Journal Homepage: - www.journalijar.com
INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)
Article DOI: 10.21474/IJAR01/19026
DOI URL: http://dx.doi.org/10.21474/IJAR01/19026

RESEARCH ARTICLE

AIRWAY CHALLENGES IN A ANKYLOSING SPONDYLITIC PATIENT WITHTRAUMATIC CERVICAL SPINE FRACTURE - A CASE REPORT

Sateesh Kumar J.[1], Raj Murugan[2], Krishnagopal Vinod[3] and Akash Yadhav[4]

1. Post Graduate, Department of Anaesthesiology, CC &PM, Sree Balaji Medical College and Hospital, Chennai.
2. Assistant Professor, Department of Anaesthesiology, CC &PM, Sree Balaji Medical College and Hospital, Chennai.
3. Professor, Department of Anaesthesiology, CC &PM, Sree Balaji Medical College and Hospital, Chennai.
4. Senior Resident, Department of Anaesthesiology, CC &PM, Sree Balaji Medical College and Hospital, Chennai.

Manuscript Info

Manuscript History
Received: 05 May 2024
Final Accepted: 09 June 2024
Published: July 2024

Key words:-
Ankylosing Spondylitis, Cervical spine fracture, Topical Anesthesia, awake fiberoptic intubation, Airway Management, Cervical spine stabilization

Abstract

Background: Ankylosing Spondylitis (AS) is a chronic inflammatory condition that results in the fusion of the spine and decreased flexibility, commonly known as bamboo spine. This condition presents significant challenges to anesthesiologists due to potential difficulties in managing the airway, cardiovascular issues, and compromised respiration. AS patients face an increased risk of fractures and spinal cord injury, especially in the cervical spine, which is prone to instability and higher morbidity and mortality rates. Maneuvers to manage the airway and intubation techniques may exacerbate movement in the cervical spine, potentially leading to further injury.

Case Report: A 42-year-old man with a history of AS presented with a cervical spine injury after a road traffic accident. MRI showed fractures at the posterior arch of C1 and C4-C5 levels with nerve root compression. The patient, who was not regularly followed up, was taking medication. Preoperative assessment revealed a potentially difficult airway, and the patient had quadriparesis and reduced sensation. Due to the risk of spinal cord injury, an awake fiberoptic intubation (AFOI) was planned. The AFOI was successfully performed through the nasal route, and the patient underwent a C4-C5 discectomy and stabilization. The postoperative recovery was uneventful, with no new neurological deficits.

Discussion: The case emphasizes the need to minimize movement of the cervical spine when managing the airway in AS patients with cervical spine fractures. Using AFOI is more effective than other techniques in this scenario, as it minimizes cervical movement and allows for post-intubation neurologic assessments. Although the glidescope video laryngoscope and intubating laryngeal mask airway are considered as alternatives to direct laryngoscopy, anesthesiologists still prefer AFOI as the primary option.

Conclusion: This case report demonstrates the best airway management for an AS patient with a cervical spine fracture, with a focus on the role of the anesthesiologist in preventing further injury and neurologic deterioration. Awake fiberoptic intubation is the safest alternative for AS patients with cervical spine fractures, as long as the anesthesiologist has the requisite skills and knowledge.

Corresponding Author:-Sateesh Kumar J.
Address:-Post Graduate, Department of Anaesthesiology, CC & PM, Sree Balaji Medical College and Hospital, Chennai.

Introduction:-

Ankylosing Spondylitis(AS), also known as Marie Strumpell disease, is a chronic inflammatory condition characterized by periods of exacerbations and remissions, resulting in the fusion of spinal bones and reduced flexibility in the back and neck, clinically identified as bamboo spine[1]. The disease spectrum ranges from mild back stiffness to a completely fused ankylosed spine with variable peripheral arthritis and extra-articular involvement. Anesthesiologists need to carefully consider the degree of upper airway involvement, pulmonary restrictive disease, cardiac function, and neuroaxis accessibility when managing patients with AS due to the altered anatomy and potential for difficult airway management. Managing AS patients poses significant challenges to anesthesiologists, necessitating a focus on potential difficulties with the airway, cardiovascular issues, and compromised respiration. In such cases, awake fiberoptic intubation is recommended as the safest approach, enabling continuous monitoring and preservation of spontaneous respiration until a definitive airway is secured[2].

