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Anesthetic Challenges in a Patient with Ankylosing Spondylitis Undergoing Corrective Spinal Surgery: A Case Report

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ABSTRACT

Ankylosing spondylitis (AS) is a progressive inflammatory disease characterized by spinal rigidity, kyphotic deformities, and significant challenges in airway management during surgery. We report the case of a 50-year-old male with severe kyphosis caused by long-standing AS, scheduled for corrective spinal surgery. Preoperative assessment revealed restricted cervical mobility, a “chin-on-chest” deformity, and a high risk of difficult intubation. Awake video-laryngoscopy-assisted intubation, combined with regional airway blocks, was successfully performed to minimize complications. Intraoperative neuromonitoring, strategic positioning, and meticulous hemodynamic management were implemented to ensure patient safety. The surgery was completed without neurological deficits, and the patient was discharged in stable condition. This case underscores the importance of thorough airway planning, neuromonitoring, and intraoperative vigilance in AS patients undergoing spinal correction. It highlights the critical role of a multidisciplinary approach in achieving successful surgical outcomes.

Introduction

Ankylosing spondylitis (AS) is a long-term inflammatory condition driven by the immune system and is one of the most prevalent types of seronegative spondyloarthropathies [1]. This condition is characterized by inflammation and the gradual fusion of the axial skeleton and adjacent joints [1-4]. AS primarily affects men, with peak onset occurring in the third decade of life, particularly in individuals carrying the HLA-B27 allele [1, 3]. Patients experience back pain and stiffness caused by complications such as atlantoaxial subluxation, cervical fractures, and spinal cord compression [2]. Additionally, AS can present with extra-articular symptoms, including anterior uveitis, inflammatory bowel disease, psoriasis, and cardiovascular or pulmonary complications. Severe thoracic and costovertebral joint damage may result in restricted ventilation [3].

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In advanced cases, surgical interventions such as knee and hip replacements or spinal correction for flexion deformities may be necessary to improve function and quality of life. These procedures present significant challenges for anesthesiologists [3, 5]. Preoperative evaluation should emphasize the severity of the disease, extra-articular involvement, and potential airway complications. Documenting perioperative neurological deficits is critical, and essential investigations may include pulmonary function tests, ECG, echocardiography, and cervical spine imaging [3].

A rigid posture and limited joint mobility, especially in the temporomandibular joints, pose substantial challenges in airway management and anesthesia administration [2, 5]. Modern airway strategies, such as awake video-laryngoscope intubation and the use of a laryngeal mask airway, are particularly beneficial for these patient categories [2, 5]. Maintaining proper cervical alignment is strongly recommended due to the fragile and stiff nature of the spine [6]. Motor-evoked potential (MEP) and somatosensory-evoked potential (SSEP) recordings are frequently utilized for neurological pathway analysis, offering significant benefits for electrophysiological monitoring [5].

The following case highlights the successful management of anesthesia challenges in a patient with ankylosing spondylitis.

Case presentation

A 50-year-old male was diagnosed with ankylosing spondylitis 20 years ago, with kyphosis onset occurring 12 years ago and progressing significantly over the past four years. He presented with severe painless bending and inability to look forward, prompting the scheduling of corrective spinal surgery aimed at addressing the spinal deformity, alleviating symptoms, and improving functional abilities.

The patient's medical history includes vitiligo, hyperthyroidism for 16 years, a smoking history of two packs per year, and a family history of rheumatoid arthritis. Physical examination revealed a full set of teeth and a chin-on-chest deformity. Both upper and lower limb motor function were graded as 5/5. Deep tendon reflexes were 2+, while plantar reflexes were downward. There were no signs of incontinence, saddle paresthesia, clonus, sensory instability, or Hoffman sign. Bilateral straight-leg raising (SLR) was negative. Severe kyphosis was visibly apparent (Figure 1 a and b).

