East African Medical Journal Vol. 92 No. 7 July 2015
DUAL OMENTAL FLAP IN OBLITERATING POST-PNEUMONECTOMY BRONCHOPLEURAL FISTULAE
F. W. Nangole, MBChB, MMed, FW, EBOPRAS, Lecturer, S. O. Khainga, MBChB, MMed, FCS (Plast), FCS (CoSecSa), Senior Lecturer, Department of Surgery, College of Health Sciences, University of Nairobi, A. Ruturi, MBChB, MMed, Divison of Cardiothoracic Surgery, Kenyatta National Hospital, M. Hussein, MBChB and Y. Carnjini, MBChB, Department of Surgery, College of Health Sciences, University of Nairobi, P.O. Box 19676-00202, Nairobi, Kenya

DUAL OMENTAL FLAP IN OBLITERATING POST-PNEUMONECTOMY BRONCHOPLEURAL FISTULAE

F. W. NANGOLE, S. O. KHAINGA, A. RUTURI, M. HUSSEIN and Y. CARNJINI

ABSTRACT

***Background*: Post-pneumonectomy bronchopleural fistulae is associated with high mortality and morbidity. The omental flap has been widely used to manage this condition either through laparoscopic or open surgery with varied degrees of success. We present a modification of the omental flap by using two flaps of the omentum in obliterating the bronchopleural fistulae.**
***Objective*: To evaluate the effectiveness of dual omental flap in obliteration of post-pneumonectomy bronchopleural fistulae**
***Design*: A prospective clinical study.**
***Setting*: The cardiothoracic unit at the Kenyatta National Hospital between January 2010 and December 2013 .**
***Subjects*: Five patients with post-pneumonectomy bronchopleural fistulae managed in a period of four years.**
***Results*: Pneumonectomy were due to cancer of the lungs in two patients and tuberculosis in three patients. All the patients had previously attempted repair with a pleural patch without success. Dual omental flap was utilised to repair the fistulae. All patients had successful repair of the fistula and no recurrence was noted at one year of follow up.**
***Conclusion*: Dual omental flap offers an alternative technique in obliterating post-pneumonectomy fistula. The two flap technique allows for one flap to completely seal the fistula while the second flap provides an additional airtight closure over the first flap and hence prevents any leakages. This ensures higher success rate with few recurrences.**

INTRODUCTION

Post-pneumonectomy bronchopleural fistulae are a well known and serious complication in thoracic surgery. The treatment for bronchopleural fistula remains a challenge with various treatment options having different success rates (1,2). Among the options for the fistula closure include direct fistula closure, pleural patch, pectoralis muscle flap and the omental flap (1,2). Globally the risk of a bronchopleural fistula (BPF) after pneumonectomy has significantly reduced over the years varying from 2.6-12.5% (3). Nevertheless the mortality rates remain high ranging from 25 to 71% (4,5). Omental flaps for the closure of the bronchopleural fistulas were first described in 1975 and since then various case series have been documented with various modifications (1,6-12).
In this paper we share our experience with a dual omental flap in the management of post-pneumonectomy bronchopleural fistula at Kenyatta National Hospital, a tertiary public hospital in Kenya.

MATERIALS AND METHODS

This was a prospective clinical study of patients operated on by the authors with post-pneumonectomy bronchopleural fistula between January 2010 and December 2013.All patients were reviewed by both the plastic and cardiothoracic surgeons. Baseline investigations done included full haemogram , urea , electrolytes , liver function tests and albumen levels. The bronchopleural fistula was confirmed through clinical evaluation as noted by persistent leakage of

air from the pleural space. Patients who on initial assessment were noted to be of poor nutritional status were initially managed by high calorie protein diet until there nutritional status improved. Patients with systemic sepsis were also commenced on systemic antibiotics until there general conditions improved before surgery was done.

Operatively, laparatomy was done through an upper midline incision. After entering the abdominal cavity, the omentum was identified. The left and right gastoepiploic vessels with the arcade were also identified. The omentum was then freed from both the greater gastric wall and the transverse colon with all precautions to include the gastroepiploic arcade in the flap. After successful mobilisation of the omental flap, the flap was split into two leaflets. One leaflet was based on the gastroepiploic arcade. The second leaflet was based on one of the terminal branches of the left gastroepiploic artery (Figure 1). The two leaflets of the omentum were then marked with a stitch for the ease of identification (Figure 2). An aperture was then created in the ipsilateral hemi diaphragm and the leaflets delivered into the thoracic cavity. After attaining haemostasis, the laparatomy wound was closed.