Case description:

A 42-year-old male presented with a suspected cervical spine injury following a road traffic accident. He had no history of loss of consciousness, ENT bleed, head injury, or vomiting. The MRI revealed a posterior arch of C1 fracture and carrot stick fracture at the C4-C5 level with nerve root compression due to secondary spinal canal stenosis from C2-C6 and ossified anterior and posterior longitudinal ligament along all thoracic and cervical vertebrae, consistent with classic Bamboo spine appearance[3]. He had been diagnosed with ankylosing spondylitis 6 years prior and was on tablet methotrexate 10mg per week , tablet sulphasalazine 1gram daily and 2 doses of tablet infliximab 200mg taken in the past but not on regular treatment follow-up. X-ray results showed significant degenerative changes and ankylosis in the hip joints, lower lumbar spine, and sacroiliac joints. Prior to the accident, he was able to perform his regular daily activities with minimal limitations, but had been experiencing low backache while standing from a sitting position for the past 2 years.

A comprehensive preoperative assessment was performed, encompassing medical history, recent exacerbations, cardio-respiratory functions, spine deformity, and airway examination. The patient was of moderate build and nourished, with stable vitals and a room air saturation of 98%. Airway examination revealed potential intubation difficulty due to Mallampatti grade 3, restricted neck movements, thyromental distance <6.5 cm, upper lip bite test grade 3, mouth opening of 2 finger breadths, and placed in a cervical collar.

Fig. (1):-lumbar spine AP and lateral X-rays showing classical bamboo spine.

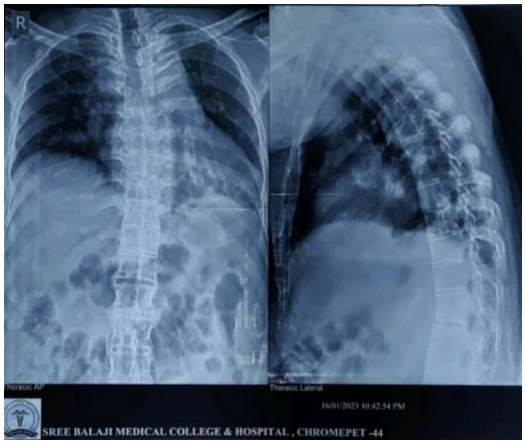

Fig. (2):- Chest xray AP and lateral Showing syndesmosyte formation.

Fig. (3):- MRI whole spine –. shiny corner sign in lumbar spine , C4-C5 Carrot stick fracture, posterior subluxation and listhesis

Fig. (4):- Hip xray showing bilateral sacroilitis.

The patient was alert, oriented, and had normal systemic findings. Neurological examination indicated quadriparesis and diminished sensation in all four limbs.All neurological deficits were noted .Chest wall expansion was measured with the tape which showed <1 inch difference when patient deeply inhale and exhale . This explains reduced chest wall compliance[4]. Additional tests, including hemogram, liver function, renal function, and electrocardiogram, all yielded normal results. Echocardiogram also found to be normal with no aortic insufficiency. Due to a cervical spine fracture and the anticipation of a difficult airway, the plan for achieving airway access was using awake flexible fiber-optic bronchoscopy[5].

In preparation for C4-C5 discectomy, decompression, and stabilization, the patient was given thorough explanations about the fiberoptic intubation process and was assured of comfort. Informed consent also covered authorization for a tracheostomy if obstructive cervical osteophyte or severe cervical flexion deformity hindered successful intubation, and an ENT opinion was sought to assess nasal integrity for airway access.

After an appropriate fasting period, the patient in the preoperative room was administered with a intramuscular injection of 0.2mg of Glycopyrrolate to dry the airway, injection of 5mg morphine and an intravenous injection of 1 gram of Methylprednisolone .

Furthermore, 2 drops of Nasal xylometazoline were instilled into each nostril to relieve nasal congestion. This was followed by a nebulization of 4ml of 2% lignocaine with an oxygen flow rate of 7-8L/min, and then , both nostrils were packed with 2 gauze pieces soaked in 5ml of 2% lignocaine with adrenaline.