His cardiovascular system was unremarkable upon physical examination, and his hematologic and biochemical tests were within normal limits. The preoperative airway assessment indicated a potential for difficult intubation due to restricted cervical movement, particularly in extension, and a Mallampati score of 4. Spirometry (pulmonary function testing) revealed a restrictive pattern. X-ray imaging demonstrated thoracolumbar kyphosis, complete ankylosis of the spine, and bilateral hip joint ankylosis (Figure 2).

After obtaining written informed consent for general anesthesia, preparations for difficult intubation were made, including standby equipment such as a video laryngoscope and a flexible fiberoptic bronchoscope. The patient's NPO (nothing by mouth) time was adequate, and standard monitoring procedures including pulse oximetry, invasive blood pressure monitoring, electrocardiography, capnography, and thermometry were initiated. Intravenous access was verified. During preoxygenation, 100% oxygen was administered for 3 minutes at a rate of 5 liters per minute.

The airway was prepared after intravenous sedation with 100 mcg fentanyl (Caspian Tamin) and 2 mg

Fig. 1. Severe kyphosis a and b

Fig. 2. Thoracolumbar kyphosis, entire ankylosis of the spine, and ankylosis of both hip joints(a&b)

midazolam (Tehran Chemi), while maintaining spontaneous breathing under sterile conditions. The oral cavity was anesthetized with 10% lidocaine spray (Kharazmi). The superior laryngeal nerve was blocked by inserting a needle 2 cm lateral to the upper thyroid cartilage notch, directed upward and backward to a depth of 1–1.5 cm, followed by the injection of 2 mL of 2% lidocaine (Caspian Tamin) on each side. A transtracheal block was performed by identifying the cricothyroid membrane (CTM) and advancing a needle attached to a 5-mL syringe straight back and slightly downward. Upon aspirating air, confirming proper positioning, 4 mL of 2% lidocaine was injected.

After approximately 10 minutes, awake video-assisted oral intubation was successfully performed using a 7.5 mm ID cuffed spiral endotracheal tube (Well Lead). Fiberoptic intubation was planned as a backup strategy in case of failure. Proper endotracheal tube placement was verified with positive end-tidal carbon dioxide detection and bilateral equal breath sounds. General anesthesia was initiated, and additional peripheral (16-gauge) and arterial (20-gauge radial) lines were placed, along with neuromonitoring electrodes for early detection of neurological compromise.

To maintain anesthesia, propofol (100 mg/kg/min; Fresenius KABL) and remifentanil (0.5–1 mcg/kg/min; Exir) were infused, supplemented by ketamine (30 mg/min; Sterop) and lidocaine (0.5 mg/kg/min; Caspian Tamin). A baseline neurologic monitoring test was performed by the neuromonitoring technician.

The four-hour surgical procedure involved vertebral osteotomy. The patient received 1000 mL of Ringer's lactate, 1500 mL of isotonic saline, and one unit of packed red blood cells, with an estimated blood loss of approximately 1500 mL. Somatosensory and motor nerve monitoring remained satisfactory throughout the operation.

Postoperatively, the patient was transferred to the Intensive Care Unit and discharged after seven days in stable condition (Figure 3).

Discussion

Ankylosing spondylitis (AS) affects approximately 0.1%–0.5% of the population [6]. Progressive ossification and autofusion of vertebral joints are hallmark features, often leading to the characteristic "Bamboo Sign" seen in advanced radiographs [5, 7]. Severe spinal deformities, such as chin-on-chest caused by fixed cervical flexion, can impair forward vision, hygiene, and swallowing [3, 5]. Limitations in cervical range of motion, combined with temporomandibular joint involvement that restricts mouth opening, pose significant challenges for anesthesiologists during intubation [2]. Pathological changes in the posterior longitudinal or interspinous ligaments can lead to the formation of continuous bony bars, making epidural or spinal catheter placement particularly challenging or even impossible in some cases [7].

In 2018, Dr. Copuroglu and Sagiroglu documented anesthetic challenges in two cases of AS. The first involved a 47-year-old man scheduled for hip replacement who initially refused regional anesthesia. After failed fiberoptic intubation attempts, he was awakened, and an epidural catheter was successfully placed despite prior lumbar surgery. Upon detecting cerebrospinal fluid, the catheter was repositioned

Fig. 3. After surgery(a and b)

in the subarachnoid space, allowing the surgery to proceed. The second case involved a 49-year-old woman undergoing hip replacement who successfully received epidural anesthesia [2].

