Case study: Managing a case of ankylosing spondylitis for inguinal hernia repair

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Abstract
A 55-year-old man diagnosed with ankylosing spondylitis presented for inguinal hernia repair. The patient was found to have limited neck movement, thoracic kyphosis and restrictive lung disease. Surgery was performed under hernia block, which was inadequate. General anaesthesia was then administered and airway patency was maintained with an endotracheal tube used as a nasopharyngeal airway.

Introduction
Ankylosing spondylitis (AS) forms part of a group of rheumatic diseases collectively known as spondyloarthropathies (SpAs) that affect the mobility of the spine. SpAs are almost exclusively associated with the presence of the genetic marker HLA-B27. They affect primarily axial joints but can also affect peripheral joints (such as in the feet and shoulders)[1].

The incidence of AS is 0.5 to 4 per 1 000 in the general population[2] and is more common in males, with a male:female ratio of 10:1. The main pathology is progressive inflammatory synovitis, starting in the axial skeleton. Chronic inflammation and repair (fibrosis and ossification) result in extra bone formation that eventually leads to the fusion of the vertebrae. The stiffening of the joints due to this abnormal fusion is known as ankylosis.[1]

AS produces a rigid 'bamboo spine', which restricts neck movement and makes direct laryngoscopy and intubation difficult to impossible. Awake fibreoptic intubation is therefore the safest choice for airway management in patients with AS. The alternative is the laryngeal mask airway. We encountered a patient with AS for hernia repair performed under hernia block, which was inadequate. Surgery was therefore completed under general anaesthesia with a nasopharyngeal airway device.

Case report
A 55-year-old man diagnosed with AS 20 years ago presented for inguinal hernia repair. On examination, it was found that he had thoracic kyphosis, restricted neck movement, an interincisor gap of 5 cm and a modified Mallampati classification of 3. His respiratory rate was 24 min^{-1} and breath-holding time was 12 sec. O_2 saturation on room air was 91%. An X-ray of the spine showed interspinous ossification and vertebral fusion. Pulmonary-function tests showed moderate restrictive airway disease. A 2D transthoracic echocardiogram revealed no significant abnormalities. Preoperative indirect laryngoscopy was not done.

After the patient was assessed, it was decided to perform surgery under inguinal hernia block. In case of failure of the block, it was decided to introduce a laryngeal mask airway (LMA™) and then to continue surgery under general anaesthesia. Written informed consent was obtained and adequate duration of fasting was confirmed.

There was no provision for fibreoptic bronchoscopy or an intubating LMA™ in our institute. An airway cart with alternative devices for difficult intubation, however, including a classic LMA™ and cricothyroidotomy needle, were kept ready. The patient was premedicated intravenously with 1 mg of midazolam. The inguinal hernia block was performed by an experienced anaesthesiologist using 15 cc 0.5% bupivacaine and 15 cc 2% lignocaine made up with saline to a total volume of 40 cc for a body weight of 65 kg.

After ensuring adequate analgesia, surgery was commenced. The patient maintained saturation, administered through nasal prongs with a 4 litre O_2 supply, of 96%. During the dissection of the peritoneal sac, however, the patient started complaining of pain. He was therefore given 50 µg slow-intravenously, repeated after 10 min. In view of inadequate pain relief, however, we converted to general anaesthesia. Therefore, 2 $mg.kg^{-1}$ was given slowly and, after ensuring adequate mask ventilation, a size-3 classic LMA™ was introduced. Optimum positioning, however, could not be achieved after two attempts: bag movement and chest expansion were inadequate and there was considerable air leakage; the capnogram also showed an increased phase-II and phase-III slope, indicating airway obstruction. We therefore decided to remove the LMA™ and to use a nasopharyngeal airway to administer respiratory gases. The latter, however, was not available. The length of a well-lubricated portex endotracheal tube with a 7-mm internal diameter was then marked from the tip of the nares to the angle of the mandible and passed through the nose up to the mark. The capnogram was normal. A safety pin was inserted horizontally to avoid the accidental slipping-in of the tube. The tube was then connected to the Bain circuit. Anaesthesia was maintained with an $N_2O:O_2$ ratio of 60:40 and 0.5% to 1% of halothane.

Surgery was completed uneventfully. Once the patient became conscious and started responding to commands, the tube was removed. For pain relief, 100 mg of diclofenac in rectal suppository form was introduced.

Discussion

AS is a distinct disease entity characterised by the inflammation of multiple articular and para-articular structures, frequently resulting in bony ankylosis.

The major clinical features of AS are listed in Table I.[1]

The most common presenting symptom of patients with AS is lower back pain due to the involvement of the sacroiliac joint. After the involvement of the costovertebral joints, chest expansion becomes restricted. The patient then practises diaphragmatic breathing, which may be observed as the ballooning of the abdomen during inspiration. The cervical spine is ankylosed late in the course of the disease, leading to restriction in neck movement and head rotation. The spine eventually becomes completely rigid, with a loss of normal curvature and movement.[4]

Common surgeries done in these patients are total hip replacement, knee arthroplasty and femoral osteotomy, the elongation of the Achilles tendon, a laminectomy and decompression, and hernia repair.