In the Operating room , a difficult airway cart comprising oropharyngeal and nasopharyngeal airways, a gum elastic bougie, Laryngeal Mask Airway, fiberoptic bronchoscope, and cricothyroidotomy set was prepared. The patient was transferred to the operating room, and two 18 G peripheral lines were secured. All required ASA standard monitors were connected, and baseline readings were documented. The patient received a pre-medication of IV Inj. Midazolam 1 mg and Inj. Fentanyl 50mcg. Patient was started on inj. Dexmedetomidine 50 mcg bolus followed by infusion of over 10 minutes followed by 25 mcg[6] . Following this, patient was carefully positioned in a supine position with a cervical collar in place, and a pillow was used to support their head and neck due to their inability to lie flat on the table. All pressure points were adequately padded for comfort and safety. Manual in line immobilzation done throughout the AFOI .

Following aseptic measures and using the landmark technique, bilateral superior laryngeal nerve block was performed with 3 ml of 1% Inj. Lignocaine on each side, with careful aspiration conducted due to the proximity of the carotid artery. This approach numbs the larynx above the vocal cord. Subsequently, a transtracheal block was performed with 4ml of 1% Inj. Lignocaine to anesthetize the recurrent laryngeal nerve, ensuring proper tracheal placement by confirming air bubbles on aspiration and preventing posterior laryngeal wall puncture. Supplemental oxygen supplied with nasal prongs 6L/min .

Vocal cord topicalization was carried out using a 10% lignocaine spray. The fibreoptic bronchoscope, which was attempted through the right nostril and directed towards the vocal cords for the insertion of a lubricated 7.5 mm internal diameter endotracheal tube and fixed at 28cm after checking Bilateral equal air entry. The patient tolerated the procedure well, and after confirming the appropriate position of the tracheal tube, anesthesia was induced intravenously with Inj. Propofol 100mg and Inj. Atracurium 40mg iv and maintained with sevoflurane of MAC 1.1 in an oxygen - nitrous oxide mixture(50:50) using volume controlled ventilation. Airway pressure and plateau pressure maintained within permissible limits.

The surgeon performed anterior cervical approach to C4-C5 discectomy. Normothermia and normocarbia maintained .Mean arterial pressure was maintained more than 85 mmHg . Boluses of fentanyl and atracurium were administered intermittently, ensuring hemodynamic stability throughout the procedure. Patient was then transferred to the intensive care unit for postoperative ventilation and showed no new neurological deficits. Extubation was performed on postoperative day 2, and the subsequent hospital stay was uneventful.

Discussion:-

Ankylosing spondylitis poses significant airway challenges due to osteophyte formation in the vertebra and ligament ossification resulting in the rigid bamboo spine , impaired mobility and osteoporosis which increases the risk of fractures and spinal cord injury even with minor trauma. Fracture incidence is 11 times higher in AS patients than non affected individuals. In Ankylosing spondylitis , cervical fractures require early diagnosis and treatment plan as it can lead to devastating neurological deficits or even fatal . Spinal cord injury can result from fracture, dislocation, disk herniation or buckling of ossified ligamentum flavum . Even low energy trauma can cause disruption of fused ligaments or fused vertebral body or facet joints especially in the subaxial cervical spine , causing major deformity and instability.

During tracheal intubation and subsequent positioning, there is a considerable chance that traumatized cervical lesions compressing the spinal cord will exacerbate the pre-existing neurological disease. In patients with catastrophic cervical spinal cord injuries, preexisting ankylosing spondylitis with spinal column involvement makes the spinal column more stiff and makes airway management more challenging. Among these situations, awake fibreoptic intubation (FOI) is regarded as the gold standard for managing the airway with greater ease and success while minimizing cervical spine movement[7]. The intubation position was difficult to achieve in this case because of the stiff curvature of the ankylosed spinal column. Minimizing movement during intubation and assuming the proper position were crucial for preserving spinal cord function and preventing neurological damage.

Because of the structure and arrangement of the cervical vertebrae, fractures of the cervical spine occur in AS patients approximately half as frequently as fractures of other parts of the spine.Compared to fractures in patients without AS, they are often more unstable and have a 3.5-fold increased related morbidity and mortality rate[8].