Our patient, a 50-year-old man scheduled for spinal correction surgery, required awake videolaryngoscopy-assisted intubation due to the nature of the procedure and his physical condition. After performing nerve blocks for airway innervation while maintaining spontaneous breathing, intubation was successfully achieved using a video laryngoscope. Similarly, Irfan Ul Haq et al. managed a predicted difficult airway in an AS patient undergoing hip replacement using a fiberoptic bronchoscope, mirroring our approach [8]. Conversely, Kotekar et al. did not perform awake intubation for a similar case. They reported anesthetic challenges in an AS patient where epidural and subarachnoid block attempts failed due to spinal rigidity and deformity. Awake intubation was ultimately successful on the third attempt [7].

Proper positioning in AS patients is crucial due to their increased risk of iatrogenic injuries related to osteopenia and osteoporosis. Maintaining cervical spine alignment is imperative [6]. Supporting the patient with foam blocks, pillows, or bolsters to accommodate kyphosis has been recommended. A jack table can be used to accommodate the head in cases of chin-on-chest deformity, while the reverse Trendelenburg position helps mitigate venous stasis, cerebral edema, and laryngeal swelling during prolonged surgeries [9]. To minimize head rotation, we maintained alignment between the head and torso. In our case, a Mayfield head frame was used in combination with the reverse Trendelenburg position to reduce intraocular pressure risk, and multiple pillows were provided for support. Daniel M et al. applied similar positioning techniques at their institution [6], as did Kolb et al. in 2022 for AS patients undergoing surgery [9].

Complex spinal deformities in AS often necessitate prolonged surgeries, frequently requiring prone positioning that may expose soft tissues to extensive pressure. Neurological monitoring is vital during spine surgery and manipulation [6]. Intraoperative electrophysiological monitoring, including Somato-sensory Evoked Potential (SSEP) and Motor Evoked Potential (MEP), offers non-invasive methods for assessing sensory and motor pathways. While SSEP evaluates the sensory pathway and dorsal horn, MEP assesses motor function and the anterior spinal column. Volatile anesthetics and neuromuscular blockers may reduce amplitude or increase latency, but propofol and remifentanil infusions preserve MEP and SSEP signals [3, 5]. Some studies suggest that propofol may cause dose-dependent suppression of MEP amplitude, whereas ketamine is known to enhance it.

In our case, the patient's neurological pathways were monitored using SSEP and MEP. Propofol, remifentanil, ketamine, and lidocaine were infused during the procedure, with no observed changes in latency or amplitude. Langeloo et al. studied MEP in 16 patients undergoing osteotomy and recommended its use for monitoring during extension osteotomy [10, 11]. Andleeb et al. (2022) assessed the effects of subanesthetic ketamine doses on MEP during spinal surgeries, finding that ketamine increased signals by 24%–100% compared to a saline control group [12]. While we did not compare ketamine with a placebo, no signal degradation occurred after its infusion in our case.

Conclusions

Ankylosing spondylitis poses significant challenges and risks for anesthetists due to its systemic effects. For lower limb and perineal surgeries, neuraxial blocks can serve as a viable alternative to the technically demanding general anesthesia approach. Effective management of challenges such as difficult positioning, airway complications, and associated cardiovascular, pulmonary, or neurological risks is critical.

MEP and SSEP monitoring are strongly recommended for spinal surgeries to reduce the risk of neurologic complications. These procedures demand anesthetics that minimally interfere with neurophysiological signals. Further research is necessary to better understand the specific impacts of ketamine and lidocaine on SSEP and MEP latency and amplitude.

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Ethical Considerations

Ethical statement

The patient has provided informed consent for participating in the study and publishing the images in this case report.

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Conflict of Interests

There are no conflicts of Interest regarding the publication of this article.

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