Phrenic nerve block as a novel adjunct to the local treatment of bronchopleural fistula

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ABSTRACT

Bronchopleural fistula (BPF) is a life threatening complication after pneumonectomy with an incidence of about 2-5% and a mortality rate of up to 50%. Topical treatment such as fibrin glue has been previously described with limited success. We present a novel case in which blocking the phrenic nerve assisted in a successful topical closure of the BPF.

INTRODUCTION

Bronchopleural fistula is a life threatening complication after pneumonectomy with an incidence of about 2-5% and a mortality rate of up to 50%. Topical treatment such as fibrin glue has been previously described with limited success. Early sealant dislodgement has been widely postulated as being one of the causes for failure of local therapy. We present a case of a young female who developed a bronchopleural fistula (BPF) 2 months following a right-sided pneumonectomy and successful treatment using topical sealant and a phrenic nerve block to prevent early dislodgement.

CASE REPORT

A 43 years old female was referred to our service for further management of a carcinoid tumour in the right lower lobe. Initial histological diagnosis suggested Small Cell Carcinoma and correspondingly, she was treated with chemo and radiotherapy. However, subsequent histology was deemed to favour a carcinoid tumour. She had a repeat bronchoscopy, which showed extension of the tumour from the origin of the right upper lobe bronchus, through the bronchus intermedius. As the parenchymal lesion in the lower lobe was present, a pneumonectomy was required for adequate clearance. A high risk of BPF was anticipated due to the fact that she had previous radiotherapy and was on active steroids for the management of Adrenal insufficiency. She underwent a right-sided pneumonectomy in which the bronchial stump was closed in two layers with 3/0 PDS and reinforced with an intercostal muscle flap and pericardial fat. She had an uneventful recovery and was discharged home. Histology confirmed a Carcinoid tumour (T2a, NO, Mx), complete resection at all margins with no evidence of small cell or large cell carcinoma. Unfortunately, a routine outpatient chest x-ray performed 2 months following her surgery, revealed a drop in the air-fluid level in the right hemi thorax. A CT Thorax was suspicious for a BPF. A bronchoscopy confirmed a 2 mm BPF. A right Video Assisted Thoracoscopy (VATS) was performed to examine the thoracic cavity and the bronchial stump. The hilar region and bronchial stump was macroscopically

intact and there was no evidence of any infection in the right hemithorax. Due to the relatively small size of the BPF and absence of any empyema, topical sealant was used for closure of the fistula. One of the main causes of failure of topical treatment is early expectoration of the glue in the peri-operative phase. To counteract this, we decided to perform a local phrenic nerve block prior to application of the fibrin glue. During VATS procedure, the right phrenic nerve was identified and injected with 10 mls of 0.25% bupivicaine**.** After the phrenic nerve block, the fistula was brushed gently at bronchoscopy to encourage bleeding and subsequent granulation, and 2 mls of topical fibrin sealant Tisseel^{TM} (Baxter Healthcare Corporation, Westlake Village, CA 91362 USA) was applied. Her post procedure course was uneventful and she was discharged home. A repeat CT scan 6 months after the treatment shows no recurrence of the fistula with a satisfactory fluid level in the Right Hemithorax. Follow-up to date at 3 years, there has been no clinical or radiological evidence of any recurrence of the fistula.

DISCUSSION

Bronchopleural fistula is a very serious complication post-operative lung resection associated with significant morbidity and a mortality of up to 67% (1) It has a reported incidence of up to 20% post pneumonectomy (2). Right sided resections (esp. right pneumonectomy), mediastinal lymph node resection, pre-operative radiation and residual or recurrent carcinoma at the bronchial stump have been identified as technical factors predisposing to BPF. Non-operative factors included diabetes mellitus, hypoalbuminaemia, cirrhosis and steroid administration. In our patient, given that several of these risk factors were present, we anticipated a high risk of BPF following her pneumonectomy. Numerous bronchoscopic procedures have been reported in the literature for the management of small BPF, ranging from the use of glue (3), absolute ethanol (4) to bronchial blockade (5) and stents (6). Fibrin sealant has been widely used to occlude BPF, but often necessitates repeat interventions with poor clinical outcomes (7). Endobronchial treatment has a disappointing success rate of only 30% and a mortality of up to 40% (8). As indicated previously, it has been widely postulated that one of the main causes of failure of local therapy is early dislodgment of the topical sealant before permanent closure of the BPF occurs (9,10). This early dislodgment very often occurs when the patient coughs, especially during extubation, causing expectoration of the sealant before a strong and permanent closure has been achieved. An exploratory VATS is usually performed in early suspected BPF to assess the stump itself and the hemithorax for any signs of infection .We believe that inducing a temporary phrenic nerve palsy during this procedure may help in preventing the dislodgement of topical sealant. Bronchopleural fistula remains a dreaded complication after pulmonary resection. We describe a novel method whereby a local phrenic nerve block was used successfully to prevent early dislodgement of the topical sealant. To our knowledge, this is the first case ever described in the literature. This technique is easy, safe, quick, inexpensive and was successful in treatment of this small bronchopleural fistula.

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