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Preliminary Report

Use of greater omentum in thoracic onco-surgery

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Abstract
Background: Omentum is well known for its immunocompetence and good blood supply; and therefore, is being used in various complex thoracic procedures. Specially, in situations when staplers, sealants and total parenteral nutrition may not be used because of financial constraints, omentum may prove very helpful in preventing post-operative fatal complications.
Methods: A retrospective review of 61 patients was undertaken. Patients were categorized into two groups. In group I, omentum was sutured to the anastomosis for prophylaxis of leak from gastro-oesophagectomy after radical surgery for cancer of cardia and oesophagus. In group II, it was used for therapeutic purpose, to control diffuse air leak from lung parenchyma after chest wall and invaded lung resection for malignant chest wall tumours (subgroup A) and treatment of post pneumonectomy bronchopleural fistula for NSCLC of right lung (subgroup B). Gastro-oesophagectomy, closure of bronchial stump and suturing of lung parenchyma after wedge resection was done with manual suturing technique only.
Results: Group I: There were 57 patients with the diagnosis of cancer of cardia and oesophagus, who underwent radical surgery. Transthoracic approach was used in 96.5% patients, whereas 3.5% patients underwent transhiatal resection. Anastomotic level was located in chest in 68.4% and in neck in 31.6% patients. The leakage rate was 5.4%. **Group II:** There were three patients in subgroup A, all with lesions located in left side of chest wall. There was one patient in subgroup B. Chest tube was removed after a mean time of 2 days and after 4 days in subgroup A and B, respectively. There was 1 mortality (1.6%) secondary to chylothorax.
Conclusion: Use of pedicled omentum appears to be a very simple technique to prevent the anastomotic leak after radical surgery for cancer of cardia and oesophagus, and to seal the diffuse parenchymal pulmonary leak after various procedures in thorax.

Key words: greater omentum; omentoplasty; omentopexy

The greater omentum has attracted significant attention from thoracic surgeons over the years. The following features of omentum are especially valuable for clinical practice: plasticity, immunocompetence, angiogenecity and good blood supply.

In thoracic surgery, it is used most widely for the filling of so-called dead spaces as in chronic empyema, frontal mediastinitis, chest-wall defects after resection and to strengthen a main bronchus stump in case of a failure after pneumonectomy[1, 2]. The majority of authors reported good results after such surgery. In the developing world, various facilities of newer technology may not be used commonly because of financial constraints from the side of patient. For example, use of staplers for closure of bronchial stump, lung parenchyma after its resection or performing gastro-oesophagectomy is very popular and has almost replaced the manual suturing techniques. Similarly, in case of development of leakage from a gastro-oesophagectomy, total parenteral nutrition may prove very useful in its conservative management. The above methods are used only occasionally in our set up. Omentum may prove the best friend for thoracic surgeons in such circumstances. In this report, we retrospectively reviewed our cases in thoracic surgery for cancer patients where pedicled omental flaps were used.

Materials and methods

A retrospective review of 61 consecutive patients in whom omentum was used for the diseases of lung, chest wall, oesophagus and cardia was undertaken.

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Patients were categorized into two groups according to the indication for use of omentum. In group I, pedicled omentum (4x6 cm) along greater curvature was preserved and sutured circumferentially or in some cases only anteriorly to the anastomosis (omentopexy) for prophylaxis against anastomotic leak after radical gastro-oesophagectomy for cancer of cardia and oesophagus. In group II, it was used for therapeutic purpose, primarily to control diffuse air leak from lung parenchyma after chest wall and lung resection for malignant chest wall tumours (subgroup A) and treatment of post pneumonectomy bronchopleural fistula (subgroup B). Patients in subgroup A underwent chest wall reconstruction with latissimus dorsi flap and prolene mesh. Omentum was delivered into thoracic cavity through the diaphragm after mobilizing it from the transverse colon preserving the vascular supply, based on right or left gastroepiploic vessels. It was sutured with interrupted 000 silk to the surface of pulmonary parenchyma. In case of postpneumonectomy bronchopleural fistula, it was stitched around the bronchial stump loosely with 000 vicryl. Closure of bronchial stump and suturing of lung parenchyma after wedge resection was done with manual suturing technique only. Mechanical staplers or sealants were not used. A R0 resection was confirmed histopathologically in all cases. In none of the patients, neoadjuvant treatment was considered.

Results

Group I: There were 76 patients with the diagnosis of cancer of cardia and oesophagus, who underwent radical surgery at BPKM Cancer Hospital during a period of 1999-2005. There were 57 patients in whom omentopexy was used (Table 1). The mean age of patients was 57.8 years. Anastomotic level was located in chest in 39 (68.4%) and in neck in 18 (31.6%) patients. There was no leak from the anastomosis placed at chest whereas all three leaks were observed from the anastomosis placed at neck. Leaks were managed conservatively and all leaks healed after a mean duration of 15 days (range 11-28 days).

