SUBGLOTTIC MEMBRANE. A CASE REPORT

S. G. PALEIZ, L.R.C.P. & S.*

ENDOTRACHEAL intubation is today an accepted part of anaesthesia. Most complications following intubation are, in general, amenable to simple forms of treatment. For the more severe problems, amongst which is subglottic membrane, active diagnostic and therapeutic measures are required.

Aetiological factors responsible for complications of endotracheal intubation include infection, constitutional defects, tissue anoxia, local laryngo-tracheal abnormalities, shape, size and form of endotracheal tube, movement of tube in trachea, neck position, inflammation following duodenal catheter pressure with secondary involvement of trachea (1), trauma from the laryngoscope and the stylet, chemical irritants, following their use for sterilization of tubes (3), undue sensitivity of patient's trachea to endotracheal tubes, and allergic reactions (8).

It is an axiom that for the optimum treatment the exact diagnosis is necessary. To exemplify this and to indicate the necessity for a constant high suspicion of a subglottic membrane, the events leading up to such a case and a description of this case are here given.

During the middle of February, 1955, there was an unusual spate of postoperative respiratory complications in two of the hospitals in this area. These complications occurred at a time when there was a minor endemic of upper respiratory infections One of the patients at the University Hospital, a white female, required an emergency tracheotomy following a cholecystectomy with a very tight fitting endotracheal tube. In retrospect this is considered to have been a case of subglottic membrane. The description of the investigated case follows.

M.S., a 68-year-old white woman, was admitted to the University Hospital for cholecystectomy on February 22, 1955. Cholelithiasis had been demonstrated radiologically two years previously, elsewhere. Since age 15 the patient had suffered from intermittent diarrhoea. In 1922 her only child was born. In 1927 hospitalization was necessary for several weeks for a nervous breakdown. In 1929 an uterine prolapse was repaired by an abdominal operation. A dilatation, curettage and insertion of radium for menopausal bleeding in 1938 was successful. All of these procedures were without complications. Since 1935 treatment for hypertension had been continuous.

Physical examination revealed a thin, poorly developed female, with a moist, pale skin. The pulse was 108, blood pressure 170/90, and respirations 22. The apical impulse was in the anterior axillary line. The abdomen was protuberant, with a midline infra-umbilical scar The spine showed a mild kyphosis. The urinalysis, haematology, and blood chemistry were all within normal limits, except the serum amylase which was 320 Somogyi units (normal 50–200).

On February 24, 1955, a cholecystectomy was performed. Premedication consisted of demerol® 75 mgm. and atropine sulphate $\frac{1}{100}$ gr. Anaesthesia was

*University Hospital, Edmonton, Alberta.

induced with sodium pentothal®, anectine® and syncurine®. A No. 9 Magill portex tube, fitted with a low pressure, inflatable red rubber cuff, lubricated with tronothane® jelly was passed with difficulty into the trachea. An airtight fit between the trachea and the endotracheal tube was obtained without inflating the cuff. Anaesthesia was maintained with cyclopropane, diethyl ether, nitrous oxide, oxygen, and anectine®. Controlled respiration was employed for the major portion of the operation. The anaesthetic time was 2 hours 20 minutes. On extubation unusual resistance was encountered. Both the operation and the anaesthesia were uneventful About 4 hours postoperatively the patient developed wheezing. At 10 P.M. that night the patient was in obvious respiratory embarrassment, with hoarseness, stridor, and tachypnoea. There was no pain. Pulse was 80 per minute, blood pressure 150/70, and respirations 28. The next morning her condition was certainly no better. A portable X-ray plate of the chest revealed no abnormality. A laryngoscopy, followed by a bronchoscopy, was performed. The epiglottic chink, the epiglottis, and the cords were only very mildly inflamed, but a greyish débris was found in the trachea below the cords at the level of the cricoid cartilage. This was removed with an immediate, impressive improvement in the patient's respiratory exchange and in her general condition But this satisfactory state was not to continue. On February 26, 1955, the patient had resumed wheezing, hoarseness, trachypnoea, and stridor A pharyngeal culture taken at this time showed "scant pus cells with a few Gram positive cocci Culture revealed many staphylococcus aureus (haemolytic) sensitive to erythromycin® and chloromycetin® " On February 27, 1955, the patient was worse. There was marked stridor, cough, dyspnoea, tachypnoea, wheezing, and use of her accessory muscles of respiration. Pulse rate was 110 per minute, temperature 99 6, and respirations 28. On February 28, 1955, at 7.00 A.M. the patient was restless, confused, greyish-white in colour with cyanosed extremities and in an obviously dangerous condition. Temperature was 100 8, pulse 80, respirations 38. A No 7 Magill portex endotracheal tube was passed with rapid improvement in respiration and colour This procedure was followed by a bronchoscopy which showed a greyish-white membrane lying loose in the trachea below the cords, apparently loosened and displaced by the previous endotracheal tube. The membrane was removed The cords appeared normal. The pathology report on the membrane was as follows: "The specimen consists of a portion of plastic appearing, grey material, which measures 1 cm. in diameter. Section shows a fragment of membranous tissue, consisting chiefly of fibrin, infiltrated by many collections of leukocytes, with polymorphonuclears predominating. Bacterial clumps are also noted towards the surface."

