



Difficult Airway and Anesthetic Management in a “3-On” Ankylosing Spondylitis Patient

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Abstract

Ankylosing Spondylitis (AS) is a progressive chronic inflammatory disease with ankylosis of sacroiliac joint, intervertebral disc fiber ring and its surrounding connective tissue. Herein, we reported a severe case of a 45-years' old male patient who has the AS illness for 27 years and his condition was deteriorated in the last 2 years. Cobb's angle that measures the curvature of scoliosis is 180° with folding of the spine. His chin touching on chest, face on femur, sternum on pubis, namely “3-on” deformity and his head and neck movement was extremely limited. The patient received four stages of surgery from August 15th, 2019 to October 31st, 2019 to correct the spinal deformity with general anesthesia. Difficult airway in such patients is extremely challenge to the anesthesiologist during anesthesia management. For this case, the low-dose opioids combined with dexmedetomidine were slowly administered to induce very light sedation, which was used to apply awake intubation with FOB. Postoperatively, the patient was able to look straight and walk normally. There were no unanticipated events during stage I-VI.

Keywords: Ankylosing spondylitis; Difficult airway; Case report

Background

Ankylosing Spondylitis (AS) is one of the most frequent chronic immune-mediated diseases [1] and prevalence in males at adult age. The disease affects mainly the axial skeleton and the sacroiliac joints [1]. As the course of the disease progresses, joints become permanently ankylosed in positions that severely impairs daily living activities [2]. Many patients present difficult airway due to immobilization of the neck which makes intubation general anesthesia hard. In addition, the multiple complex surgical problems, massive blood loss, difficult airway, restrictive cardiopulmonary function [3-6] are huge problems for anesthesiologists. Therefore, how to get through surgical and anesthesia placidly is very important for these patients. A severe case of ankylosing spondylitis with fixed rigidity of the cervical-thoracolumbar spine and “3-on” deformity (chin on chest, face on femur, sternum on pubis) for posterior spine osteotomy and orthopedic surgery under general anesthesia is reported here.

Case Presentation

A 45-year's old male patient (Figure 1a; weight 49.5 kg), suffers ankylosing spondylitis for 27 years and deteriorated in the last 2 years. Cobb's angle that measures the curvature of scoliosis was 180° with folding of the spine. His head and neck movements were very limited and the body was “3-on” deformity (chin on chest, face on femur, sternum on pubis). No other medical history was recorded except for upper gastrointestinal bleeding twice. CT scan (Figure 1b) showed L3-L5 vertebral compressed and flattened, aortic tortuosity, thoracic aorta, bilateral common iliac artery slightly hardened; ankylosing spondylitis accumulates bilateral sacroiliac joint and hip joint; an old fracture of the 10th rib on the right side. ECG and cardiac function (EF: 0.64) were normal and pulmonary function was not done due to limited body position. Arterial blood gases (PO₂ 96.9 mmHg, PCO₂ 46.4 mmHg; Hb 121 g/L) were relative normal and D-dimer was slightly increased (0.83 mg/L). He was scheduled to receive posterior spine osteotomy and orthopedic surgery under general anesthesia. The patient received four stages of surgery from August 15th, 2019 to October 31st, 2019, which were the bilateral femoral neck osteotomy, the C7 modified PSO, C4-T4 kyphosis correction diorthosis Internal fixation with bone graft bilateral femoral neck osteotomy, the T12, L3 modified PSO, T8-L5 kyphosis correction diorthosis and the bilateral hip arthroplasty, respectively. All stages of surgery were performed under general anesthesia. The monitoring during anesthesia

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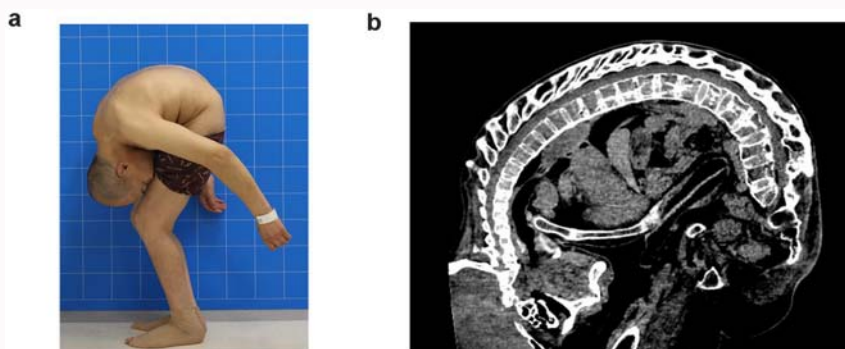


Figure 1: a) Shown the lateral view of the patient. b) Shown the sagittal CT examination, which can see that L3-L5 vertebral compressed and flattened, aortic tortuosity, thoracic aorta, bilateral common iliac artery slightly hardened; ankylosing spondylitis accumulates bilateral sacroiliac joint and hip joint; an old fracture of the 10th rib on the right side.

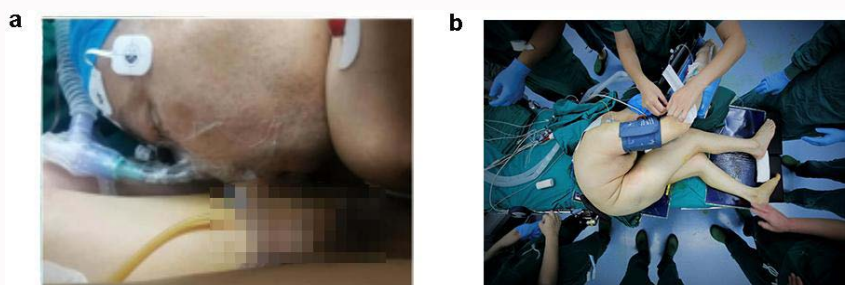


Figure 2: a) Shown the lateral view of the patient after nasal intubation. b) Shown the patient's position before the operation of stage I.