Group II: There were altogether four patients. In subgroup A (Table 2), all had lesions located in left side of chest wall. Mean size of the mass was 8 cm. pathologically, all had soft tissue sarcoma. There was one patient in subgroup B, who developed bronchopleural fistula and empyema thoracis 10 days after right pneumonectomy for squamous cell carcinoma of lung. Chest tube was removed after a mean duration of two days (range – 1-3 days) and after four days in subgroup A and B, respectively. No major postoperative complication was found. There was one (1.6%) in-hospital mortality in the series. The patient after esophagectomy developed chylothorax and he died on 7th postoperative day.

Table 1: Group I (n=57)

Parameters	n (%)
Male	34 (59.6)
Female	23 (40.4)
Transthoracic approach	55 (96.5)
Transhiatal approach	2 (3.5)
Two-field nodal dissection	53 (83)
Nodal sampling	4 (7)
Anastomotic leak	3 (5.4)

Table 2: Group II (subgroup A)

Parameters	n
Male	2
Female	1
Mean number of resected ribs	4.7

Discussion

Omentum has been long used for different purposes for its capacity of localizing infection and sealing micro perforations. In thoracic surgery the omentum is used most widely for the filling of so-called dead spaces at chronic empyema, mediastinitis, chest-wall defects after resection and to strengthen a main bronchus stump in case of a failure after pneumonectomy.[1-3]

It is believed that covering an anastomosis, particularly the one at high risk of dehiscence (e.g., after preoperative radiotherapy), with a well vascularised flap of omentum provides oxygen and nutrients for improved healing. Moreover, the omentum delivers vascular endothelial growth factor, a potent angiogenic factor.[4] This substance appears to be responsible for demonstrated ability of omentum to accelerate neovascularization across anastomotic line.[5] Morgan and colleagues[5] demonstrated revascularization of totally ischemic bronchial autografts with omental flaps in dogs.

Levashev and colleagues showed their results after use of omentum both for prophylaxis and treatment of difficult situations after thoracic procedures. Out of 68 patients in their series, in 35 patients after right pneumonectomy and 13 patients after circular tracheal and carinal resection and one patient after tracheal resection with free allogenic tracheal graft received omentopexy for prophylactic purpose. They had only one bronchopleural fistula (after right pneumonectomy) and two tracheal dehiscence after tracheal resection. The patient with bronchopleural died, but in the cases of tracheal dehiscence, omentum could seal the leak hermetically and later healed perfectly. The important point is that the case of allogenic graft wrapped with omentum did perfectly well.[3]

The leakage rate from gastroesophageal anastomosis after radical surgery for cancer of cardia and oesophagus may vary from 6-8% to as high as 30%.[6-10] If the leak happens in thoracic cavity, it often proves fatal. Most of the authors recommend omentopexy of anastomosis placed in the chest after surgery for oesophagus and cardia.[11] There are few series documenting its efficacy in protecting the anastomotic leak when the anastomosis is placed at neck as well.[12, 13]

Shrager and colleagues reviewed 85 cases after complex cardiothoracic procedures where omentopexy was used.[14] The authors used omentum for prophylaxis of anastomotic dehiscence, established infection and for chest wall resection. There were seven cases of cervical exentration and pharyngoesophageal anastomosis, with omentopexy. All of them were considered to be at high risk of anastomotic dehiscence because of preoperative radiation or recent chemotherapy/ steroid use. There was no anastomotic leak. It was concluded that omental transposition should be considered in complex cardiothoracic surgical problems.

Ohwada and colleagues reported the anastomotic leakage rate of 2.1% vs. 20% (P<.01) for omentopexy (n=48) and no-omentopexy (n=15), respectively for cervical esophagogastrostomy after radical esophagectomy.[12] Same authors had earlier reported a leakage rate of 3.1% in 32 patients with cancer of oesophagus, who underwent radical esophagectomy with three-field lymph node dissection and cervical esophagogastrostomy with omentopexy.[13]

For underdeveloped countries where there are limitations in use of newer technologies, the main emphasis should be given to prevention of the complications and secondly to deal with the complications with the available facilities. In such circumstances, we found omentum to be a good friend of thoracic surgeons. We had a very acceptable leakage rate from gatroesophageal anastomosis after radical resections (5.4%). Had the leak occurred in the thoracic cavity, it would have been disastrous. Fortunately, we did not have leakage in the chest, which we totally believe was due to omentopexy. In our own previous series comparing omentopexy versus no omentopexy for leakage gastroesophageal anastomosis following radical surgery for cancer of cardia and oesophagus we found a significant advantage in doing omentopexy.[15]

Ometopexy for gastroesophageal anastomotic wrapping is very simple and adds about 10 minutes of extra time. So far suturing to the bronchial stumps for prophylaxis of stump-blow out is considered, we think that a less invasive procedure like intercostal muscle flap or pericardial flap may fulfil similar purpose with lesser complications. But in context of chest wall and parenchymal lung resection (other than lobectomy) for chest wall tumours, use of omentum is very much justified as it readily adheres to pulmonary surface preventing prolonged air leak.

Conclusion

In conclusion, results from several authors and our own results show that omentum should always be kept in mind after various complex thoracic operations including cancer. Especially, it should be considered by surgeons practicing in developing countries, where the facilities of newer techniques, e.g. sealants, total parenteral nutrition, mechanical staplers may not be used because of financial constraints.

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