Furthermore, the Hauswald et al. evaluated the way basic airway techniques affected cervical spine mobility. Within forty minutes of their deaths, eight human victims of traumatic arrest were studied. It was discovered that the mean maximum displacement of the cervical spine for mask ventilation was 2.93 mm, oral intubation was 1.51 mm, guided oral intubation was 1.85 mm, and nasal intubation was 1.20 mm. More cervical spine displacement was generated by mask ventilation than by the other interventions that were focused on.[9]

According to Sawin et al. and Horton et al The craniocervical junction (occiput - C1) is where most cervical motion occurs during laryngoscopy in both awake and unconscious participants . The subaxial cervical segments subjacent to and including C4 are minimally displaced.[10]

Donaldson et al. found that: (1) nasal and oral intubation techniques resulted in similar amounts of SAC (space available for the cord) narrowing; (2) application of cricoid pressure produced no significant movement at the craniocervical junction; and (3) preintubation maneuvers (chin lift, head tilt,jaw thrust) narrowed the SAC more than intubation techniques.[11]

It is important to document pre-operative neurological findings as well as any safety measures used. In the event of future medicolegal actions, it is crucial to have a record of appropriate care during the laryngoscopy procedure, as well as throughout the entire anesthesia and postoperative time[12].

In our case , ankylosing spondylitis with cervical spine fracture added the risk of spinal cord injury which made us choose AFOI (Awake fibreoptic intubation) for securing airway . Airway management is challenging as preoperative assessment showed that sniffing position is impossible, reduced mouth opening and cervical collar insitu . These reduced the options for us to intubated in this patient. Secondary neurologic injury due to clinical intervention like direct laryngoscopy , mask ventilation and pre intubation maneuvers where avoided by using AFOI .We preferred AFOI (Awake Fibreoptic Intubation) to secure the airway considering the simultaneous existence of ankylosing spondylitis along with a cervical spine fracture which elevated the potential risk of spinal cord injury. Airway management is difficult as the preoperative examination revealed limited mouth opening, an insitu cervical collar, and an impossibility of the sniffing position. These limited our options for intubating this patient. By employing AFOI, secondary neurological impairment from clinical interventions such as direct laryngoscopy, mask breathing, and pre-intubation techniques were prevented.The advantages of fibreoptic bronchoscopy are its potential for use in awake patients, the minimal cervical movement required to achieve tracheal intubation, and the ability to perform post intubation neurologic assessments in cooperative and cognitively intact patients.

As the nasopharyngeal axis is more closely aligned with the laryngeal and tracheal axes, we opted the nasal route over the oral one, which has been demonstrated to require less cervical spine movement[13].

When doing AFOI, the patient is made calm and awake with minimal respiratory depression by dexmedetomidine, a selective alpha 2 agonist used for sedation, analgesic, sympatholytic, and anxiolytic effects. With its capacity to preserve arousability, reduce hemodynamic response, and improve patient tolerance, it is the ideal drug for conscious sedation. The proper proportion of sedation and comfort are given to the patient during AFOI by a combination of fentanyl (2 mcg / kg), midazolam (0.02 mg/kg), and dexmedetomidine (1 mcg/kg).

AFOI, glidescope video laryngoscope, and intubating laryngeal mask airway are alternatives to direct laryngoscopy for reducing cervical spine motion. With regard to a minimal degree of cervical spine rotation or displacement, AFOI is more effective than the others[11]. In cases of cervical spine fractures involved with vocal cords positioned anteriorly, the glidescope also failed[14].

Conclusion:-

This case report highlights the optimal airway management for an AS patient who was scheduled for a discectomy and stabilization after sustained a cervical spine fracture.An anesthesiologist's foremost objective is to reduce the risk that our intubation skills and techniques could do further harm or impede neurologic functions. Measures such as Reduction of cervical movement and maintaining spinal cord perfusion by keeping mean arterial pressure >80mmhHg decreases further neurological deterioration .When an anesthesiologist has exceptional abilities and

knowledge in patient counseling, airway blocks, topicalization, conscious sedation, and the use of FOB, awake fiberoptic intubation is the most safest way of securing airway for ankylosing spondylitic patients with cervical spine fractures.

