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Flap choice for closure of open window thoracotomy: a response to the author of the article entitled "the omentum flap for empyema treatment: indications and disadvantages"

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Submitted Nov 05, 2016. Accepted for publication Nov 22, 2016.
doi: 10.21037/jtd.2016.12.55
View this article at: http://dx.doi.org/10.21037/jtd.2016.12.55

The principle of empyema treatment includes cleansing the pleural cavity of bacterial infection and removing the empyema cavity. Open window thoracotomy (OWT) is the most invasive and radical treatment for severe empyema; the procedure itself, as well as its closure, is challenging.

For OWT closure, transposition of the omental pedicle and muscle flaps is often performed. However, flap choice is difficult and controversial. We reported the outcomes of using the omental pedicle and muscle flaps for OWT closure (1) and concluded that the omental pedicle flap was superior to the muscle flap in terms of fewer local recurrence and shorter hospital stay, although rates of success and mortality were equal.

Shipkov *et al*. pointed out some important issues (2). They described the importance of flap choice and disadvantages of the omental pedicle flap. Surgical trauma resulting from harvesting the omentum can be severe. Laparotomy may cause severe complications, such as diaphragmatic hernia, hemorrhage, and ileus (3). Here one patient in the omental pedicle flap group developed severe complication. Therefore, we understand their resolution that flap choice for OWT closure is an extremely important issue and that, in most of their cases, the muscle flap is the first choice.

We recognize the usefulness of the muscle flap. Transposition of the muscle flap is simple to be performed (4), without the need to change patient position during surgery (2). We agree that the muscle flap should precede the omental pedicle flap as a choice for OWT closure in cases that are not severe and the omental pedicle flap should be limited to complicated cases.

However, the incidence of local recurrence is not negligible with the muscle flap. The implications of this finding relates to the fact that improved survival of patients with thoracic empyema depends on a successful OWT closure (5) and that exacerbation of empyema can worsen the nutritional status. In such cases, repeated OWT would subject a patient to a further invasive procedure. Therefore, selection of a suitable flap for OWT closure should take into account prevention of local recurrence. Factors that influence local recurrence and refractoriness of OWT should be investigated to improve success rates.

The most important issue that Shipkov *et al*. pointed out was selecting an appropriate flap according to the type of empyema (2). The location and volume of the cavity, status of thoracic infection, presence of bronchopleural fistula (BPF), etiology of infection, past history of abdominal operation, and type of previous thoracic incision influence flap choice for OWT closure (1). The characteristics of the patients in whom empyema was treated were added to our report (*Table 1*). This information can help in choosing the flap to use for OWT closure. Compared with patients in whom the muscle flap was used, those in whom the omental pedicle flap was used had higher percentage of prior lung resection (66.7% *vs*. 38.8%); similar incidence of BPF (11.1% *vs*. 11.1%); higher overall incidence of pulmonary fistula, including BPF (77.8% *vs*. 38.9%); and higher proportion of thoracic empyema located inferiorly (22.2% *vs*. 77.8%) and in the superior and inferior locations combined (44.4% *vs*. 11.1%). The abovementioned data support our choice of the omental pedicle flap for severe

Table 1 Characteristics of patient

Characteristics	Omental pedicled flap	Muscle flap
Infection side		
Right	4	3
Left	5	15
Localization		
Superior	2	2
Inferior	3	14
All	4	2
Bronchopleural fistula		
+	1	2
–	8	16
Pulmonary fistula		
+	7	7
–	2	11
Prior lung resection		
Pneumonectomy	1	1
Lobectomy/segmentectomy	5	5
Partial resection	0	1
Chronic empyema		
+	3	1
–	6	17

cases. We feel that the presence of a pulmonary fistula strongly affects successful OWT closure. Because such cases are more difficult to treat, we believe that transposition of the omental pedicle flap for OWT closure is a better option.

Omentoplasty requires three important criteria as Kitano pointed out (6). First, is the feasibility of harvesting the omentum. In patients who have undergone laparotomy or in those who had peritonitis in the past, the presence of severe adhesions will prevent collection of the omentum. Second, is the availability of the omentum. Cases with omental infection, omental ischemia, and presence of malignant neoplasm in the omentum are not candidates for omentoplasty. It is also important to avoid injury or torsion of the omentum during surgery to preserve blood supply. Third, is ensuring a sufficient volume of the omentum, which will depend on individual nutritional status, as indicated by the body mass index and serum albumin level. Preserving a good nutritional status is quite important for OWT closure using an omental pedicle flap.

The indications and techniques of omental pedicle flap use for OWT closure need to be mentioned. In our opinion, thoracic empyema with pulmonary fistula including BPF, complicated postoperative course, multiple drug-resistant infection, and poor pulmonary function are good indication for using omental pedicle flap. These cause severe empyema and less curative than usual (3).

Surgical techniques continue to develop these days. Although laparotomy is quite invasive, laparoscopic omentoplasty was found to be feasible and comparable with laparotomy in terms of safety and efficacy in treating chronic thoracic empyema (7). Based on our experience, changing the position of a patient during surgery is not essential. At our institution, we keep patients in a semi-lateral decubitus position during both laparotomy and thoracic operation, without the need to change positions, but only the angle of the operation table. This way, we can shorten the surgery time and exposure to anesthesia, thereby, making the procedure less invasive.

In conclusion, although the use of muscle flaps is advantageous in many cases, use of the omental pedicle flap may be the better option for severe thoracic empyema. The selection of appropriate flap for OWT closure must take into account prevention of local recurrence, and there should be no hesitation to use the omental pedicle flap for this purpose. However, we underscore that the process of selection of a suitable flap remains an unsolved issue. In future, specific indications for the omental pedicle flap for OWT closure should be identified.

Acknowledgements

None.

Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

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Cite this article as: Shinohara S, Chikaishi Y, Kuwata T, Takenaka M, Soichi Oka, Hirai A, Imanishi N, Kuroda K, Tanaka F. Flap choice for closure of open window thoracotomy: a response to the author of the article entitled "the omentum flap for empyema treatment: indications and disadvantages". J Thorac Dis 2016;8(12):E1777-E1779. doi: 10.21037/jtd.2016.12.55

