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Occlusion of a Spiral Embedded Endotracheal Tube: A Case Report

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Abstract

Spiral embedded or Armoured tubes are most commonly used during neurosurgical cases for securing airway. In spite of advantage of spiral embedded tubes at times lead to disaster since any deformity in these tubes is permanent and leads to occlusion of a patent airway.

We share our experience of a kinked armoured endotracheal tube leading to difficulty in ventilation intraoperatively. A 29 year old female, who underwent pedicle screw fixation for compression fracture D_{12} following fall from height, under general anaesthesia with armoured tube in prone position. Following change in position from supine to prone, patient bite on the tube created permanent deformity resulting in occlusion, leading to increase in endtidal CO_2 and difficulty in ventilation.

Keywords: Spiral embedded; Armoured ETT , Airway obstruction

Introduction

Spiral embedded endotracheal tube (Armoured ; Flexometallic ; Reinforced) is frequently used during anaesthesia when kinking or compression of the tube is likely to occur especially during neurosurgery, head and neck, and oral surgery.[1-3] Theses tubes can be easily angled away from the operative field without getting kinked. Despite the mentioned advantages, complications may associate with the use of spiral embedded ETT. The major complication reported with the use of spiral embedded ETT was related to the patients biting on the tube.[4] This case report describes compression of spiral embedded ETT during pedicle screw fixation of fracture D_{12} following change in position from supine to prone.

Case report

A 29 year old female, with insignificant past medical history, came with fracture D_{12} following fall from height. She was taken up for pedicle screw fixation. General anaesthesia was induced with thiopentone sodium 5 $mgkg^{-1}$, morphine 0.1 $mgkg^{-1}$. Tracheal intubation with spiral embedded ETT of 7.5 mmID, was achieved using vecuronium 0.1$mgkg^{-1}$. After securing the tube at mark 22 at angle of mouth. Breath sounds were heard equally in both the lungs. Anaesthesia was maintained with 50% nitrous oxide in oxygen and isoflurane. Patient was then turned into prone positon and surgery started.

Approximately 10 minutes after start of surgery, there was progressive increase in endtidal CO_2 from 40 mmHg to 64 mmHg and increased airway pressure from 14 cmH_2O to 40 cmH_2O. Suspecting lighter plane, isoflurane concentration was increased, vecuronium top up repeated. Still endtidal CO_2 increased and reached to 71 mmHg. Patients vitals remained stable. Mechanical ventilation was shifted over to manual ventilation. Ventilation was difficlut and air entry was rechecked. There was marked decrease in airentry bilaterally. Acute bronchospasm was

suspected.Nitrous oxide was stopped, ventilation with 100% O_2 resumed,Inj. hydrocortisone 100 mg i.v, Inj. deriphyllin 8 mg i.v , salbutamol puffs were given. Still there was difficulty in ventilation as resistance was high. We doubted the tube obstruction by a mucous plug and therefore tried to remove it by suction, but the suction catheter was stuck in the midway. Therefore , we suspected kinking of the tube. We inserted an oropharyngeal airway and repositioned patient neck. There was significant improvement in ventilation and endtidal CO_2 , airway pressures returned to normal values. After assurance that the patient was stable, surgery continued uneventfully. There were no further complication or sequeale. Later inspection of the spiral embedded ETT showed that the patient bite had deformed the spiral wire at mark 19, which led to partial occlusion of tube as tube was stuck in between molar teeths of the patient. **(FIG.1)**

Discussion

Spiral embedded ETT have a metal or nylon spiral reinforcing wire covered with both internally and externally by rubber, latex or pvc or silicone. Spiral embedded ETT resist kinking and has been proven valuable for head and neck , neurosurgical procedures and for prone position operations. Despite the mentioned characterstics of armoured tubes, some complications have been reported in the literature.[5-6] Insertion of armoured tube needs a stylet. Sometimes obstruction occurs secondary to the lubricant used to pass the stylet.[7] Problems resulted from cuff herniation and eccentric cuff inflation have been described previously as well. Tube bite, usually with the incisors and molars is a major complication, which results in deformity of the embedded wires and irreversible obstruction of the tube. This may happen when the patient experiences light anaesthesia or during recovery from anaesthesia. Obstruction due to the foreign body, mucous plug, blood has also been reported. Biting on the tube causes respiratory obstruction and may result in complications like hypoxia, hypercarbia, negative pressure pulmonary edema, rise in intracranial pressure and rise in blood pressure. Early recognition of the problem may avoid these dreaded complications. Difficulty in ventilation, increase in airway pressure, a positive deflection on the inspiratory phase of capnography pointed obstruction at some level which we anticipated and confirmed by inability to pass suction catheter through the spiral embedded ETT.

Conclusion

Thus, early anticipation of obstruction of spiral embedded ETT can prevent complication which may be fatal to the patient. Moreover, if the armoured ETT is not well secured and protected, the life threatening complication i.e occlusion due to patient biting may occur. Adequate depth of anaesthesia, bite block, oropharyngeal airway will prevent this complication.

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LEGENDS: FIG 1.