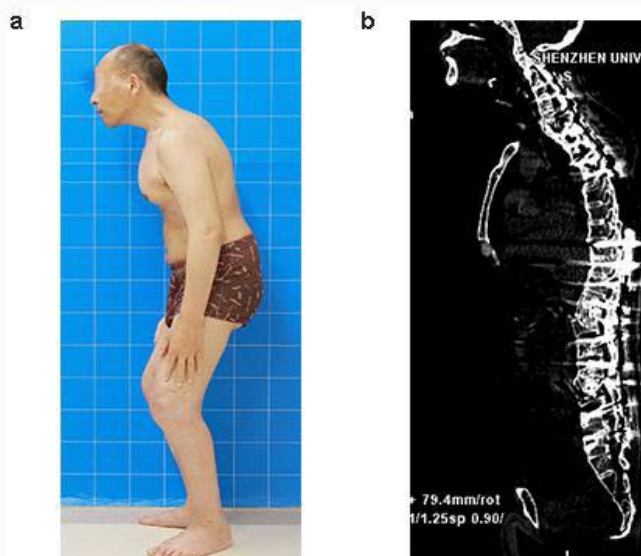


Figure 3: a) Shown the lateral view of the patient after four stages operations. b) Shown the sagittal CT examination after all stages of operations, which can see that ankylosing spondylitis was corrected basically.

and surgery included pulse oxygen, temperature, BIS and invasive artery blood pressure, central venous pressure *via* the right internal jugular vein catheter, bilateral cerebral oxygen saturation (medtronic), continuous cardiac output (Edward EV1000) and absorbing Sense Evoked Potential (SSEP) and Motor Evoked Potentials (MEP) (Xltek, Natus neurology). In the stage I and II surgery, patient was intubated *via* nasotracheal under FOB guide. The ephedrine and furacilin nasal drop were applied and the nasopharyngeal airway was used for oxygen inhalation (4 L/min to 6 L/min). Dexmedetomidine was administrated at 0.4 µg/kg/h and the sufentanil was intravenous

injected intermittently until a total dosage of 10 µg. Repeated nasal administration of 0.5% tetracaine were done and after lightly depressing the tongue the area around the epiglottis was sprayed with the same drug. When the patient's numbness in the oral cavity was achieved, the endotracheal tube of 6.5[#] was gently inserted from the left nostril and then slowly advanced inside with FOB successfully (Figure 2a, 2b). After endotracheal intubation, anesthesia was induced with propofol (1 mg/kg to 2 mg/kg), sufentanil (0.1 g/kg to 0.2 g/kg) and rocuronium bromide (0.6 mg/kg) and maintained with dexmedetomidine, propofol, sevoflurane and remifentanil. His

lung was mechanically ventilated under the Pressure-Controlled Ventilation Volume Guaranteed (PCV-VG) mode and respiratory parameters were adjusted according to the airway pressure and lung compliance. Goal-directed fluid management and autologous blood transfusion were performed throughout the operation at all stage surgery. The patient underwent four operations over a period of two months to correct the maxillofemoral, maxillothorax, and thoraco-humiliation deformity with general anesthesia in sequence. There were no unanticipated events during stage I-VI. Postoperatively, the patient was able to look straight and walk normally (Figure 3a). After the operation, rehabilitation training and instrument body balance training were actively carried out to restore the normal walking function of patients. The patient reported great satisfaction with the spine corrective operation and the anesthesia.

Discussion and Conclusion

A severe case of ankylosing spondylitis, who had four surgeries to correct his thoracic and lumbar kyphosis was achieved successfully (Figure 3a, 3b). However, we have faced multiple complex surgical problems, massive blood loss, difficult airway, restrictive cardiopulmonary function, intraoperative protection of spinal cord function and the operation position placement as reported previously [7,8]. His mouth and nose were covered and there was only 2 cm to 3 cm from the face to thigh. There was not enough space to even place mask and laryngeal mask. Furthermore, no other hard visual intubation equipment can be used. Due to severe neck and hip deformities, when life threatening events occurred, patients were really in danger [10-14] as CPR cannot be performed or even modern technique, e.g., extracorporeal circulation, can be very difficult to establish to save patients' life. Therefore, with those consideration in our mind, the low-dose opioids combined with dexmedetomidine were slowly administered to induce very light sedation supplemented with effective airway local anesthetics and then awake nasal airway intubation was successfully done under FOB. This really benefits from the British Difficult Airway Association (DAS) recommends [9]. Dexmedetomidine was used during intubation is a good choice as it has less respiratory suppression [15] and other advantages including analgesia and opioid sparing effects [16,17]. Difficult or failed airway management in anesthesia is a major contributor to patient morbidity and mortality, including potentially preventable adverse outcomes such as airway trauma, brain damage, or death. The cases of ankylosing spondylitis accompanied by jaw pressing sternum, sternum pressing pubic bone, face pressing thigh deformity and bilateral hip joint ankylosis are extremely rare. The development of anesthesia strategies for such patients still needs further clinical validation and individualized design.

In conclusion, surgery correcting severe spinal deformity is complicated and our limited experience indicated that a multidisciplinary team work with a full cooperation can make such a highly challenging anesthesia and surgery to be succeed. This kind of surgery should be performed to improve patient's life quality.

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