Rupture of Bronchus with Recurrent Stricture Following Primary Anastomosis

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In April, 1959, at the annual meeting of the American Association for Thoracic Surgery, Hood and Sloan presented an analysis of all cases of injuries of the trachea and major bronchi since the review by Kinsella in 1947. They noted that pulmonary resection had been utilized far too often in recent years and emphasized that repair of such injuries without sacrifice of lung tissue is feasible in the majority of cases. They presented seven cases in their own series, including one that had plastic repair of a recurrent stricture.

This is a case report of recurrent stricture following primary anastomosis and for which dermal grafting was subsequently utilized with an apparent successful result. It is being presented in detail because of some unusual aspects of the problem and some observations that might be useful in the diagnosis and management of similar problems.

This 28 year-old white woman was seen in consultation at the Dearborn Hospital in Madera, California on February 25, 1958, approximately 24 hours after she was injured in an automobile accident. X-ray films on February 24 had revealed considerable emphysema with a suggestion of partial collapse of the left lung by pneumothorax, but the lung fields appeared essentially clear. Other injuries included fractures of the mandible, right femur, left clavicle, and left scapula. She was placed in traction in an oxygen tent and given three units of blood in the next 24 hours. A repeat portable chest film on February 25 (Figure 1) revealed increased pneumothorax on the left. There was generalized haziness throughout the right lung, suggesting diminished aeration and patchy areas which were interpreted as atelectasis, pneumonitis or hemorrhage into the lung parenchyma.

Physical examination revealed a well-developed and nourished white woman in an oxygen tent, appearing drowsy from recent medication, but responding to stimulation. Her pulse was rapid but regular. There was no cyanosis. Respirations were regular, about 24/minute, but quite noisy as though she had retained secretions. There was considerable subcutaneous emphysema over the chest and neck, extending up to the scalp. Breath sounds were absent on the left and coarse rhonchi were heard on the right.

She was prepared for tracheostomy and left thoracostomy with tube drainage. It was planned to do these procedures under local anesthesia, but, on removal from the oxygen tent, she became apprehensive, restless and dyspneic. A catheter was passed blindly into the trachea, and the aspiration of a moderate amount of bloody secretion resulted in some improvement. A general anesthetic was then administered and an endotracheal tube was inserted. The anesthetist remarked that there appeared to be resistance to his bag pressure throughout the operative procedure. A large Foley catheter was inserted in the left second anterior interspace with evacuation of a large amount of air. A No. 6 tracheotomy tube was inserted with aspiration of a moderate amount of bloody secretion. However, she continued to have a wheezing type of respiration and diminished air exchange, even though breath sounds were heard bilaterally. Rapid, labored respirations continued on return to the ward, and her condition was considered critical.

During the next few days she showed gradual general improvement, but bilateral wheezing persisted. An x-ray film on February 28, 1958, revealed good aeration of both lungs, although breath sounds were diminished on the right side. On March 4 there was still considerable wheezing bilaterally, but on March 7, breath sounds were entirely absent on the right side and the left lung was clear. An x-ray film on March 8 (Figure 2) still revealed good aeration of both lungs. Part of one tooth was missing and foreign body forceps were used for extraction. Rupture of the bronchus was suspected for the first time on this examination, and the findings at repeat bronchoscopy on March 18 seemed fairly conclusive. This time a 7 mm. bronchoscope was used, and the right main-stem bronchus was again noted to be partially occluded by granulation.
tissue a short distance below the carina. After removing some of the granulations, a 5 mm. bronchoscope could be passed beyond the obstruction, but the usual landmarks could not be identified. Faint breath sounds were heard afterwards, but an x-ray film on March 19 (Figure 3), revealed the right lung completely opaque with the trachea deviated to the right. It was obvious that the right main-stem bronchus had been ruptured at the time of the accident, and the right lung was now functionless.

It was felt that some attempt at plastic repair should be made, but in the presence of the other multiple injuries, it was difficult to decide just when surgery should be performed. Consultation regarding the fractured jaw and severe fracture of the femur indicated that the pulmonary problem took precedence. Meanwhile a repeat bronchoscopy on April 2 revealed complete occlusion of the right main-stem bronchus by fibrostenosis just below the level of the carina.

Right thoracotomy was performed on April 9, 1958, 44 days following injury, and the right lung was found to be completely atelectatic. Scar tissue in the region of the right main-stem bronchus made dissection tedious, but it was soon apparent that there had been complete transection of the bronchus at the carina, with the distal end retracted about 1½ cm. and a thick fibrous band between the stumps. Reimplantation of the right main-stem bronchus into the trachea was considered the procedure of choice. The distal stump was incised and viscid mucoid secretion was aspirated. An asepto syringe and rubber catheter were used to partially inflate the lung, and all lobes expanded. The end of the bronchus was trimmed for anastomosis, and it was noted that the transection was just proximal to the upper lobe orifice with no encroachment on the lumen of this orifice. A window was made in the trachea near the carina, and the anastomosis was made with interrupted sutures of tantalum wire. A free pericardial fat-pad graft was used to cover the suture line anteriorly. At the time the trachea was opened, the endotracheal tube was passed into the left main-stem bronchus. On enlarging the tracheal opening, the cuff on the tube was nicked and deflated, but the tube still fit snugly in the left bronchus. However, on withdrawing the tube into the trachea to inflate the right lung, the control of the patient’s respirations was not too good. The chest was closed quickly and the condition improved. At conclusion of surgery, the tracheotomy tube was replaced. Good breath sounds were heard bilaterally.

