the group of spondyloarthritis (SpA), sharing similar characteristics with other forms of disease, namely genetic with familial predisposition and the presence of the HLA-B27 antigen, as well as clinical and imaging features, the hallmark being sacroiliitis detected on plain X-ray or magnetic resonance imaging (MRI) [1].

Due to its' chronic nature, AS causes irreversible damage through a persistent inflammation that leads to the formation of bony outgrowths called syndesmophytes or causing abnormal calcifications of ligaments and ultimately vertebral body fusion. These in turn translate into severe deformations of the spine and limited axial mobility. Up to 24-36% of patients also presents with involvement of the hip joint and often requires orthopedic surgery for total hip arthroplasty [2].

Patients with AS represent a challenge to the anesthetist, regardless whether the technique of choice is general or regional anesthesia, taking into consideration the frequent occurrence of a difficult airway access, as well as associated cardiovascular and pulmonary comorbidities.

CASE REPORT

A 52-year-old male presented to the Emergency Department with pain and complete loss of function of his right lower limb. The symptoms developed spontaneously and there was no history of recent

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trauma. The patient was admitted to the orthopedic ward with a diagnosis of right femoral neck fracture, stage IV Garden.

His past medical history was significant for spondylarthritis, bilateral pulmonary fibrosis, severe osteoporosis with multiple vertebral compression fractures at the T7-T11 levels, multinodular goiter with hyperthyroidism. The patient also exhibited several cardiovascular risk factors, such as 30 pack-year smoker, grade III obesity and uncontrolled grade III arterial hypertension. He also suffered from chronic venous insufficiency. His surgical history revealed a L2 vertebroplasty in the past decade.

His chronic medical treatment included sulfasalazine 2 grams daily, thiamazole and teriparatide. The patient also admitted to using non-steroidal anti-inflammatory drugs, with an "on-demand" regime.

His imaging workup included a chest x-ray which showed diffuse bilateral peribronchial fibrosis. Due to the emergency and logistic constraints, pulmonary function tests (i.e., spirometry, carbon monoxide diffusing capacity) could not be performed preoperatively. His complete blood count, inflammatory markers, basic metabolic panel and blood clotting tests were within normal range.

The preanesthetic consult was significant for an ASA (American Society of Anesthesiologists) surgical risk class IIIE, a Mallampati III score, a thyromental distance of 5 cm and a neck circumference of 33 cm. He was partially edentulous, with a class B on the mandibular prognathism test and a slight degree of limitation of the cervical spine mobility was also noted.

Due to the aforementioned comorbidities and given the high risk of an anticipated difficult airway, we considered that regional anesthesia was preferable to general anesthesia in this patient. Medical information and choices were provided for the patient in order to make an informed decision. The patient opted for spinal anesthesia and he was brought to the operating room.

After standard anesthetic monitoring, two peripheral 18G intravenous catheters were placed and the difficult airway kit was checked and requested on site. With the patient in the sitting position, premedication was administered (Midazolam 20 ug/kg). The L2-L3 intervertebral space was marked. Employing a strict aseptic technique, a 25G Quincke spinal needle was advanced in a median approach until clear cerebrospinal fluid was noted and 12 mg of isobaric Bupivacaine, 30 ug of Fentanyl and 10 ug of Adrenaline were injected into the intrathecal space. After spinal block onset, a right fascia iliaca nerve block was performed under ultrasound and nerve stimulation monitoring and 30 ml of 0,2% Ropivacaine (0,5 mg/kg) with 6 mg of Dexamethasone were injected. The maximum anesthetic height achieved was at approximately the T11 dermatome, which allowed for the surgery to be safely performed, namely a cemented total right hip arthroplasty with a Zimmer-Biomet prosthesis.

