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RESEARCH ARTICLE

THORACOLUMBAR FIXATION FOR CHANCE FRACTURE IN ADVANCED ANKYLOSING SPONDYLITIS: A CHALLENGE TO ANAESTHESIOLOGIST

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ABSTRACT

A case of advanced ankylosing spondylitis involving the entire spine posted for posterior thoracolumbar fixation in view of unstable chance fracture at T12 - L1 level. Patient had fixed rigidity of the cervical spine with minimal rotational movement and inability to lie supine with recent ICU admission for acute pulmonary oedema due to severe plasmodium falciparum infection, post optimisation in ICU patient was posted for thoracolumbar fixation from T8 to L4 level. An awake fiberoptic guided intubation was performed and case was done under total intravenous anaesthesia in the prone position. Intraoperative neuromonitoring (SSEP/MEP) done to rule out neurological damage during surgery and positioning. Considering prolonged surgery and difficult airway postoperatively, patient was electively ventilated and extubated uneventfully within 24 hours without any fresh neurological injury.

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INTRODUCTION

Ankylosing spondylitis is a slow-onset inflammatory arthropathy. The pathological process is granulation tissue infiltration into bony insertions of ligaments and joint capsules. It eventually leads to fibrosis, ossification, and ankylosis[1].Ankylosing spondylitis of the cervical spine can lead to decreased mobility and, in severe cases, total fixity. Due to involvement of temporomandibular and cricoarytenoid joint securing airway can be Challenging in these patients, as joint involvement is usually not predicted by conventional airway scoring systems. The disease itself poses a challenge to anaesthesiologists, as managing difficult airway, securing central venous access and positioning of the patient, neuraxial monitoring and managing massive intraoperative massive blood loss is extremely taxing in these patients.[2]. Ankylosing spondylitis patients may require surgery for disease-related complications or for any other incidental surgical procedure. This report describes a case of advanced ankylosing spondylitis with fixed rigidity of the cervical spine along with

chronic liver disease and recent severe Plasmodium falciparum infection induced acute pulmonary edema posted for percutaneous thoracolumbar fixation of Unstable Chance fracture due to flexion-distraction injury at T12-L1 level involving all three spinal columns, operated in prone position with intraoperative neuromonitoring.

CASE REPORT

A 54-year-old male (170CM, 85KG), known case chronic liver disease and advanced ankylosing spondylitis with fixed flexion deformity of the cervical spine (Figure 1), posted for complex thoracolumbar fixation. Our patient had immobile cervical spine due to which he was not able to lie supine and always required two pillows below neck. Patient gave history of fall from stairs followed by lower back pain along with difficulty in walking, on further investigation patient diagnosed to have unstable fracture at thoracolumbar junction due to flexion-distraction injury at T12-L1 level (Figure 2), during hospital stay, patient was admitted in ICU for acute pulmonary edema most likely due to severe falciparum malarial infection induced lung injury, post optimization in ICU patient was posted for surgery in view of unstable fracture as surgical stabilization was mandatory to avoid neurological damage and to facilitate early mobilization of patient, hence posted for percutaneous fixation from T8 to L4 level. Detailed preoperative assessment was done, on clinical examination patient was afebrile, P 105/min, BP 130/70 mmhg, Spo2 95 to 98% on O2 with nasal prongs at 2lit/min (with intermittent continues positive airway pressure CPAP ventilation and ovemight CPAP support) on auscultation bilateral minimal basal crepts noted, heart sounds were normal. Neck movements were restricted in antero-posterior as well as lateral position, with no extension and minimal flexion possible. Mouth opening was adequate, mallampatti grade 2 with no loose teeth, laboratory studies significant values included, Hb 10.7gm/dl, serum albumin 2.7gm/dl, INR 1.2 and APTT 43.9secs, rest of the values were within normal limits. MRI dorsolumbar spine showed advanced ankylosing spondylitis involving the whole spine with ossification of all interspinous ligaments and ankylosis of bilateral sacroiliac joints with unstable fracture at thoracolumbar junction due to flexion-distraction injury at T12-L1 level involving all three spinal columns with mild retropulsion of the D12, no cord compression noted. HRCT chest showed multiple sub segmental atelectatic bands in both lungs lower lobes and right middle lobe most likely post infective sequelae. Considering recent history of ICU admission in view of breathlessness and desaturation, CT pulmonary angiography (CTPA)done which showed no evidence of pulmonary arterial thromboembolism, it showed bilateral diffuse ground glass haze with a perihilar, suprahlar predominance, associated with smooth interlobular septal thickeing and patchy areas of airspace opacification in the dependent / subpleural aspects of both lower lobes [Left > Right] representing pulmonary edema. Color Doppler Venous for bothlower limb done to rule out pulmonary embolism, suggestive of no features of deep venous thrombosis in both lower limbs. After due clearance from cardiology and chest medicine patient accepted for surgery under ASA grade III, in view of unstable fracture as surgical stabilisation was mandatory to avoid anyfurther neurological damage and to facilitate early mobilisation of patient. Considering difficult airway awake fiberoptic intubation (FOB) was planned to secure the airway hence patient explained in preoperative

