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CASE SERIES

DIFFICULT INTUBATION IN CERVICAL SPINE INJURY PATIENTS WITH ANKYLOSING SPONDYLITIS: SINGLE-CENTER EXPERIENCE

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Abstract

Introduction: Airway management in patients with ankylosing spondylitis (AS) poses a challenge due to a limited spinal range of motion and mouth opening. This challenge is further exacerbated in instances where neck injuries result in neurological deficits. The method of choice for airway management in such cases is awake intubation using a fiberoptic bronchoscope. However, this approach can be uncertain, necessitating multiple attempts, which can be an uncomfortable experience for the awake patient.
Case Series: We studied 17 patients with AS who were operated on, at the Institute for Orthopedics "Banjica" due to cervical spine injury and consequent quadriplegia. All patients had a difficult airway. Mallampati grades were III-IV, and on a Wilson scale of 5 or more, there was rigid cervical spine stiffness, with varying involvement of the temporomandibular joint, inter-incisor gap below 3.2cm, and thyromental distance below 5.1cm. Patients were nebulized with 2% lidocaine, and a bite blocker was placed. They were sedated while maintaining spontaneous breathing. Awake nasotracheal fiberoptic intubations were performed in a semi-sitting position. After confirmation that the intubation was successful, intravenous induction was performed, and anesthesia was maintained with sevoflurane and remifentanil. After the surgery, the patients were transferred to the Intensive Care Unit for postoperative ventilation. Epistaxis occurred in 6 patients, with no other acute complications.
Conclusion: Awake fiberoptic intubation is a complex and risky procedure, especially in cases of cervical spine fracture where neurological deterioration is a possibility. Adequate topical anesthesia and sedation can provide a calm patient without coughing and vomiting.

Key Words: *Ankylosing spondylitis, Difficult airway, Intubation, Spine injury.*

Introduction

Ankylosing spondylitis (AS), alternatively known as Morbus Bechterew, is a chronic and progressive inflammatory seronegative arthropathy. The disease usually originates in the pelvic joints before expanding to the spine and affecting the spinal column region's joints, intervertebral discs and ligaments. In advanced stages, it can spread to other joints, including the hip and shoulder, and eventually lead to ossification of all connective structures and ankylosis of the joints, resulting in immobility of the spinal column that adopts a "bamboo" appearance (1,2).

Managing the airway of patients with ankylosing spondylitis can be challenging due to the reduced range of motion in the spine and limited mouth opening. A neck injury can further complicate the situation, resulting in a neurological deficit. The preferred method for airway management in such cases is awake intubation using a fiberoptic bronchoscope (3). Nevertheless, the procedure can often be uncertain and require multiple attempts, causing significant discomfort for an awake and injured patient.

We present a series of cases of advanced ankylosing spondylitis where patients underwent surgery due to cervical spine injury, with an emphasis on the challenges of establishing an airway. This study excluded patients with AS who were admitted for elective total hip or knee arthroplasty or corrective spinal surgery.

Case Series

We studied patients with AS who were admitted to the Institute of Orthopedics "Banjica" due to cervical spine injury in the period from January 2019 to December 2023. After clinical and radiological assessment, operative treatment was indicated in 17 patients due to cervical spine injury and consequent quadriplegia.

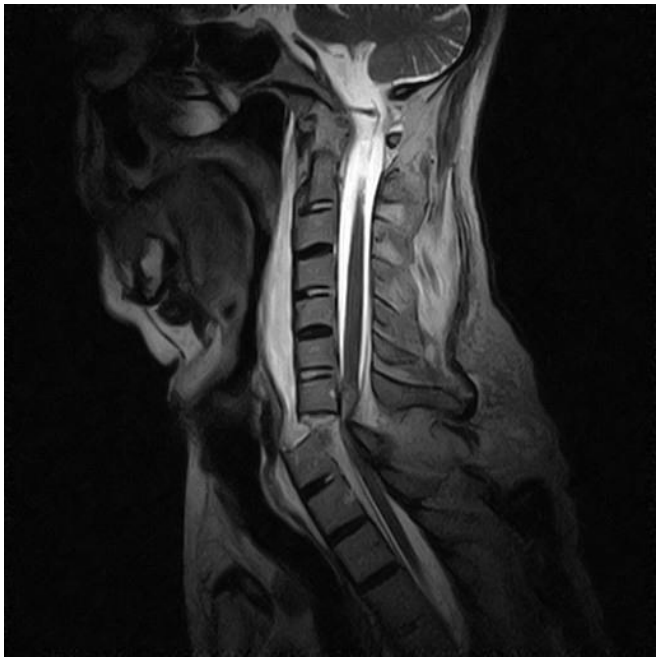

Figure 1. Magnetic resonance imaging showing C7/Th1 fracture dislocation.