Figure 1
Bileafed omental flap with one leaflet based on the gastroepiploic arcade and the other on the terminal branch of the left gastroepiploic vessels

Figure 2
Demonstrates right bronchi fistula

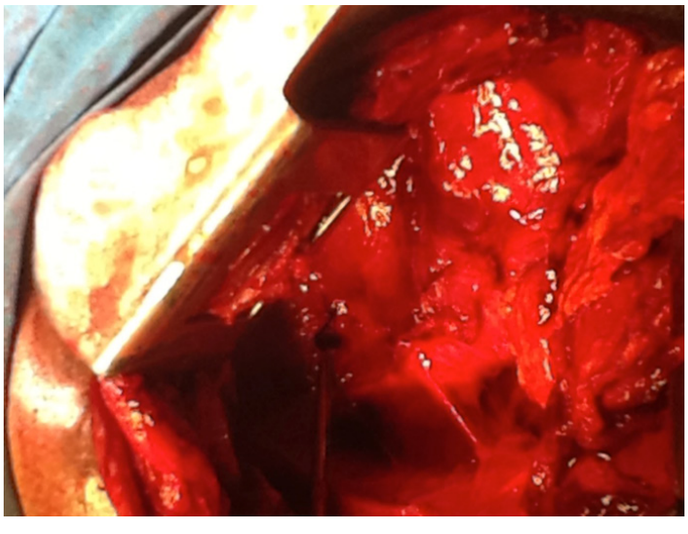


Figure 3
Left bronchi fistula

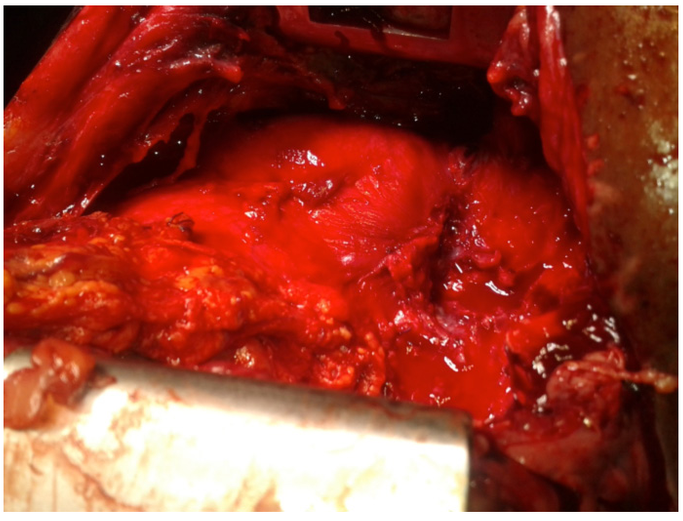


Figure 4
Suction of debris and necrotic sloughs from the fistula prior to insertion of the flap

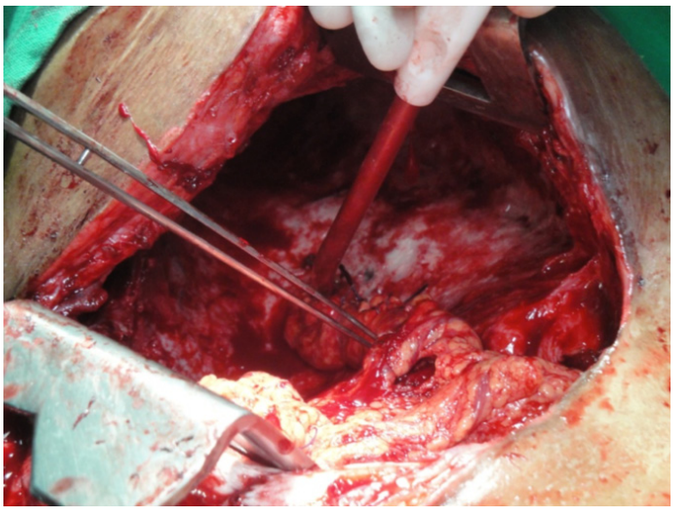


Figure 5
Gastro epiploic based omental flap used to obliterate the bronchi fistula

