

## An alternative technique of dealing special cases of bronchopleural fistulas.

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**ABSTRACT:** The closure of a bronchopleural fistula (BPF) complicating pneumonectomy remains a serious challenge for the surgeon. Although several endoscopic, surgical and combined (surgical + endoscopic) techniques have been proposed to manage this complication, serious technical challenges appear when the bronchial stump is too rigid and/or is in very close proximity to the carina. In such cases the use of common staplers can be proved ineffective or even hazardous.

In the present we describe a tension-free technique for buttressing the bronchial stump with intercostal muscle flap. Although we have not applied this technique neither in humans nor in animals yet, its theoretic advantages are obvious and we believe that it can be applied to specific cases of BPF's with very short and rigid bronchial stump.

*Key Words:* Bronchopleural fistula, Treatment, Surgical technique.

### INTRODUCTION

Bronchopleural fistula (BPF) is an infrequent but life-threatening complication following pneumonectomy and according to recent studies its' incidence is reported to range 0-15% with mortality rates ranging from 16 to 72%<sup>1,2</sup>.

BPF's commonly occur after aggressive peeling of the bronchial stump or other surgical errors in technique, or it may appear after the administration of neo-adjuvant irradiation or chemotherapy<sup>3</sup>.

Among various risk factors that have been studied as etiologic factors for the BPF's, specific anatomic parameters concerning the length and the diameter of the stump seem to play the central role in the development of this complication. These anatomic parameters give also an explanation about the higher incidence of BPF's in men as well as in right pneumonectomies<sup>4</sup>.

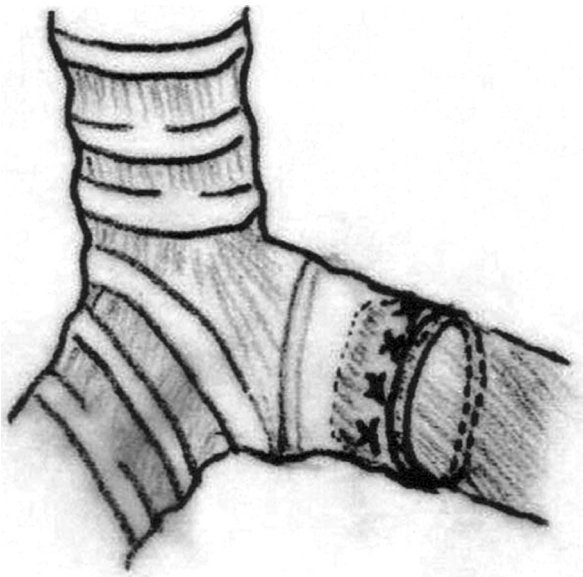
Our surgical technique can be considered as an ultimate attempt in dealing with specific cases of BPF's with unfavorable anatomy, before the thoracic surgeon has to proceed to more complicated tracheal reconstructive procedures.

### TECHNIQUE

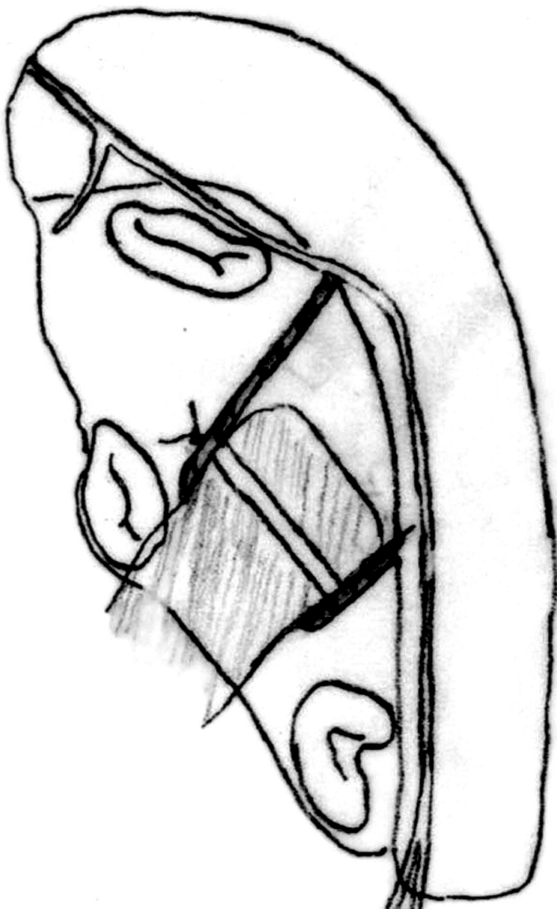
Our tension-free, buttressing technique could be proposed for selected cases of BPF's where previous surgical attempts have been failed due to the rigidity and shortness of the bronchial stump. According to it, a thick intercostal muscle flap is inserted into the short bronchial stump promoting its complete buttress. Following, the bronchial edges are approximated with tensionless non-absorbable interrupted sutures (Figures 1, 2). Special care should be given not to jeopardize the blood supply of the flap, as well as to provide adequate length of it in order to avoid any unnecessary tension. Similarly to all the other well-known techniques used in BPF's, the re-amputation of the bronchial edges of the stump if feasible, is desirable. Furthermore, a gentle abrasion of the inner wall of bronchus before inserting the flap can be proved helpful in promoting the adhesion formation between the two tissues.