Figure 1. Flexion deformity of neck

Figure 2. Chance fracture at T12-L1 level

Figure 3. Chance fracture post-fixation

period in detail about the procedure, high risk consent was taken, post-operative ICU and SOS ventilator support explained. Patient was kept in negative balance for 5 days in ICU and incentive spirometry started 3 days prior to surgery.

On day of surgery nebulisation with 4% lignocaine were given in ICU before shifting patient to OT, in preoperative room nasal pledgets soaked with 2% lignocaine adrenalin and xylometazolin (otrivin) were inserted in both the nostrils, once inside the operation theatre routine ASA monitors were attached, under all aseptic precautions right radial artery was cannulated with 20G jelco, patient was then preoxygenated with nasal cannula and mild sedation given with inj. fentanyl 25mcg IV and inj. Dexemedetomidine (Dexem) 2mcg/ml infusion stared at the rate of 0.5mcg/kg/min ,with patient in propped up position with two pillows under the neck, 2%lignocaine jelly was inserted in both the nostrils and 2% lignocaine 3ml injected transtracheally, fiberoptic scope was then passed via left nostril standing facing the patient, after reaching the carina, no 7 flexometallic (armoured) tube was railroaded over the FOB scope and tube fixed at 25cm mark at left nostril. After confirming endotracheal tube placement with ETCO2 tracing and bilateral equal air entry, patient was induced inj. propofol 150mg and inj cisatracurium 10mg bolus was given, under all aseptic precautions right internal jugular vein was then cannulated and sterile dressing applied, all the neuromonitoing electrodes were then applied and after taking baseline SSEP and MEP readings patient was given prone position. Patient was given prone position taking care the curvature of OT table and bolster matches patient's spine curvature. Mayfield's clamp were applied by operating surgeon maintaining neck flexion before giving prone position to avoid risk of injury to rigid cervical spine., in Prone position neuromonitoring signals were obtained and compared with baseline signals . Intraoperative an aesthesia maintained with inj. propofol (10mg/ml) infusion at the rate of 100 to 150mcg/kg/min and inj dexem 0.2 to 0.5 mcg/kg/min, BIS was maintained in the range of30 to 50 throughout the surgery.

Under C- arm anteroposterior and lateral views guided percutaneous entry and track made in pedicles of T8, T10, T12, L2, L4 with J needle, wire, tap and screws placed with tubular connector, L1 fracture reduced, rods were measured, precontoured with thoracic kyphosis and placed subcutaneously along the tubes and tightened. Fracture reduction checked and T8 to L4 fixation was done (figure 3). Post Thoracolumbar fixation patient turned supine carefully and Mayfield clamps removed, after making patient supine neuromonitoring signals were obtained, no fresh neurological insult noted. The surgery lasted for 6 hrs., intraoperative blood loss was around 300ml and urine output was 350ml, patient was given 1500ml crystalloids intraoperatively, ETCO2 was maintained between 28 to 35mmhg and central venous pressure maintained between 8 to 12 cm H20, postoperative blood gas showed pH 7.325, PCO2 50 mmHg, PO2 185 mmHg, HCO3 20.3, and SaO2 99.7%. In view of prolonged surgery, difficult airway decision was taken to electively ventilate patient overnight in ICU, following day in morning sedation was stopped and patient weaned off & extubated uneventfully. Post extubation, his blood gas on nasal prongs 4lit/min showed pH 7.41, PCO2 37.7 mmHg, PO2 115 mmHg, HCO3 23.3, and SaO2 99.3%. Rest of the postoperative course was uneventful and patient was shifted to ward on postoperative day 4 and discharged on postoperative day 8 with stable hemodynamics.