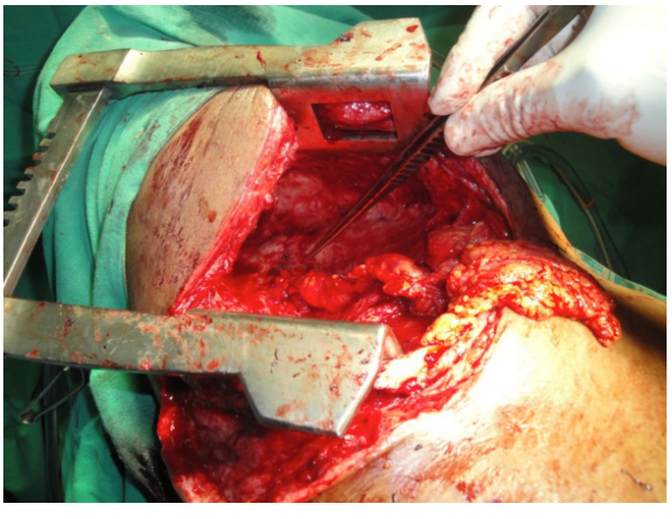
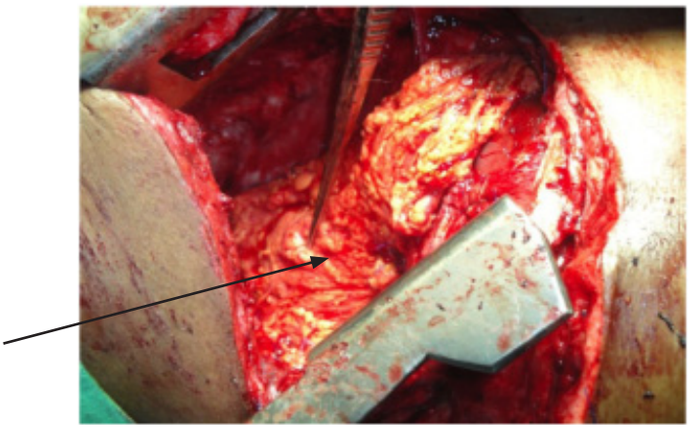


Figure 6
Second omental leaflet used to cover the bronchi fistula and assist in t obliterating the thoracic dead space



A lateral thoracotomy incision was then done. The bronchiopleural fistula was positively identified (Figure 2 and 3). Any debris around the fistulae were removed and the edges of the fistulae refreshened by the use of a currate.

One of the leaflet was then directed into the fistula and secured with prolene 2/0 stitch in interrupted fashion (Figure 3-5). This would be firmly secured into the bronchus to ensure complete obliteration of the fistulae. The second leaflet was then guided over the first leaflet and rolled over it in multiple layers like a sheet folded over itself. This leaflet was also secured with interrupted prolene 2/0 sutures to ensure an airtight closure (Figure 6,7). Airtight closure was confirmed by a Valsalva maneuver by asking the anaesthetist to increase the ventilation pressures while noting for any gas leakage around the fistula.

Chest tube drain was then inserted and the wound closed in layers. Immediate post-operatively air leakage was monitored by checking for any bubbling in the underwater seal drain. The drains were removed on the fifth post-operative day. The patients were subsequently discharged around the seventh post operative day and subsequently followed up in the clinic till one year after surgery.

RESULTS

A total of five patients with bronchiopleural were managed with the dual omental flap techinique. The age range for the patients was 35 years to 57 years with a mean age of 46 years. The male female ratio was 4 to 1. The primary pathology for the patients was tuberculosis in three and cancer of the lungs in two patients. Three patients had right pneumonectomy done with two patients left pneumonectomy. All patients had had direct fistulae closure at the time of pneumonectomy with no success. Attempted repair with a pleural patch had been done in three patients with recurrence of the fistulae.

Bileafed omental flap was subsequently done in all the five cases. No fistulae recurrence was noted up to one year of follow up. One patient had infection at the thoracotomy site that healed with dressings. No sepsis nor wound dehiscence was noted at the laparotomy site.

DISCUSSION

Post-pneumonectomy bronchopleural fistula is a serious and life threatening complication. Inappropriate management of this condition results in high morbidity and mortality. The quality of life is greatly interfered with as the patient keeps on getting recurrent pleural cavity infection that is associated with bad odor and discharge that makes the patient a social misfit.

Several approaches have been described in literature in trying to close the fistulae. This include direct fistula closure, pleural patch, muscle flaps and the omental flap. Direct fistula and pleural patch as demonstrated in this study are probably associated with the highest recurrence rate. There role in the management of bronchiopleural fistulae reccurence is thus limited. Muscle flaps commonly used in closing the fistula are the pectoralis major and the Lattismus dorsi muscle. The Lattismus dorsi muscle in many instances is rendered useless by the lateral thoracotmy incision that sacrifices its pedicle. Pectoralis major muscle flap on the other hand is associated with anterior chest wall deformity that is aesthetically not pleasing to many patients especially females.