### DISCUSSION

Surgical attempt to close the fistula through the contaminated environment of the hemithorax usually



**Figure 1.** The intrabronchial muscle stump. Notice the single sutures.



**Figure 2.** Bacillary section. Notice the single suture, the aortic arch, the vagus nerve, the stumps of pulmonary artery and veins.

fails. Right sided BPF's are even more challenging since the stump of the right bronchus is always short, less than 2cm in length. For this reason re-amputation of the stump during reoperation for closure of such a fistula is difficult to be performed through a right thoracotomy, with transsternal-transpericardial route to be documented as the best approach for right-sided BPF's<sup>1</sup>.

Our proposed technique could be considered as an alternative in dealing with specific cases of early and large BPF's with bronchial stump 1-2 cm long. This length is assumed to be essential in order to allow us to buttress the bronchus and on the other hand to prevent the muscle flap from prolapsing into the trachea or into the other bronchus.

Despite that we have not performed this new proposed technique in humans or in animals yet, we believe that this non-technically demanding technique appears to have several theoretical advantages. First of all, equally to all the buttressing procedures<sup>5</sup>, our proposed technique is tension free and can result optimum overall outcome and low possibility of recurrence. Second, any increase in the intrabronchial pressure which occurs during mechanical ventilation or cough, tends to push the proximal to the suture line part of muscle flap towards the bronchial wall sealing any possible air leakage. Third, our proposed technique can also be safely combined with any kind of supplement endoscopic intervention<sup>6</sup>. And last but not least, its' effectiveness can be easily tested intraoperatively by filling the hemithorax with sterile saline similar to all other thoracic surgery procedures.

Should this last attempt of dealing a BPF with a very short and rigid bronchial stump fail e.g. multiple reoperations, radiation ect, the thoracic surgeon may unavoidable have to proceed to a more complicated bronchoplastic procedure, but with unfortunately higher cost in morbidity and mortality.

## Μια εναλλακτική χειρουργική τεχνική αντιμετώπισης ειδικών περιπτώσεων βρογχοπλευρικών συριγγίων.

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**ΠΕΡΙΛΗΨΗ:** Η χειρουργική σύγκλιση βρογχοπλευρικών συριγγίων μετά από πνευμονεκτομή παραμένει μέχρι σήμερα μια σοβαρή πρόκληση για το χειρουργό. Αν και έχουν προταθεί αρκετές ενδοσκοπικές, χειρουργικές και συνδυασμένες (χειρουργικές + ενδοσκοπικές) τεχνικές αντιμετώπισης, σοβαρές τεχνικές προκλήσεις εξακολουθούν να εμφανίζονται όταν το βρογχικό κολόβωμα είναι πολύ άκαμπτο ή/και όταν βρίσκεται πολύ κοντά στην τρόπιδα. Σε αυτές τις περιπτώσεις η χρήση των κοινών συρραπτικών μπορεί να αποδειχθεί αναποτελεσματική ή και καταστροφική.

Στο παρόν άρθρο περιγράφουμε μια χειρουργική τεχνική χωρίς τάση κατά την οποία το βρογχικό κολόβωμα επιπωματίζεται με κρημνό μεσοπλεύριου μυός. Αν και δεν έχουμε εφαρμόσει την τεχνική αυτή ακόμα σε ανθρώπους ή πειραματόζωα, τα θεωρητικά πλεονεκτήματά της είναι προφανή και πιστεύουμε ότι μπορεί να εφαρμοσθεί σε ειδικές περιπτώσεις βρογχοπλευρικών συριγγίων με πολύ κοντό και ανελαστικό βρογχικό κολόβωμα.

*Λέξεις Κλειδιά:* Βρογχοπλευρικό συρίγγιο, Θεραπεία, Χειρουργική τεχνική.

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