



ANAESTHETIC MANAGEMENT OF A PATIENT WITH TRAUMATIC CENTRAL CORD SYNDROME COMING FOR SUPRACONDYLAR FIXATION OF RIGHT FEMUR

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ABSTRACT

Central cord syndrome is the most common incomplete cervical spine injury presenting with variable degree of quadriplegia. We report anesthetic management of a patient with traumatic quadriplegia along with supracondylar fracture of femur, scheduled for surgical correction. The attendant problems of protection of the cervical spine, difficulty in intubation of the unstable cervical spine are discussed in this report.

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INTRODUCTION

Central cord syndrome (CCS) is the most common cervical spine injury leading to traumatic quadriplegia. It is caused by spinal cord compression and edema with selective destruction of lateral corticospinal tract.

Along with the spinal cord injury (SCI) some patients are associated with multiple other injuries, of which fracture of femur is common. Early reduction of the fracture site with internal fixation is the preferred method of management to reduce further morbidity.^[1]

We report the anesthetic management of a patient with supra condylar fracture of femur along with CCS who was scheduled for open reduction and fixation. The management of anaesthesia includes not only the challenge of a difficult airway, the risk of aggravating further cervical spine injury, hemodynamic instability, as well as the added conundrum of surgical correction.

Case Report

48year old male patient was scheduled for surgical correction of supracondylar fracture of the right femur. The fracture was a result of a road traffic accident ten days earlier which resulted in traumatic quadriplegia. There was a history of loss of consciousness for brief period after the accident.



Figure 1 3D reconstruction of the Supracondylar fracture of femur

The patient was stabilized initially in the casualty and appropriate investigations were performed. On examination patient had weakness in both the limbs (Grade 3/5). Sensations were preserved in both the limbs.

Magnetic resonance imaging of the spine revealed circumferential disc bulge at C₃₋₄ level with severe indentation of anterior thecal sac and compression of bilateral lateral recess and neural foramina.

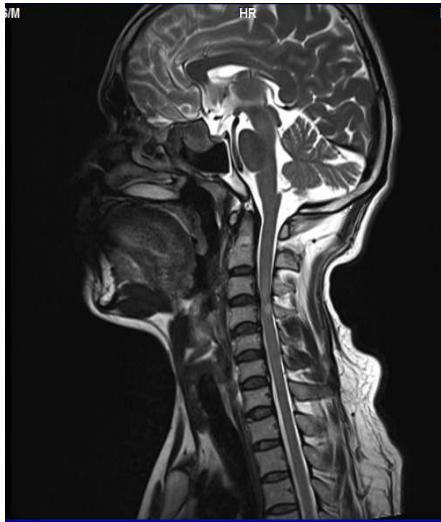


Figure 2 CT scan of the patient with compression at C3-4 level

The computerized tomograph scan of chest revealed fibrosis of right middle lobe of lung, which was an incidental finding.

A detailed pre-anesthetic check and investigations were done before scheduling the patient for the surgery. Special emphasis had been made to rule out autonomic instability in the patient. After explaining procedure to the patient and documentation of the preexisting weakness in the limbs, appropriate consent was taken. The patient was planned for general anaesthesia and all necessary equipment for difficult intubation were kept ready.

On the day of surgery, patient was wheeled into operating room with hard collar (Philadelphia Collar) insitu, and was premedicated with fentanyl 2 μ /kg, after attaching all the necessary monitors. The patient was induced with propofol 1.5mg/kg. After confirmation of successful trial of ventilation, injection atracurium 0.5mg/kg was given, and preservative free lignocaine (60mg) was given to attenuate laryngoscopic response. Philadelphia collar was opened anteriorly, manual in line stabilization (MILS) was maintained by a trained assistant and bougie was used to aid in intubation and patient airway was secured with oral cuffed endotracheal tube of size 8.0 mm.

After intubation the collar was refastened, head and neck was immobilized again. Patient was maintained on mixture of air, oxygen and Sevoflurane 2-3% to maintain appropriate depth of anaesthesia.

Intra operatively patient received 1gm Paracetamol and 75 mg Diclofenac Sodium intra-venously along with 2 liters of crystalloid fluid. Hemodynamic stability was maintained throughout the procedure and mean blood pressure kept around 80-85mmHg.

At the completion of the procedure, wound was infiltrated locally with 20 ml of 0.25% Bupivacaine and tramadol 50 mg was given as a part of multimodal analgesic technique.

After completion of surgical procedure, the action of muscle relaxant was reversed by using neostigmine 0.08 μ g/kg and glycopyrrolate, and the patient was extubated after full consciousness was achieved.

Patient was wheeled out of operating room along with hard collar and shifted to recovery room. In the recovery room the patient was reassessed regarding the neurological status and found to have no new neurological findings.

The patient had an uneventful post-operative course and was discharged on 5th day.

DISCUSSION

CCS is the most common form of the incomplete SCI characterized by motor impairment in the arms and hands and to a lesser extent in the legs with variable sensory loss and bladder dysfunction. Fractures, subluxation, forced hyperextension and herniated nucleus pulposus are the main pathogenic mechanisms of Traumatic Central cord syndrome. Nearly 50% of patients with CCS suffer from congenital or degenerative spinal stenosis and sustained injuries during hyperextension. The brain's ability to send and receive the signals to and from the parts of the body below the site of injury is reduced but not entirely blocked. This syndrome is associated with damage to large nerve fibers that carry information directly from the cerebral cortex to the spinal cord.

The main goal in anaesthetizing patient with CCS is to avoid further injury to the spinal cord. Restricted cervical spine mobility, presence of autonomic hyperreflexia increases the challenge manifold.

