CURRENT STRATEGIES FOR THE TREATMENT OF THE POST-PNEUMONECTOMY EMPYEMA

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Abstract: The post-pneumonectomy empyema remains a feared complication in modern thoracic surgery. The classic approach is based mainly on open thoracic window, alone or part of more complex strategies, as well as on thoracoplasty and mioplasty of the infected space. During the last years, some new promising strategies have emerged, allowing a faster healing and/or a more limited chest wall mutilation (negative pressure therapy associated with open thoracic window, thoracoscopic debridement and the accelerated version of the Clagett procedure proposed by Weder and Grodzky teams). Each of the proposed methods has advantages and disadvantages, which are difficult to put in balance. The heterogeneity and the small number of the reported series, associated with the lack of any prospective randomised study make an evidence-based approach almost impossible.

INTRODUCTION
The post-pneumonectomy empyema remains a feared complication in thoracic surgery. Despite significant advances in the outcome of the patients with pneumonectomy (1), its incidence and associated mortality cannot be neglected.(2,3)

PURPOSE
The present paper aims at reviewing the main current strategies used for the treatment of the post-pneumonectomy empyema. The advantages and disadvantages of each method are analysed in an attempt to make an evidence-based approach of this problem.

MATERIALS AND METHODS
We have performed a review of the published literature concerning the treatment of the post-pneumonectomy empyema (PPE). We did not take into consideration neither case-reports, nor the articles dealing only with the treatment of the bronchial fistula after pneumonectomy.

RESULTS
The review of the literature has shown several techniques/strategies, each of them with advantages and disadvantages. The number of the patients is small, suggesting a limited experience with this postoperative complication. There are no prospective randomized studies allowing steady conclusions with clear statistically significance.

Drainage by tube-thoracostomy is usually performed as an emergency procedure to control sepsis and to avoid the inundation of the contra-lateral lung, but it does not allow a correct debridement and has a very high rate of recurrence when used alone.(4)

Ben-Nun and Soudack (2003) report a small series of debilitated patients in whom a Foley tube-thoracostomy associated with ambulatory lavages with antibiotics and fibrinolitics was used as a long-time definitive treatment.(5)

The Open Thoracic Window is performed nowadays frequently in patients with PPE. It allows a good access to the cavity and a correct debridement. In some cases, it may be used as a definitive treatment, but spontaneous healing is extremely slow, requiring months or even years of daily dressings.(6) In most cases, it is used as part of more complex strategies. The association with negative pressure therapy accelerates the healing process allowing an earlier discharge and/or definitive treatment.(7,8)

The Clagett method consists in performing an open thoracic window followed by daily dressings until the cavity becomes clean, which takes usually between 6-8 weeks, followed by the filling of the cavity with an antibiotic solution and closure of the stoma.(9) It has the advantage that it is not associated with a definitive mutilation of the chest but it requires a quite complicated prolonged care and carries the risk of late recurrence.(10) Another important aspect is that, due to various reasons, the strategy is not completed in a significant part of the patients, who remain with a definitive stoma.(11)

Thoracoplasty, thoracomioplasty and muscle transposition remain the current arsenal of treating post-pneumonectomy empyema. The classic thoracoplasty procedure for PPE, thoraco-mediastinal plication was described by Andrews in 1961 (12) and it was used by several authors with different modifications.(13,14) Miller (1984) reports the possibility of filling the entire post-pneumonectomy empyema space with the use of multiple neighbourhood muscle flaps.(15) The use of distant free flaps has also been reported as an elegant solution in small series (16,17), but it requires special training and has a specific morbidity related to the microvascular anastomoses.

In our days, most authors use a combination of limited thoracoplasty with intrathoracic transposition (thoracomioplasty). All these procedures have the advantage of achieving a relatively quick healing and a complete obliteration of the empyema space, with no possibility of late recurrence. They all involve a certain esthetic and functional disturbance, which is acceptable in the context of post-pneumonectomy empyema.(13,14,18,19)

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The Schneiter-Weder-Grodzky method appears as a promising solution for PPE, being considered an accelerated version of the Clagett procedure. It consists of repeated scheduled thoracotomies with aggressive debridement and packings performed under general anesthesia; if bronchial fistula is present, it is closed with the use of flaps. The thoracotomy is closed between the debridements and the packings remain inside the chest. When the cavity appears clean, the cavity is filled with an antibiotic solution and the thoracotomy is definitively closed. The authors report with this method an excellent rate of healing in a short time.(20,21) The video-thoracoscopic approach has also been reported with good results in selected cases. It involves debridement performed under thoracoscopic vision associated with prolonged drainage and pleural irrigation.(22-24) This approach has the main advantage of allowing a correct debridement of the post-pneumonectomy space without a new thoracotomy and its associated morbidity.

The management of the bronchial fistula (if present) requires a special attention since its closure is mandatory to avoid the recurrence of the empyema. Small fistulae may be treated by an endoscopic approach based on the use of different glues, occluders or stents.(25-27) Larger fistulae require usually a major surgical procedure – including closure – reinforcement using muscle flaps (28) or re-resection of the stump using a transfemoral approach.(29-30) A minimally invasive approach for the closure of the bronchial fistula is also possible in selected cases, by using a transcervical mediastinoscopic dissection and endo-GIA staples.(31,32)

**DISCUSSIONS**

There are some principles of PPE treatment which are accepted by everyone, such as adequate drainage in the acute phase (in order to avoid bronchial inundation and sepsis), closure of the bronchial fistula and definitive obliteration of the cavity.(2,3) However, the exact way to achieve these goals is an extremely debated subject with various possible solutions. From the study of the available literature, it is difficult to give a strong recommendation for treating a patient with PPE. There are several aspects that make an evidence-based approach impossible: the small number of the patients, the increased heterogeneity of the patients, the lack of any prospective randomized study and the difficulty to put in balance the advantages and disadvantages of different approaches.(14)

Most of the large series include a high proportion of patients coming from other centers (10,14,20,21), which suggests that this condition is regarded as a critical one, requiring referral to a tertiary center.

The new strategies based on a minimally invasive approach of the post-pneumonectomy space are attractive due to the rapidity of the healing and the limited chest wall mutilation.

**REFERENCES**