The immediate post-operative course was uneventful and x-ray films on April 11, and April 17, 1958 showed the right lung well aerated. Breath sounds were absent from about the eighth post-operative day, however, and bronchoscopy on April 24 revealed partial occlusion of the anastomosis by granulation tissue. After removing some of the granulations with the suction tip, it was possible to pass the 5 mm. bronchoscope. The bronchus beyond appeared normal except it was impossible to identify the upper lobe orifice. The wire sutures were not visible. In spite of repeat bronchoscopies with dilatation, stenosis was progressive and on June 13 it was impossible to pass even the smallest bougie. It is interesting that all x-ray films showed the right lung well expanded (Figure 4) in spite of the marked stenosis and absence of breath sounds.

**FIGURE 1**  X-ray film 24 hours after injury showing left pneumothorax and subcutaneous emphysema. **FIGURE 2**  X-ray film 12 days after injury showing good aeration of both lungs although breath sounds were absent on the right side.
Repeat thoracotomy was performed on July 2, 1958, and the lung was still aerated. There was dense scar tissue over the anastomosis and the pulmonary artery. The bronchus was dissected free and an incision was made in the membranous wall near the upper lobe bronchus extending through the stenotic area a short distance on to the trachea. The edges separated about 1 cm. and the incision measured about one and one half cm. A full-thickness dermal graft was taken from the lower part of the incision, denuded of its epidermis, and reinforced with No. 30 stainless steel wire. It was sutured in place with 4-0 chronic catgut. The lung inflated readily. The post-operative course was uneventful, and she was transferred to the Fresno County Hospital on July 14, 1958, for further care.

Bronchoscopy on July 23, 1958 revealed a small amount of granulation tissue at the site of anastomosis, and this was cauterized with 20 per cent silver nitrate. The main-stem bronchus appeared collapsed at this level, but admitted easily bougies up through No. 22. Subsequent bronchoscopies were performed at intervals of about three weeks, and dilatations were necessary until December 2, 1958. A wire suture was removed on one occasion and this was thought to be the one used to reinforce the dermal graft. Iodized oil (Lipiodol) was instilled on February 11, 1959 (Figure 5) with excellent filling of all lobes and no evidence of bronchiectasis. At bronchoscopy on September 16, 1959, the 7 mm. bronchoscope was easily passed into the right main-stem bronchus.

Now she is in good general condition 23 months after the injury and 18 months after the second bronchoplasty. Breath sounds are excellent on the right side, and there is no indication of diminished respiratory reserve. The tracheostomy was kept open by tube and later by plastic plug to facilitate bronchoscopies. The plug was removed in May, 1959, and the wound healed within four weeks. She has been able to resume activities which includes singing as a part-time entertainer.

Discussion

In retrospect it would appear that the diagnosis should have been established earlier. Initially attention was focused on the left chest because of the obvious pneumothorax. Nevertheless, there were other signs which should have at least suggested rupture of the bronchus as a possibility. The anesthetist observed, at the time of initial intubation, that there was resistance to bag pressure even after the pneumothorax had been relieved and a good airway established. Also wheezing respirations persisted on the right side after suctioning of the tracheobronchial tree through the tracheotomy tube. Foreign-body in the bronchus (aspiration of tooth) was considered as a possible explanation for the wheezes, and in retrospect this was not likely in the absence of x-ray evidence of an opaque foreign-body.

Bronchial rupture was not seriously entertained as a possibility until the bronchoscopy on March 11, 1958, 14 days after the initial injury. Earlier diagnosis would not have altered the treatment, since the other injuries were of such magnitude that no major procedure would have been contemplated as long as the patient's condition
RUPTURE OF BRONCHUS

FIGURES 5

FIGURE 5: (two films). Bronchogram two months after dermal grafting revealing right main bronchus widely patent and no evidence of bronchiecstasy.

was stabilizing. However, it would seem in this case that to consider the possibility of bronchial rupture would be to make the diagnosis.

Tracheostomy facilitated the subsequent management of the problem. She tolerated the tube and later the plastic plug so well that the tracheostomy was maintained throughout the entire 15 months of treatment. She was apprehensive and would not have permitted bronchoscopy by the oral route with the usual topical anesthesia. Light general anesthesia was usually given, but bronchoscopy was accomplished easily and was used freely. It is interesting that the tracheostomy wound closed spontaneously within four weeks after removal of the tube.

REFERENCES


TUBERCULOUS MENINGITIS

A group of 50 children who recovered from tuberculous meningitis on treatment with SM and INH have suffered a significant degree of intellectual impairment. It appears that the factor having the most unfavorable influence in intellectual recovery is severe clinical illness as evidenced by convulsive seizures.

Loss of consciousness for some time during the early phase of tuberculous meningitis in itself does not appear to be a highly unfavorable sign. Nevertheless, when unconsciousness is associated with convulsive seizures, the intellectual functioning of the patient, in most instances, can be expected to be seriously impaired.

An infant with tuberculous meningitis may be expected to have an unfavorable prognosis aside from any other factors. An older child who has remained conscious throughout his illness and without convulsions, may be expected to have a relatively good prognosis.


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