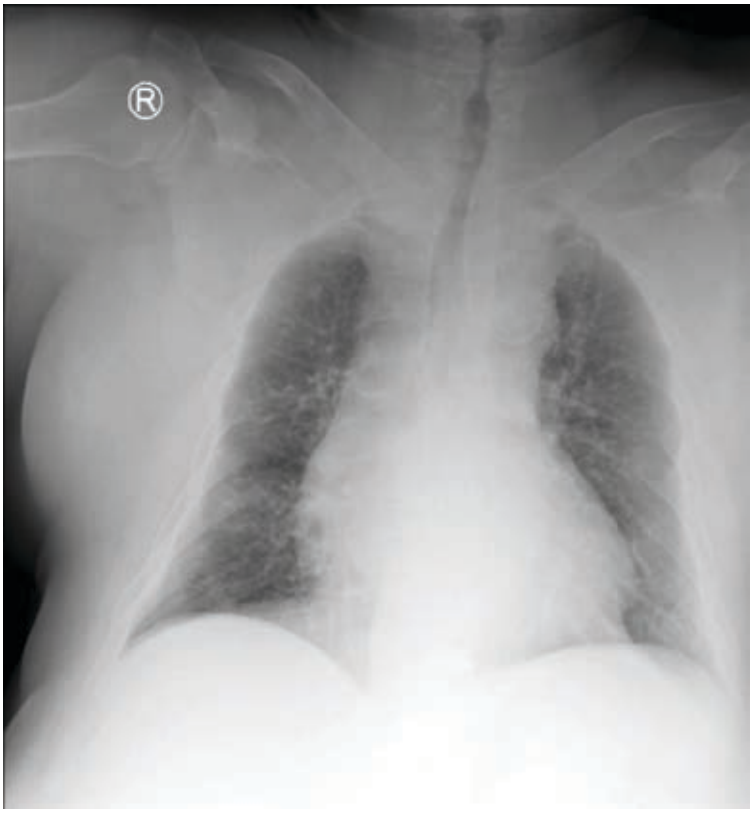

FIGURE 1. - Frontal chest X-ray demonstrating diffuse bilaterally increased pulmonary interstitial markings, suggestive of pulmonary fibrosis

Intraoperative monitoring did not show any significant variation of the patient's vital signs and he remained stable for the entire three-hour duration of the procedure. The immediate postoperative evaluation of the patient's pain using a VAS (visual analogue scale) revealed the patient was comfortable and not in pain. Pain management was therefore achieved with supplementary paracetamol and nonsteroidal anti-inflammatory drugs (NSAIDs) as needed. Remission of the spinal block and the fascia iliaca block occurred after four and twelve hours, respectively. No adverse events were noted. The patient's postoperative course was favorable, as he was permitted weight-bearing on the operated limb by using a walking frame on day two after surgery. He was discharged on postoperative day eight with recommendation for physical therapy and rehabilitation.

DISCUSSION

Patients with AS frequently present a challenge for the anesthesia team. This is mainly due to the high probability of difficult airway access because of limited cervical spine movement caused by vertebral fusion and temporo-mandibular joint involvement with poor interincisor distance. Moreover, AS patients can present associated comorbidities, notably restrictive pulmonary dysfunction due to costovertebral joint involvement and pulmonary fibrosis. These circumstances may complicate general anesthesia and mechanical ventilation. For these cases, several techniques may be utilized for airway management, including laryngeal masks or awake fiberoptic intubation [3]. Videolaryngoscopy has been shown to facilitate glottic visualization in a series of patients who were managed by means of nasotracheal intubation, but did not significantly improve the tracheal intubation rate [4]. Vertebral fractures and secondary neurologic deficits due to laryngoscopy itself have been described in certain patients with severely altered cervical spines [5].

On the other hand, neuraxial anesthesia is a safe and effective alternative to general anesthesia in surgical patients with AS, particularly those with surgical procedures involving the lower limb. Nonetheless, spinal anesthesia is particularly difficult to administer in such patients, owing to syndesmophytic vertebral fusion and calcifications of the interspinous ligament and the ligamentum flavum.

Certain approaches for administering spinal anesthesia in patients with AS and modified lumbar spinal anatomy have been reported. The use of a median approach in patients with evidence of interspinous ligament calcification is somewhat controversial, with a recent systematic review suggesting a paramedian approach or ultrasound identification of the intervertebral space be utilized in such patients [6]. On the other hand, the paramedian approach seems to have a relatively high failure rate and frequently requires multiple attempts to achieve an adequate spinal block [7]. Caudal epidural anesthesia, where the anesthetist inserts an epidural catheter through the sacrococcygeal membrane, an anatomical structure frequently untouched by the inflammatory process, has been reported to provide sufficient surgical anesthesia and postoperative analgesia, while also reducing the need for opioids in the immediate postoperative period [8]. This latter technique may however produce significant complications, such as accidental intraosseous injection of local anesthetic with consequent local anesthetic systemic toxicity.