American Spinal Injury Association (ASIA) has graded the severity of the injury basing on certain parameters. [2] Our patient can be graded as grade C

The main debate in anaesthetizing the patient scheduled for peripheral surgery is the preferred choice of safe anesthesia.

Gurajala et al^[3] in a prospective study have concluded that central neuraxial blockade in patients with recent stable fractures of the spine was not associated with adverse neurological events, but the number of patients who had cervical spine injury in the study was only two. Discussion of general anesthesia versus regional anesthesia in this patient was eventually finalized by the evidence of safety of general anesthesia.

On examination of the airway, mouth opening was good(on opening the collar), thyromental distance was normal and faucial pillars were visualized on mouth opening. We planned for general anesthesia with manual in line axial traction for intubation for this patient. This was done by a second trained anesthesiologist, to stabilize the cervical spine during laryngoscopy. The rigid collar was removed, once the trial of ventilation was successful, as it can impede mouth opening, and moreover it does not contribute significantly to neck stabilization during laryngoscopy and would be an obstruction if a surgical airway was required.

Studies have proved that in subjects without a cervical injury, direct laryngoscopy causes extension of the cervical spine, at the atlanto-occipital junction, and to a lesser extent at the C1 to C2 joint. [4]

Nolan found that when compared with routine sniffing position, MILS decreased laryngoscopic view in 45% of patients and 22% of patients had a Grade 3 (epiglottis only) view and using a gum elastic bougie greatly increased the ease of successful intubation within 45 seconds. [5] We have used gum elastic bougie as an aid in intubation. The gum elastic bougie is a useful adjunct during direct laryngoscopy. It allows accepting higher-grade laryngoscopy views of the vocal cords, thereby limiting the forces transmitted to the cervical spine.

When MILS is utilized, incidence of neurological impairment due to endotracheal intubation has been reported to be extremely rare.^[6] Care should also be taken with mask ventilation. The absolute minimum of jaw thrust and chin lift should be used to maintain the patient's airway^[7,8]

Several varieties of intubation techniques exist, but no one technique has been proved to be superior to others. Rigid indirect video laryngoscopy has become an alternative to conventional direct laryngoscopy with the Glide Scope® (Verathon Medical, Bothell, WA, USA) and the Airtraq® (Prodol Ltd., Vizcaya, Spain) being the two popular devices amongst others. Studies looking at cervical motion suggested less movement occurred with airtraq^[9,10] while Glidescope produced equivocal results^[11,12]

Under general anesthesia it is very difficult to assess further neurological injury. Mcleod and Calder identified some features that help in diagnosing laryngoscopic induced spinal cord injury such as myelopathy present on recovery,^[13] short period of unconsciousness, autonomic disturbances following laryngoscopy. It is therefore prudent to focus on the prevention of neurological injury. In our patient we did continuous monitoring in the peri-operative period which did not reveal any hemodynamic changes and post-operative recovery also was uneventful.

The conduct of anaesthesia in a patient with CCS is challenging, besides the difficult intubation, and prevention of further cord injury, it also includes the quandary of the use of suxamethonium.

Denervation of the muscle leads to the formation of $\alpha 7$ acetylcholine receptors (AChRs) which have unusual functional and pharmacological characteristics compared to the normal muscle ($\alpha 1$, $\beta 1$, δ , ϵ/γ) AChRs. Potassium ion is released suddenly along the entire length of the fiber rather than gradually as the action potential propagates. This produces a rapid rise in serum potassium levels, which can precipitate irreversible ventricular dysrhythmias and cardiac arrest. This becomes clinically significant within about a week following denervating injury and lasts for at least 6 months to 2 years. Hence we have avoided succinylcholine for intubation. Autonomic Hyperreflexia (AH) is a well-known clinical emergency in individuals who suffered a spinal cord injury at T6 or above. The spectrum of AH varies from asymptomatic to mild discomfort and headache to a life-threatening emergency including intracranial hemorrhage, retinal detachment, seizures and death.^[14]

It has been observed that the higher the injury level the greater the degree of manifested cardiovascular dysfunction.^[15]

It is also noted that only 27% of incomplete tetraplegics present with AH in comparison with 91% of complete tetraplegics with the lesion.^[16]

While AH occurs more often in chronic stage of spinal cord injury at or above the 6th thoracic segment, there is also clinical evidence of episodes of autonomic dysfunction in the first days and weeks after injury.^[17]

A variety of non-noxious and noxious stimuli can trigger episodes of AH. Despite the partial or total loss of sensation below the level of injury it is important to recognize that surgical procedures or manipulations can initiate the episodes of AH. There is level 5 evidence that indicates the patients at

risk for AH may be protected against developing intraoperative hypertension by either general or spinal anesthesia.^[18]

The role of hemodynamic stability to maintain spinal cord perfusion cannot be underplayed. Traumatic SCI is frequently complicated by systemic hypotension and reduced spinal cord perfusion pressure^[19]

Spinal cord perfusion is auto regulated over a wide range of systemic blood pressure in the same fashion as cerebral blood flow^[20]

Spinal cord blood flow has been shown to be adversely affected following traumatic SCI. American association of neurological surgeries (AANS) published recommendations for the hemodynamic goals for SCI patient. These include maintaining mean pressures around 85-90 mm of Hg in the initial days. In concurrence to these recommendations we maintained the mean arterial pressures in the peri-operative period.

CONCLUSION

Management of a patient with cervical spine injury associated with fractures of the lower limb is not so uncommon, but anticipation of the associated limitations and conceptualization of a concrete plan makes it easier to manage the challenging scenario. Highlighting the difficult airway should not take away the importance of hyperkalemia associated with suxamethonium or even the rare instance of autonomic hyperreflexia and its management and most importantly the maintenance of hemodynamics to maintain the spinal cord perfusion.

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