Airway management in AS is a daunting task. Previously, patients undergoing surgical procedures were subjected either to awake direct laryngoscopy and intubation or to tracheostomy.[5,6] Currently, airway management is highly evolved, with an array of specialised devices and techniques. This includes (i) tracheal tube guides, (ii) supraglottic devices, such as an LMA™, and (iii) video laryngoscopes.[7] Breaching the airway by surgical methods may be the last option.

Thorough preoperative airway assessment is to be carried out to predict the difficulty of tracheal

Table I: Major clinical features of AS

Joint/organ involvement	*Clinical effects*
Enthesitis*	Painful swelling and tenderness[1]
Sacroiliac joint involvement	Lower back pain
Lumbar/thoracic vertebrae	Kyphosis
Cervical vertebrae	Limited neck mobility, difficult laryngoscopy
Temperomandibular joints	Limited mouth opening (10%)[2]
Cricoaretynoid joints	Vocal-cord fixation
Costovertebral joints	Limited chest expansion
Lungs	Pulmonary fibrosis resulting in massive hemoptysis, restrictive airway disease
Cardiovascular: Ascending aorta	Aortic incompetence (3%), angina[3]
Fibrosis of AV bundle	Conduction defects
Eyes: Anterior uveitis, iritis	Pain, photophobia, blurred vision
Renal: Amyloidosis	Albumin urea, reduced renal function
Systemic involvement	Fatigue, low-grade fever, anaemia

* Inflammation at the junction where the joint capsule, tendons and ligaments attach to the bone

intubation. This includes Mallampati classification and investigation of the thyromental distance, interincisor gap and atlanto-occipital extension (Table II).[8]

Table II: Airway assessment

Assessment	*Increased likelihood of difficult intubation*
Mallampati classification	≥ 3
Thyromental distance	≤ 6.5 cm
Interincisor gap	≤ 4 cm
Atlanto-occipital extension	Limited extension, fixed flexion deformity (chin-on-chest deformity)

Patients with a modified Cormack-Lehane system (MCLS) score III or percentage of glottic opening (POGO) score zero are defined as presenting difficult tracheal intubation.[8]

Patients with AS are prone to vertebral fracture even with minor movements, especially extension, resulting in neurological deficit and death. Careful manipulation of the neck during tracheal intubation is mandatory to avoid fractures.[2] Fixed neck flexion may preclude cricothyroidotomy or tracheostomy, as the cricothyroid membrane may lie inferior to the sternal notch.[2]

Awake fibreoptic intubation is the safest choice for airway management in these patients because it can be applied while spontaneous breathing is maintained. Some patients, however, refuse or cannot tolerate awake fibreoptic intubation. They may undergo the procedure after the induction of anaesthesia with oral intubating devices, such as Berman or Ovassapian airways.[8]

Mask ventilation in AS is often easy due to the skeletal fixation of the airway. Most of the procedures in a supine position can be conducted successfully using LMA™ (either classic or intubating).[9,10]

In the array of new devices developed for the management of difficult airways are video laryngoscopes. These devices consist of a light source and video camera located in the blade of a rigid plastic laryngoscope connected to a separate liquid-crystal display monitor. These are the Glidescope® (Saturn Biomedical System Inc. Burnaby, British Columbia, Canada)[8] and the Pentax-AWS® (Pentax Corporation, Tokyo, Japan).[7] The advantage of these scopes is that the systems do not need to align the three axes for tracheal intubation. Lai, Chen, Hwang and Lee have shown that the predictors of difficult intubation (MCLS and POGO) were significantly improved by Glidescope in AS patients.[8]

Although there are reports of successful spinal or epidural anaesthesia, the ossification of interspinous ligaments and the formation of bony bridges make neuraxial anaesthesia either difficult or impossible in these patients.[11] Chin and Chan[12] have used the ultrasonogram (USG) as a preoperative tool to assess the feasibility of a central neuraxial blockade in an AS patient. Using a portable USG unit, they identified an open L4 to L5 space and dural puncture could therefore be achieved with a single needle pass.[12] The complications of regional anaesthesia, such as intravenous injection, should necessitate airway manipulations in difficult situations.[10]

Ndiaye, Diop, Ndoye and Ndiyae have reported a high variation in the emergence and sensory distribution of the ilioinguinal nerve as a cause of the failure of an ilioinguinal nerve block.[13] In our case, as the placement of an LMA™ was unsuccessful, we decided to go ahead with the nasopharyngeal airway. We found the nasopharyngeal airway device (the endotracheal tube) easy to pass and that it required a lighter anaesthetic plane. Although the risk of laryngospasm during introduction is small compared to that of an LMA™, there can be considerable air trapping in the stomach, diaphragmatic splinting and subsequent difficulty in breathing.

LMA™ is an easy and wise choice in the management of airways in AS patients. We, however, encountered difficulty in passing the LMA™ and therefore used a nasopharyngeal airway. The uneventful course of anaesthesia was related to careful and quick anaesthetic management. We conclude that, although regional blocks can be a safer option in anticipated difficult intubation, a well-planned strategy to go ahead in case of failure is important.

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