New ideas - Thoracic oncologic

Closure of a bronchopleural fistula using glue

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Abstract

Bronchopleural fistula after pneumonectomy remains a challenge after lung cancer surgery. It is associated with high mortality, morbidity and prolonged hospital stay necessitating further thoracotomy. We describe a technique using intra-mucosal injection of glue to close a bronchopleural fistula via bronchoscopy.

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1. Introduction

Bronchopleural fistula remains a serious complication. Various techniques are present ranging from thoracoplasty to deploying of amplatzer devices. Endoscopic closure of a bronchopleural fistula in patients who are at high surgical risk or with fistulas <5 mm in diameter appears to be an attractive solution where in the past extensive surgery has been required. Various materials have been used to seal the fistula including cyanoacrylate based glues, fibrin compounds, absorbable gelatine sponge, chemical cautery agents and vascular embolisation devices [1].

2. Case history

A 51-year-old male presented with recurrent chest infections and a chest X-ray (CXR) revealed a right hilar mass. There was no significant past medical history apart from smoking. Initial bronchoscopy showed a mass in the right lower lobe, biopsies of which confirmed squamous cell carcinoma. The forced expiratory volume was 2.1 l (59%) with a transfer factor of 62%. His exercise tolerance equated to a kilometre. The positron emission tomography (PET) scan revealed a 4 cm right hilar lesion with a standard uptake value (SUV) of 4.9 with evidence of metabolic activity in mediastinal nodes with an SUV of three. He underwent a mediastinoscopy which did not show any evidence of N2 disease.

During intubation it was noted that the tumour had progressed into the right main bronchus necessitating a right pneumonectomy for tumour clearance which was via a posterior-lateral thoracotomy. The right pulmonary artery was double ligated with 2/0 vicryl (ethicon)® followed by the pulmonary veins which were divided using an ethicon® vascular stapler. The right main bronchus was stapled using Ethicon TLH 30® stapler and divided. The bronchial stump was covered with local tissues including mediastinal pleura. Lymph nodes were sampled from stations 7 and 9. No chest drains were placed. Analgesia was provided via an epidural infusion of bupivacaine. The histology confirmed squamous cell carcinoma staged as T2N0. There were no immediate post-operative complications and he was discharged on day 6.

One week following discharge he presented with symptoms of fever, rigors and loss of appetite. A CXR revealed multiple air fluid levels in his right hemithorax. A chest drain was inserted which drained 500 ml of serous fluid and he had an air leak. Cultures from the pleural fluid grew Serratia marcescens. Over a period of three weeks he was treated with antibiotics as dictated by sensitivities. The white cell count normalised with reduction in his C-reactive protein.

At rigid and flexible bronchoscopy a 3-mm bronchopleural fistula was visualised (Fig. 1). Histo-acryl glue was injected

Fig. 1. (a, b) Cross section of the bronchial stump with the fistula at the staple line. (c, d) Intra-mucosal injection of glue resulting in mucosal apposition.
sub-mucosally using an endoscopic sclero-therapy needle. The needle was passed through the bronchial mucosa assuming that some glue was injected onto the pleural aspect of the stump. Continued injection on withdrawal of the needle raised a sub-mucosal bleb of glue causing apposition of the stump walls and a further small amount of glue was left endobronchially at the level of the fistula. No resistance was encountered despite the small calibre needle. The fistula appeared closed on bronchoscopic examination and the air leak stopped. Two weeks later the chest drain was removed and he was discharged. On subsequent follow-up to date at nine months there has been no evidence of recurrence of fistula.

3. Discussion

In the current article we present our experience with sub-mucosal injection of glue. Sub-mucosal injection of glue may help in closure of the fistula by: (1) reduction in the diameter of the fistula; (2) apposition of the stump mucosal surfaces; (3) anchoring the glue preventing it from being ejected; and (4) providing a nidus for growth of granulation tissue.

This method has several advantages including minimally invasive technique, short hospital stay and being less debilitating to the patient compared to surgery.

4. Conclusion

Sterilisation of the pleural cavity with drainage and antimicrobial therapy is an essential pre-requisite for treatment of any fistula. The endoscopic method is safe, easy and inexpensive in patients with early presentation with bronchopleural fistula.

Reference


eComment: The use of biological glues in cardiothoracic surgery

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We have read with great interest the article by Imran Hamid and Jones [1] reporting on the endoscopic submucosal injection of histo-acryl glue for closure of bronchopleural fistula in a patient with right pneumonectomy due to squamous cell carcinoma.

We entirely agree with their idea and would like to add a brief comment related to the use of biological glues in cardiothoracic surgery.

Since the experimental work of Koehnlein and Lemperle on the use of biologic glue in operations, glues have become part of the armamentarium used mainly in cardiothoracic surgery especially where tissues are frail or where added hemostasis and/or air seal is required [2].

Different types of surgical sealants-glues (Fibrin-glue, Bio-glue, Advaseal, Vivastat, Focal-Seal, Histoacryl etc.) have been developed to prevent or even to reduce postoperative air leaks.

In 2007, Chang et al. have reported the successful bronchoscopic histo-acryl gluing for post-lung-transplant bronchopleural fistula [3]. Belda-Sanchis et al. in 2010, concluded after a systematic review of 16 randomised controlled clinical trials that even though the glues reduce postoperative air leaks and time for chest drain removal, this reduction is not always associated with a reduction in length of hospitalisation. Therefore, systematic use of surgical sealants cannot be recommended at the moment [4].

The application of glues can though be associated with significant risk in cardiothoracic surgery, namely severe local inflammation, aortic pseudoaneurysm at the anastomatic site, acute aortic resection, coronary ostial stenosis, cerebral embolism, complete heart block, prosthetic valvar dysfunction and in large bronchopleural fistula treated with tissue glue alone, the glue emboli are highly likely to be blown away in coughing [2, 3].

Economopoulos et al. in 2004, have highlighted in their brief communication regarding superior vena cava stenosis due to extrinsic compression following local application of BioGlue as a delayed postcardiac complication (which was managed successfully with balloon dilatation and stent placement) the need for minimal application and avoiding large amount and spillage [5].

Our experience confirms the need for meticulous judgment of the use of biologic glues plus close follow-up of these patients.

References


