FRACTURES OF THE LARYNX IN CHILDREN

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THE RISK OF TRAUMA to the larynx and trachea is increasing.¹ The upper airway obstruction in these cases may be life threatening and because of his expertise in managing an airway an anaesthetist is often consulted for the care of these patients. Apart from Seed's² views on management of these cases, the anaesthetic literature is nearly devoid of material which may be of assistance.

This report describes a case of closed blunt trauma to the larynx and trachea in a child and the anaesthetic management.

CASE REPORT

A five-year-old black male, while playing, was hit across the front of the neck with an iron bar. Some difficulty in breathing occurred immediately, and rapidly became worse. Inspiratory stridor progressing to severe respiratory obstruction developed. On arrival at the hospital, he was cyanotic and comatose. A 6.5-mm tracheal tube was inserted under direct vision and the cuff inflated. His colour improved and he regained consciousness. Two days later he was transferred to this institution because of increasing subcutaneous emphysema of the neck and chest. He was scheduled for laryngoscopy and bronchoscopy the next day.

Pertinent Laboratory Data

Haemoglobin: 13.5 gm%, Urine: within normal limits. X-ray of the neck and thorax showed that there was a 20 per cent right sided pneumothorax and generalized subcutaneous emphysema. Some soft tissue swelling was visible in the neck. The cuff of the tracheal tube could be seen 3 cm below the cricoid.

Anaesthetic Management

Tracheal tubes of various lengths and diameters were assembled. Ventilating bronchoscopes and a tracheostomy set were prepared in the operating room.

Premedication consisted of atropine sulphate 0.4 mg intramuscularly. Induction of anaesthesia was accomplished with oxygen and halothane and spontaneous ventilation. When the patient was in deep surgical anaesthesia, and after suctioning, 2ml of 2 per cent lidocaine was instilled down the tracheal tube. The cuff was deflated and the tracheal tube removed. A 4-mm ventilating bronchoscope was then inserted after exposing the larynx with a #2 MacIntosh blade. Anaesthesia was

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maintained with oxygen and halothane. Examination of the upper airway showed extensive submucosal haemorrhage in the vocal portion of the glottis involving the left cord, the anterior commissure and extending below the level of the cricoid ring. At the second tracheal ring there was a fresh tear of the mucosa involving three-quarters of the circumference of the trachea. Two cm below this, there was a complete ring of ulceration where the cuff of the tracheal tube had been. Diagnosis was probable fractured larynx with incomplete tear of trachea. A tracheostomy was performed over the bronchoscope. Laryngoscopy was performed five days later and the tracheostomy tube was removed. Endoscopy three weeks later revealed restoration of the normal anatomy.

DISCUSSION

Fracture of the larynx or trachea may be an extremely hazardous injury. The cause is usually a direct injury to the front of the neck, but a "steering wheel" type has also been implicated.³ A high degree of suspicion is necessary in trauma cases to diagnose the condition and it should be considered when there is: (a) change in the voice, (b) pain or difficulty in swallowing, (c) haemoptysis, (d) surgical emphysema of neck, and (e) difficulty in breathing. X-ray examination is usually inconclusive because of the subcutaneous emphysema.

Some of the potential complications are:

(1) Oedema or haemorrhage of the larynx and trachea will reduce the diameter of the airway and this could be enough in the younger age group to cause severe upper airway obstruction with stridor. Injury to the vocal cords or the recurrent laryngeal nerve may compound the problem. As this is a progressive lesion initially, careful observation is necessary for several hours.

(2) The injury can cause bleeding in the subcutaneous tissue with the possibility of a haematoma compressing the trachea.

(3) Tears in the mucosa of the airway may result in surgical emphysema. This may spread to the subcutaneous tissues of the neck, face, or chest, and it may cause pneumomediastinum, pneumothorax, or interstitial emphysema of the lung. The inadvertent use of positive pressure may cause a tension pneumothorax with its attendant dangers. Similarly, "bucking" or coughing will cause the rapid spread of this surgical emphysema. Nitrous oxide may increase the size of the emphysematous areas. Spontaneous ventilation, observation, serial X-rays of chest and mediastinum, and the facilities for drainage or emergency decompression should be available. It should be emphasized that in children, positive pressure ventilation is not a prerequisite to the formation of a tension pneumothorax.

(4) Division of the trachea or of the area below the cricoid can occur in two forms:

- (a) In continuity. This type of injury may not be recognized immediately. By "skill or luck" the trachea may be intubated to establish an airway.
- (b) Not in continuity, where intubation may be impossible and valuable time can be lost. Inappropriate attempts may cause more damage and could displace the torn edges of the trachea. Ventilation may be impossible even with a bag and mask. There is a possibility that ventilation could aggravate the

emphysema. It may be necessary to insert a bronchoscope until a tracheostomy is performed below the tear and the trachea then repaired.

(5) Lastly, infection may supervene with the formation of granulation tissue.

In the case described above, a cuffed tracheal tube and overdistension of the cuff made the tracheostomy necessary. Tracheostomy was not necessary for the injury itself. The trachea was in continuity and the tear was circumferential. All being well, it should have healed without complications. Cuffed tubes are usually not advocated in paediatric patients as the cricoid ring will form a seal and allow a tube to be chosen with a reasonably leak-proof fit. Also, as the tracheal lumen is not circular, the anterior wall gets more pressure when the cuff is inflated because it is more rigid than the posterior wall.

Secondly, the blood supply to the cartilage is poor and undue pressure from the distended cuff may further compromise the circulation. The risk of extending the tear and with it the mediastinal surgical emphysema is also increased. The tube chosen should be large enough that respiration is not embarrassed and yet should not be the largest tube that can be inserted. It should be emphasized that premature attempts at decannulation may be a factor in the aetiology of subglottic stenosis. When the tracheal tube is removed, or the tracheostomy device for that matter, the inflammatory reaction can increase. Attempts to reintubate the patient may aggravate this reaction.⁴

The anaesthetic management should consist of apparatus and techniques that will not compromise the status of the damaged airway. Spontaneous respiration is retained, utilizing halothane and oxygen, to allow an adequate depth of anaesthesia for inspection of the larynx and trachea. Insertion of the bronchoscope should be done by the most experienced person available.

SUMMARY

There is an increase in the incidence of laryngotracheal trauma and a high degree of suspicion is necessary in trauma cases to diagnose the condition. The anaesthetic management in a case of closed blunt trauma has been described with a discussion of the potential complications of fracture of larynx and trachea.

RÉSUMÉ

On a noté une incidence plus élevée de traumatisme laryngo-trachéal. Le diagnostic d'une telle condition peut parfois être difficile. Les auteurs décrivent la conduite anesthésique employée dans un traumatisme cervical par un objet contondant. On discute par ailleurs des implications possibles d'une fracture du larynx et de la trachée.

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