DISCUSSION

Ankylosing spondylitis (AS) is an autoimmune spondyloarthropathy disorder that affects the joints and surrounding structures. The inflammatory process usually starts from the sacroiliac joint and then gradually spreads upwards to involve the spine up to the cervical level, as well as the costovertebral joints. The fusion of vertebrae results in the appearance known as a bamboo spine. [3] Changes in spine biomechanics result in kyphosis, spinal rigidity, and secondary osteoporosis. The pathological process is granulation tissue infiltration into the bony insertions of ligaments and joint capsules with variable likelihood of progression to fibrosis, ossification, and ankylosis [4]. The disease primarily affects the sacroiliac joints and spine, though extraspinal joint involvement can occur in 50% of cases. The majority of people have linked disease manifestations to the genetic marker HLA-B27 antigen. Breweton discovered the antigen in 96 percent of patients with ankylosing spondylitis, compared to 4 percent of controls and 51 percent of patients' first degree relatives. [5] Difficult airway in ankylosing spondylitis patients has always been a challenge for anaesthesiologists. Literature has mentioned various methods for securing airway in this patient ranging from intubating LMA 6/10 to fiberoptic intubation. [4]

Ankylosing spondylitis is a chronic and progressive inflammatory disease that affects the spine's articulations and surrounding tissue. Conventional intubation is difficult in patients with ankylosing spondylitis who have cervical spine rigidity. Awake fiberoptic intubation has recently become more popular and is regarded as the safest option for patients with anticipated airway difficulties. [7, 8] Anaesthesiologists must be concerned with restrictive ventilatory defects and airway problems associated with ankylosing spondylitis, in addition to airway management, and hence it is imperative that detailed respiratory and cardiovascular examination must be done in preoperative period. [9] Along with the safely securing airway and administration of anaesthesia, the other major concern was positioning patient in prone position for the spine surgery as patients are at risk of iatrogenic spine fractures and neurological deterioration due to pathological posture and altered biomechanics. Due to the rigid yet brittle nature of the spine, such risks may be increased not only during surgical manipulation but also during positioning within the operating room, particularly while under sedation and anaesthesia. [10]The most vulnerable area of the spine is the cervicothoracic region. [11] In our case, due to the severity of the anykylosis and the difficulty of the airway, we performed awake fiberoptic intubation with the patient propped up with two pillows under the neck. Once the airway was secured, we administered general anaesthesia and Mayfield clamps were then applied by operating orthopaedic surgeon so that while giving prone position flexion of neck is maintained, The OT table was already manipulated and bolsters were kept accordingly, and the patient was then carefully positioned without using undue force, avoiding any further neurological damage. which was confirmed by comparing neuromonitoring readings with those taken in supine position, entire surgery was done under total intravenous anaesthesia TIVA (propofol, and dexem infusion without repeating muscle relaxant and inhalation agent) throughout surgery BIS was monitored and maintained between 30 to 50 with intermittent neuromonitoring readings (SSEP and MEP) were taken to rule out any neurological damage during spine manipulation.

Intraoperative course was uneventful and patient was hemodynamically stable throughout the surgery. Because of its ability to reduce the risk of perioperative spinal cord injury, intraoperative neurophysiological monitoring (IONM) has been recommended as a standard of care for complex spine surgery (Sutter et al., 2019). [12]The intraoperative use of imaging along with neuromonitoring will lead to early detection of spinal cord compression with resultant prevention of serious spinal cord injury and paralysis. Given the difficult airway and prolonged surgery, as well as the possibility of narcotics-induced respiratory depression in the immediate postoperative period, which could lead to complications such as hypoxia and CO2 retention due to underlying restrictive lung disease, with extubation in immediate post-operative period there were high chances of patient requiring reintubation which would have been difficult and stormy, we decided to sedate the patient with continuous propofol infusion and electively ventilate the patient overnight. The sedation was stopped the next morning, and after a gradual weaning off of the ventilatory support, the patient was extubated with stable hemodynamics and maintained a saturation of 99 to 100 percent on O2 with face mask at a rate of 6 lit/min. The rest of the the postoperative course was uneventful.

CONCLUSION

In patients with severe ankylosing spondylitis stiff nature of the spine should not be overlooked and these patients should always be managed with extra care in operating room or ICU. These patients have a higher rate of neurological damage due to excessive rotation and angulation at fracture sites, which is exacerbated by pre-existing deformity and associated corrective manoeuvres. As a result of this management of these patients posted for surgery, during imaging, intubation, positioning, neurological monitoring and deformity correction, becomes especially difficult in severe Ankylosing spondylitis. It requires multidisciplinary team approach in managing such high risk cases for best outcome.

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