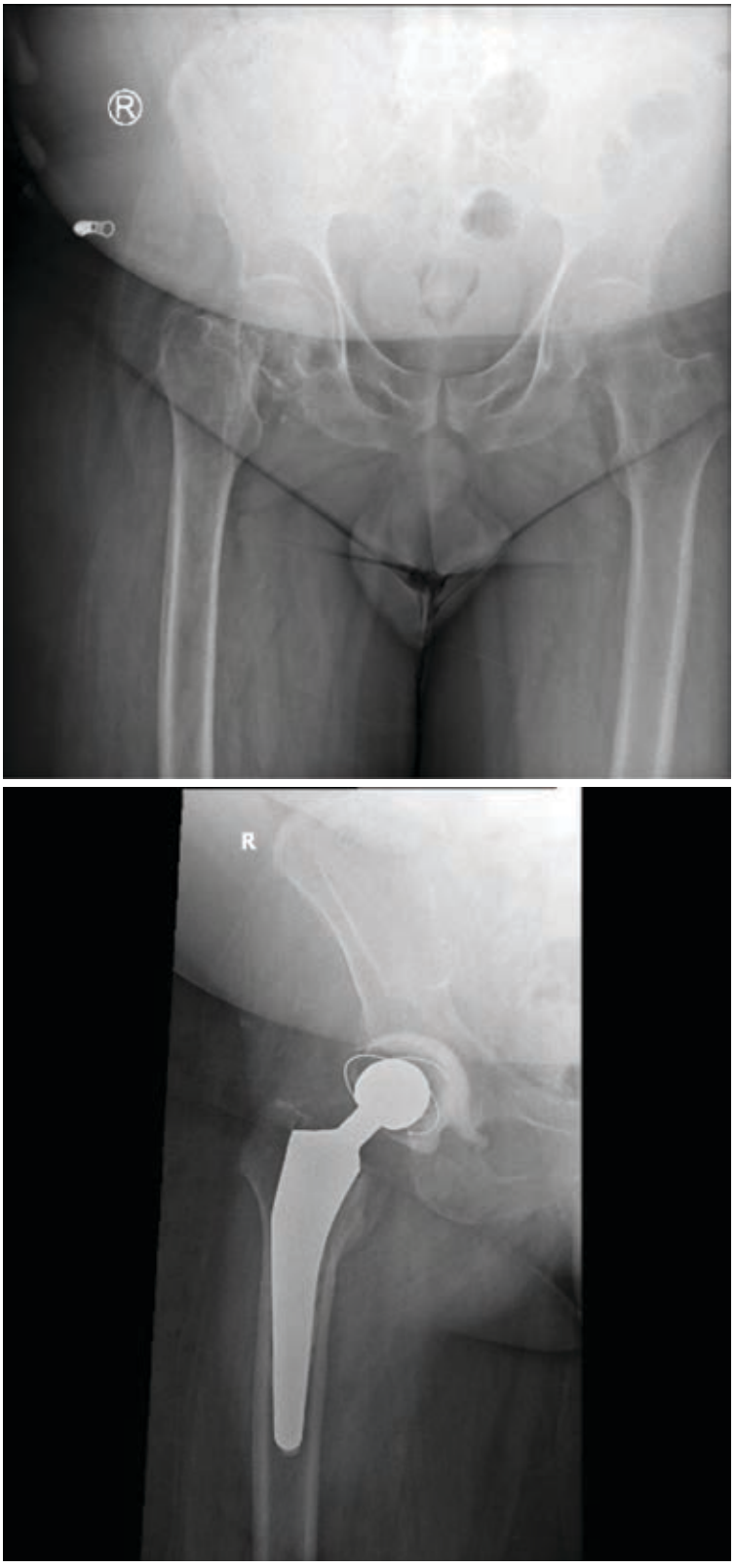

FIGURE 2. - Pelvic X-rays demonstrating the right femoral neck fracture (left) and the postoperative outcome following total hip arthroplasty (right)

As mentioned above, ultrasound techniques may facilitate intervertebral space visualization in patients with AS and altered surface anatomy. For example, placing a linear probe in the paramedian position in a longitudinal axis or in the median position in a transverse axis can help with identifying the interlaminar spaces, since the vertebral lamina has a characteristic "sawtooth" pattern or the anatomical elements of the vertebral canal, respectively [9]. Some authors report performing spinal blocks under fluoroscopy [10].

In patients with severe calcification of the ligamentum flavum or multiple syndesmophytes, a particular approach has been described – a mini-laminotomy. It has been performed under local anesthesia with the patient positioned in the prone position; this technique exposes the vertebral canal and allows the insertion of a spinal needle into the intrathecal space under direct visualization [11]. Certain complications have also been described, such as direct nerve lesion, vertebral fractures and cardiovascular and respiratory compromise secondary to an inappropriately high level of motor block.

Spinal or epidural hematomas may present as a severe and relatively frequent complication in patients with AS undergoing orthopedic procedures, more so than in the non-AS orthopedic patient population [12]. Their higher prevalence in these patients may be explained in part by the greater number of attempts required to perform adequate spinal anesthesia, a contraction of the epidural space which is an important risk factor for spinal block level ascension in these patients, as well as due to chronic use of certain medications like disease-modifying antirheumatic drugs with antiplatelet side effects, NSAIDs or acetylsalicylic acid.

Regional blocks play an essential role in the anesthetic management of orthopedic patients. The reported case depicts a patient with AS who underwent total hip arthroplasty and a T12 paravertebral block, as well as lumbar plexus and sacral plexus blocks were performed with gratifying results [13].

CONCLUSIONS

Patients with AS, especially those requiring lower limb orthopedic surgery, can oftentimes pose a real challenge to the anesthetist. Several anesthetic techniques have been employed during general or regional anesthesia and careful consideration must be given to each. A tailored approach should always be used depending on the patient's characteristics. We consider that, whenever feasible, regional anesthesia should be recommended for such patients, especially when an anticipated difficult airway and associated comorbidities may negatively impact the patient's intraoperative and postoperative course.

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