Omental flap is thus probably the gold standard in obliterating bronchiopleural fistula. This flap in recent years has gained popularity due to its ease and high success rates. Omental flaps to treat bronchopleural fistulas were first described in 1975 and have been modified since then (Virkkula & Eerola,

1975; Perianayagam *et al*., 1980; Iverson *et al*., 1986). The ability of the omentum to suppresses infection is well known and is related to its rich blood supply and lymphatic vessels. In addition, in experimental studies, it has been found that angiogenic factors within the omentum promote neovascularisation of the bronchial suture line allowing closure of the fistula (Hirata *et al*., 1992). In addition to its immunologic properties, omental flaps have the advantage of not producing chest wall deformities and impairing muscle function as seen with muscle flaps (D'Andrilli *et al*., 2009). However inspite of all this attributes bronchiopleural fistulae may still recur if the omentum is not well inserted in the bronchial stump (1,2). Puskas *et al* in his study had a success rate of only 9 out of 12. An airtight insertion of the flap should be aimed so as to prevent any air leakage and possibilities of fistulae recurrences.

Dual omental flap technique allows for this airtight insertion of the flap. One flap based on the gastro epiploic arcade is inserted into the fistula and firmly secured in the bronchus with a non absorbable suture. The flap carries with it a rich vascular supply that allows it to intergrate firmly with the bronchial tissues and hence reducing chances of any subsequent air leakages. The second flap with it main blood supply as the branches of the left gastroepiploic vessels is used to reinforce the first repair in multiple layers. and hence reducing further any remote chances of any air leakages. This flap in addition also assists in feeling up technique minimising any chances of fistula recurrence of the fistula.

REFERENCES

1. Puskas. J.D., Mathisen. D.J., Grillo. H.C. et al, Treatment strategies for bronchopleural fistula *J Thorac and Cardiovasc Surg*. 1995;**109**:989-992
2. Hoier-Madson, K., Schulze, S., Moller Pedersen, V et al. Management of bronchopleural fistula following pneumonectomy. *Scandinavian Journal of Thoracic and Cardiovascular Surgery*, 1984;**18**: 263-266.
3. Forrester-Wood, C.P. Bronchopleural fistula following pneumonectomy for carcinoma of the bronchus: mechanical stapling versus hand suturing. *Journal of Thoracic and Cardiovascular Surgery* 1980; **80**:406-409.
4. Asamura, H., Naruke, T., Tsuchiya, R.*et al*. Bronchopleural fistulas associated with lung cancer operations. Univariate and multivariate analysis of risk factors, management and outcome. *Journal of Thoracic and Cardiovascular Surgery*, 1992; **104**:1456-1464.
5. Wright, C.D., Wain, J.C., Mathisen, D.J Post-pneumonectomy bronchopleural fistula after sutured bronchial closure: incidence, risk factors and management. *Journal of Thoracic and Cardiovascular Surgery*, 1996; **112**: 1367-1371.
6. Virkkula. L.,Eerola, S. Use of omental pedicle for treatment of bronchial fistula after lower lobectomy. *Journal of Thoracic Cardiovascular Surgery*, 1975; **9**, 287-290.
7. D'Andrilli,A., Ibrahim.M.,Andreetti, C., *et al*. Transdiaphragmatic Harvesting of the Omentum Through Thoracotomy for Bronchial Stump Reinforcement. *Annals of Thoracic Surgery,* 2009; **88**, 212-215.
8. Iverson. L.I.G., Young. J. N., Ecker R.R., et al .Closure of bronchopleural fistulas by an Omental Pedicle Flap. *American Journal of Surgery*, 1986;**152**, 40-42.
9. Kondo.R., Tatsuyuki S., Hanamura, N.,etal Gastric Seromuscular and Omental Pedicle Flap for Bronchopleural fistula after pneumonectomy. *Journal of Thoracic and Cardiovascular Surgery,* 2000;**48**, 536-539.
10. Martini, G., Widmann, J., Perkmann, R., & Kuno, S.. Treatment of Bronchopleural fistula after pneumonectomy by using an omental pedicle. *Chest*, 1994;**105**, 957-958.
11. Perianayagam.W.J.,Booshanam. M.V., Muralidharan.S., The use of an omental pedicle flap in the closure of bronchopleural fistulae. *Australian and New Zealand Journal of Surgery,* 1980; **50**:204-205.
12. Yokomise. H., Takahashi. Y., Inui. K. Omentoplasty for postpneumonectomy bronchopleural fistula. *European Journal of Cardiothoracic Surgery* 1994; **8**, 122-124.