The subsequent progress of this patient was uneventful. Allergy skin tests for tronothane® jelly and red rubber performed during her convalescence were negative. The patient was ambulatory on March 1 and discharged from hospital on March 6, 1955.

Discussion

Subglottic membrane, also referred to as membranous laryngo-tracheitis (3)

and tracheal mucosa slough (2), occurs most frequently in poorly nourished females and in children (3, 7).

This complication may occur from a few hours to several days after operation, depending on the severity of the pathological changes occurring in the trachea. Four gradations, from a fibrinous membrane to an actual tracheal mucosa slough, have been described (3).

The obstruction occurs at the level of the cricoid cartilage. This is the most narrow portion of the trachea, unable to expand and covered by a sensitive loose areolar type of mucous membrane (4).

Postoperative complications of endotracheal intubation have a common entity of symptoms and signs. These include hoarseness, wheezing, stridor, cough, tachypnoea, dyspnoea, tachycardia, supraclavicular and sternal retraction. In many instances, a bronchoscopy is advisable to ascertain the exact condition. This is mandatory if a subglottic membrane is to be diagnosed correctly. It will then be found that the laryngeal anatomy is practically unchanged up to the cricoid cartilage where the membrane will be encountered. Removal of this membrane will relieve the obstruction. Repeated bronchoscopy may be necessary in some instances, as the membrane may recur. Impediment to the respiration is partly due to the obstructive débris and partly to the reflex adduction of the cords due to irritation from the membrane (4).

It must be evident that a number of subglottic membranes could be missed, either when the patient coughs up the membrane, as might be the case in an healthy male or when a tracheotomy is performed to alleviate a severe obstruction without a preliminary laryngoscopy to rule out laryngeal oedema. Occasionally, despite repeated bronchoscopies, a tracheotomy is required as a life-saving measure Particularly is this the case in children (7).

It would appear that minor trauma, associated with low grade infection, is the main factor contributing to the formation of a subglottic membrane (3).

It is noted that the longer the endotracheal tube is in position, the greater is the possibility of postoperative complications (1).

Preventive Measures

At times of prevalent respiratory infections, limit the use of endotracheal tubes to cases where it is absolutely necessary, particularly avoiding cuffs where possible; employ throat packs in preference.

Arrange for physiotherapy as a routine.

Employ antibiotics where indicated.

Avoid movement of the tube in the trachea with correct taping or by employing a fixing apparatus, such as a divided airway or an Artusio bite block.

Avoid hyperextension of the neck, particularly in children.

Avoid sterilization of tubes with chemical irritants. Employ clean tubes, and those that will mould to the anatomy of the patient.

Use the laryngoscope and stylet with skill.

Select a satisfactory size of tube.

Obtain a satisfactory nutritional state of the patient.

Conclusion

Although postoperative complications of endotracheal intubation cannot be entirely avoided, they can be minimized by constant care and vigilance. Particularly, the patient can be saved the psychic trauma of a tracheotomy by the early diagnosis of a subglottic membrane.

Summary

A case of subglottic membrane is described in an elderly white female following a cholecystectomy with an oversized cuffed endotracheal tube. The need for accurate diagnosis and the danger of being satisfied with a single bronchoscopy is pointed out. Aetiological factors and preventive measures are outlined

Résumé

L'étiologie des complications de l'intubation endotrachéale comprend le trauma, l'infection, les déficiences constitutionnelles et l'allergie.

Une femme agée, de race blanche à nutrition déficiente, chez qui l'on avait utilisé un gros tube endotrachéal à manchon durant une cholécystectomie, développa une membrane sous glottique Ces membranes se forment au niveau du cartilage cricoide et nécessitent un diagnostic bronchoscopique. En les enlevant on guérit l'obstruction respiratoire

Pour les prévenir on doit user d'habilité et d'attention. Le tube choisi doit être de calibre satisfaisant, fabriqué de matériel qui peut s'adapter à l'anatomie du patient Les tubes doivent être propres cependant il ne faut pas les stériliser par des irritants chimiques. Le tube doit rester immobile dans la trachée. Les femmes à nutrition déficiente et aussi les enfants sont les patients les plus susceptibles de souffrir de cette complication

REFERENCES

1 Dwyer, C S , Kronenberg, S , and Saklad, M The Endotracheal Tube A Consideration of its Traumatic Effects with a Suggestion for the Modification thereof Anesthesiology *10* 714 (1949)

2 Turner, F. L. Sloughs of the Tracheal Mucosa Lancet 2 237 (1949)

3. Muir, A P and Straton, J. Membranous Laryngo-Tracheitis following Endotracheal Intubation. Anaesthesia 9: 105 (1954)

4 Etsten, B and Mahler, D Subglottic Membrane A Complication of Endotracheal Intubation. New England J Med *245* 957 (1951).

5. Guedel, A E and Waters, R. M Endotracheal Anaesthesia. A New Technique Ann. Otol Rhin & Laryn *40* 1139 (1931)

6 Snyder, J. J. and Gants, R T Respiratory Obstruction at the Glottic Level Anaesthesiology *14·* 195 (1953)

7 Feinmesser, M , Aladjemoff, L and Chayen, M S. Some Laryngotracheal Complications associated with Endotracheal Anaesthesia Arch Otolaryng 59. 555 (1954).

8 Lundy, J S. Clinical Anaesthesia 1st ed , Philadelphia W. B Saunders (1942)