References:-

1)Ankylosing spondylitis: what all should anaesthesiologist know?- Rajiv Lakhotia1, Somnath Longani , Rakhi Gupta, Dept. of Anaesthesiology, Hind Institute of Medical Sciences, Barabanki, Uttar Pradesh, India ;2022 https://doi.org/10.18231/j.ijca.2022.074 .

2)Wong J, Lee JSE, Wong TGL, Iqbal R, Wong P. Fibreoptic intubation in airway management: a review article. Singapore Med J. 2019 Mar;60(3):110-118. doi: 10.11622/smedj.2018081. Epub 2018 Jul 16. PMID: 30009320; PMCID: PMC6441687.

3)Meryem E, Asaad EB, Khadija BEH, Itimad N, Nabil MB. Bamboo spine: Ankylosing spondylitis. Int J Case Rep Images 2020;11:101109Z01EM2020.

4)Chest wall kinematics and respiratory muscle action in ankylosing spondylitis patients- Romagnoli, F. Gigliotti, A. Galarducci, B. Lanini, R. Bianchi, D. Cammelli, G. Scan, European Respiratory Journal 2004 24: 453-460; DOI: 10.1183/09031936.04.00123903

5)Debas Yaregal Melesse, Tadesse Teshale Tesema, Zemenay Ayinie Mekonnen, Wubie Birlie Chekol, Airway management for individuals with suspected or confirmed traumatic cervical spine injuries: A comprehensive review and analysis, Perioperative Care and Operating Room Management, Volume 35, 2024, 100390, ISSN 2405-6030, https://doi.org/10.1016/j.pcorm.2024.100390.

6)Yousuf A, Ahad B, Mir AH, Mir AW, Wani JG, Hussain SQ. Evaluation of Effectiveness of Dexmedetomidine and Fentanyl-midazolam Combination on Sedation and Safety during Awake Fiberoptic Intubation: A Randomized Comparative Study. Anesth Essays Res. 2017 Oct-Dec;11(4):998-1003. doi: 10.4103/aer.AER_150_17. PMID: 29284863; PMCID: PMC5735502.

7)Kumar N, Bindra A, Mahajan C, Yadav N. Airway management in a patient of ankylosing spondylitis with traumatic cervical spine injury. Saudi J Anaesth. 2015 Jul-Sep;9(3):327-9. doi: 10.4103/1658-354X.154741. PMID: 26240557; PMCID: PMC4478831.

8)Mehkri Y, Lara-Velazquez M, Fiester P, Rahmathulla G. Ankylosing spondylitis traumatic subaxial cervical fractures - An updated treatment algorithm. J Craniovertebr Junction Spine. 2021 Oct-Dec;12(4):329-335. doi: 10.4103/jcvjs.jcvjs_131_21. Epub 2021 Dec 11. PMID: 35068815; PMCID: PMC8740805.

9)Hauswald M, Sklar DP, Tandberg D, Garcia JF: Cervical spine movement during airway management: Cinefluoroscopic appraisal in human cadavers.Am J Emerg Med 1991; 9:535–8

10)Sawin PD, Todd MM, Traynelis VC, Farrell SB, Nader A, Sato Y, Clausen JD, Goel VK: Cervical spine motion with direct laryngoscopy and orotracheal intubation: An in vivo cinefluoroscopic study of subjects without cervical abnormality. ANESTHESIOLOGY 1996; 85:26–36

11)Donaldson WF III, Heil BV, Donaldson VP, Silvagglo VJ: The effect of airway maneuvers on the unstable C1-C2 segment: A cadaver study. Spine 1997; 22:1215–18

12)Durga P, Sahu BP. Neurological deterioration during intubation in cervical spine disorders. Indian J Anaesth. 2014 Nov-Dec;58(6):684-92. doi: 10.4103/0019-5049.147132. PMID: 25624530; PMCID: PMC4296351.

13) Eipe N. Nasotracheal intubation. Br J Anaesth 2005;95:426-7.

14)Thompson, C., Moga, R. & Crosby, E.T. Failed videolaryngoscope intubation in a patient with diffuse idiopathic skeletal hyperostosis and spinal cord injury. Can J Anesth/J Can Anesth 57, 679–682 (2010). https://doi.org/10.1007/s12630-010-9313-5.