Anesthesiologic evaluation revealed that all patients had a difficult airway. Mallampati grade was III-IV, and the Wilson scale was five or more; rigid cervical spine stiffness, varying temporomandibular joint involvement, inter-incisor distance less than 3.2cm, and thyromental distance less than 5.1cm. These measurements concluded that standard intubation with the Macintosh laryngoscope is not possible. The anesthesia plan included the topical application of local anesthetic on the oropharyngeal and nasal mucosa, moderate intravenous sedation, and awake intubation with a fiberoptic bronchoscope. Patients were inhaled with 10% lidocaine, and a bite blocker was placed. They were sedated with intravenous boluses of midazolam (0.02mg/kg) and fentanyl (1μg/kg) while maintaining spontaneous breathing. Awake nasotracheal fiberoptic intubations were performed in a semi-sitting position. Seven patients required multiple tube placement attempts. After confirmation that the intubation was successful, intravenous induction with propofol (2mg/kg) and rocuronium (0.8mg/kg) was performed. Patients were carefully turned into the prone position. Anesthesia was maintained with O2: Air 50:50, sevoflurane and remifentanil. After the operation, the patients remained intubated, sedated, and transferred to the Intensive Care Unit, where they were connected to mechanical ventilation. Epistaxis occurred in six patients, and there were no other acute complications.

Discussion

Ankylosing spondylitis occurs in young people between 20 and 30, with a higher incidence in men. About 90% of the patients suffering from AS have a positive HLA-B27 allele (4). Apart from the spine, arthritis can affect the knee, hip, shoulder, heart, eyes and lungs (5). Cervical spine fractures in AS patients are more than 50% higher than for other parts of the spine (1). The mechanism of injury is usually low-energy trauma, such as hyperextension. A detailed and urgent neurological and radiological examination is mandatory. The surgery typically involves fracture reduction with an anterior and posterior vertebral fusion of the cervical spine (2).

Airway management in patients with ankylosing spondylitis presents a real challenge for anesthesiologists due to the reduced range of motion of the cervical spine and limited mouth opening. Additionally, the condition is aggravated by the presence of comorbidities, such as restrictive pulmonary ventilation disorder and pulmonary fibrosis (6).

The cervical spine in AS could be involved in different ways, from the minor functional restriction of movement to complete ankylosis of the neck (7). In more severe cases, the sniffing position is impossible due to the proximity of the chin and chest. Forceful attempts at extension should be avoided due to possible neurological deterioration (8).

Involvement of the temporomandibular joint occurs in over 40% of the patients, which can lead to limited opening of the mouth and difficulty in inserting the laryngoscope (9,10).

Anesthesiologists should perform a preoperative airway assessment. The Mallampati test and the Wilson scale are the most often used for evaluation. The Mallampati test observes the visibility of the oral structures with the mouth maximally open and the tongue maximally protruding, with the head in a neutral position (11), which is almost impossible

in patients with AS. The Wilson scale is the most comprehensive screening scale, including the most risk assessment variables. It includes a detailed examination of the mouth and teeth (distance between the upper and lower incisors; subluxation, size and position of the teeth), examination of the mandible (anterior and posterior depth of the mandible; thyromental distance, retraction-recessive mandible), examination of the neck (sternomental distance, circumference and mobility of the neck,) and a positive history of difficult intubation and body weight over 110kg, i.e. BMI greater than 30 (12).
The thoracic spine tends to curve forward over time. The movement of the costovertebral joints is also limited, which affects breathing by limiting the respiratory volume and reducing the vital capacity, so breathing depends mainly on the function of the diaphragm (13). Fibrosis is a common pulmonary phenomenon localized in the apices of the lungs. All these changes lead to a restrictive disorder of pulmonary ventilation, increasing the risk for pulmonary complications and the need for postoperative mechanical ventilation (14).
In spine surgery, where the patient is in a prone position, laryngeal masks are not acceptable (4,15). Video laryngoscopy sometimes allows visualization of the glottis but does not increase the success rate of tube placement in the trachea (16). Awake fiberoptic intubation is the safest and often the only option for tracheal intubation. It is essential to provide adequate sedation, with minimal respiratory depression, to preserve the patient's cooperation and spontaneous breathing during airway manipulation. In order the intubation to be successful with minimal sedation, it is necessary to anesthetize the upper airways. Applying a local anesthetic to the mucous membranes weakens the laryngeal reflex, thus protecting the upper respiratory tract from regurgitation and coughing. This creates an optimal condition for intubation and improves patient’s comfort (6,8,17,18).
Nasotracheal intubation provides access for various procedures, aids in managing difficult airways, and is beneficial for patients with cervical spine issues or requiring prolonged intubation (19). Based on all the circumstances described, we chose awake nasotracheal intubation with topical mucosal anesthesia.

Conclusion

A trained anesthesia team is required for awake fiberoptic nasotracheal intubation. This procedure is very complex and risky in conditions of cervical spine fracture due to the possibility of additional neurological damage. Adequate local anesthesia and sedation make the patient calm, without coughing or vomiting. Because it is a cervical spine injury with consequent quadriplegia, these patients require long-term mechanical ventilation and often permanent tracheostomy. Despite surgical stabilization and significant team efforts, neurological recovery is questionable and uncertain.

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