

## Endoscopic closure of bronchial fistula

HARALD ROKSVAAG, LEIF SKALLEBERG, CARL NORDBERG, KAARE SOLHEIM, BJØRN HØIVIK

*From the Central County Hospital of Hedmark, Elverum, and Central Hospital of Akershus, University of Oslo, Nordbyhagen, Norway*

The treatment of bronchopleural fistula still carries a high morbidity and mortality, especially after pneumonectomy. We report two cases treated by endoscopic application of tissue glue.

### Case reports

#### Case 1

A 62 year old man was admitted to the Central County Hospital with increasing cough, having had haemoptysis for two months. Investigations, including chest radiography, tomography, and bronchoscopy, showed a tumour of the left hilum that was almost occluding the left main bronchus, 3-4 cm distal to the carina. Biopsy confirmed a squamous cell carcinoma. No metastases were identified so a left pneumonectomy was performed. From the first post-operative day the patient's temperature remained raised despite treatment with antibiotics. Chest radiographs showed the mediastinum and the fluid level in the left pleura to be in the normal position.

Twenty two days after operation the patient collapsed and a chest radiograph showed extensive infiltration of the right lung with reduction in the fluid level on the left side, indicating a bronchopleural fistula. This was associated with a tension pneumothorax and empyema. An intercostal catheter was inserted and a tracheostomy performed. Fibreoptic bronchoscopy confirmed a visible fistula in the left bronchial stump.

Three days later it was decided to attempt to close the fistula, which had a measured volume of 1.5 litres per minute. A thin epidural catheter was advanced through the instrumentation channel of a fibreoptic bronchoscope down to the fistula and 1 ml of *N*-butyl-2-cyanoacrylate (Histoacryl) injected. The air leak through the intercostal drain ceased and there was also no evidence of a leak on the ventilator after application of the glue. The intercostal drain was removed after six days and the tracheostomy tube after 14 days. Antibiotics were continued for six weeks. The patient's condition steadily improved and the infiltration in the right lung cleared. Follow up for eight months has shown no recurrence of the fistula.

#### Case 2

A 56 year old man was admitted to the Central Hospital with repeated haemoptysis due to a friable tumour in the left main bronchus. Biopsy showed a squamous cell car-

Address for reprint requests: Dr K Solheim, Surgical Department, Akershus Central Hospital, N 1474 Nordbyhagen, Norway.

Accepted 15 February 1983

cinoma. No metastases were found and left pneumonectomy was performed. His initial recovery was uneventful but three weeks after operation a further thoracotomy had to be performed because of severe wound infection and empyema. A bronchopleural fistula was not seen at this time. A chest drain was inserted and some days later it was obvious that a bronchopleural fistula had developed. Fibreoptic bronchoscopy showed two small fistulas in the bronchial stump. A thin catheter was advanced through the bronchoscope and 1 ml of Histoacryl was injected. The next day bronchoscopy was repeated and the blue glue was seen to have closed one of the two fistulas. The injection of tissue glue was repeated and the other fistula closed. After this treatment the patient's immediate course was uneventful until 10 days later he suddenly collapsed and died. Necropsy disclosed a large pulmonary embolus. The bronchial stump was macroscopically healed. Microscopy showed extensive inflammation in the mucosa. No fistula could be seen. No glue was detected at that time but possibly it had been lost during the preparation.

### Discussion

Bronchial fistula after pneumonectomy is a severe complication with a high mortality rate. Operative treatment is difficult. There are a few published reports on endoscopic closure of bronchial fistula with tissue glue.<sup>1,2</sup> The method has also been evaluated experimentally in dogs, with satisfactory results.<sup>3</sup> Apparently the method initially works by plugging the hole, while permanent closure results from an inflammatory process, which seals the stump by fibrosis. Experimentally it has been shown that repair of the bronchial stump occurs by organisation of granulation tissue and granulomas caused by foreign bodies.<sup>3</sup> Epithelialisation with typical respiratory epithelium has also been observed.<sup>3</sup>

This paper reports the treatment of two patients. The first was extremely sick when treatment was instituted but the clinical course confirmed that the fistula had been closed successfully. Eight months later there were no signs of fistula or empyema. In the other patient the immediate clinical course after application of the glue also suggested that the fistula had closed. The long term result could not be assessed, however, as the patient subsequently died from pulmonary embolism. No fistula was found at necropsy, though this does not totally exclude the possibility of a fistula before death. We feel that the bronchoscopic application of tissue glue in such patients should be tried before the last resort of a formal thoracotomy with operative closure of the fistula. The method is technically easy.

We must, however, emphasise that solidification of the glue occurs within about 10 seconds and it is important not to let it adhere to the bronchoscope. The glue is supplied in ampoules containing 1 ml and must therefore be delivered through a very thin catheter. This also permits application of the glue as close to the fistula as possible. After treatment antibiotics and chest drainage are continued as necessary.

## References

- <sup>1</sup> Hartmann W, Rausch V. New therapeutic application of the fiberoptic bronchoscope. *Chest* 1977;**71**:237.
- <sup>2</sup> Altaparmakoff A, Dakoff J, Kosturkova M. Traitement endobronchique des fistulas bronchiques postoperatoires. *Bronchopneumologie* 1977;**27**:75-8.
- <sup>3</sup> Arruda RM, Neto FL, Santos P, Starvaggi AG. Fechamento do coto bronquico com adesivo a base de metilcianoacrilato. Estudo experimental. *Rev Ass Med Brasil* 1979;**25**:435-6.