

CURRENT STRATEGIES FOR THE TREATMENT OF THE POST-PNEUMONECTOMY EMPYEMA

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Keywords:
pneumonectomy,
empyema,
complications,
evidence-based
medicine

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 fibrinolytics 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, thoracomoplasty 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 (thoracomoplasty). 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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Article received on 04.02.2015 and accepted for publication on 17.08.2015

ACTA MEDICA TRANSILVANICA September 2015;20(3):113-115

The Schmeiter-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 transsternal 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 staplers.(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 reduced morbidity and the absence of chest wall mutilation.(22-24) The Schmeiter-Weder-Grodzky method, although involving an aggressive approach with repeated scheduled openings of the thoracotomy under general anesthesia, is attractive by the excellent reported results.(20,21) However, all these new methods were reported in a very limited number of centers, with no explanation for the slow spreading among the thoracic surgeons.

In a recent review of the literature (best evidence topic), Zahid et al. (2011) found the open approach (based on open debridement, open thoracic window and thoracomyoplasty) to be superior to the minimally-invasive approach (based on simple drainage +/- irrigation, including thoracoscopic debridement). The open approach was associated with a faster healing, a lower rate of recurrence and a lower mortality.(33)

CONCLUSIONS

There are various treatment strategies for PPE, each of them with advantages and disadvantages which are difficult to put in balance. The lack of large series and of prospective randomized studies makes an evidence-based approach impossible. Despite the limited experience, the new approaches are extremely attractive due to the rapidity of the healing and the limited chest wall mutilation.

REFERENCES

1. Klepetko W, Taghavi S, Pereszlenyi A, Birsan T, Groetzner J, Kupilik N, Artemiou O, Wolner E. Impact of different coverage techniques on incidence of postpneumonectomy stump fistula. *Eur J Cardiothorac Surg.* 1999;15(6):758-63.
2. Wain JC. Management of late postpneumonectomy empyema and bronchopleural fistula. *Chest Surg Clin N Am.* 1996;6(3):529-41.
3. Deschamps C, Allen MS, Miller DL, Nichols FC 3rd, Pairolero PC. Management of postpneumonectomy empyema and bronchopleural fistula. *Semin Thorac Cardiovasc Surg.* 2001;13(1):13-9.
4. Jadcuk E. Postpneumonectomy empyema. *Eur J Cardiothorac Surg.* 1998;14(2):123-6.
5. Ben-Nun A, Soudack M, Best LA. Non-surgical treatment for post pneumonectomy empyema. *Interact Cardiovasc Thorac Surg.* 2003;2(4):616-9.
6. Botianu PV-H, Sin A, Turcu M, Dobrică A, Stoian M, Damian V, Redis D, et al. Care of the patients with modified Eloesser open thoracic window. *Revista de Medicină și Farmacie - Orvosi és Gyógyszerészeti Szemle,* 2006;52:2:92-7.
7. Celik A, Yekeler E, Aydın E, Yazıcı U, Karaoglanoglu N. Treatment of persistent postpneumonectomy empyema by vacuum-assisted management: an analysis of nine patients. *Thorac Cardiovasc Surg.* 2013;61(7):631-5.
8. Al-Mufarrej F, Margolis M, Tempesta B, Strother E, Gharagozloo F. Outpatient management of post-pneumonectomy and post-lobectomy empyema using the vacuum-assisted closure system. *Surg Today,* 2010;40(8):711-8.
9. Clagett OT, Geraci JE. A procedure for the management of postpneumonectomy empyema. *J Thorac Cardiovasc Surg.* 1963;45:141-5.
10. Zaheer S, Allen MS, Cassivi SD, Nichols FC 3rd, Johnson CH, Deschamps C, Pairolero PC. Postpneumonectomy empyema: results after the Clagett procedure. *Ann Thorac Surg.* 2006;82(1):279-86.
11. Massera F, Robustellini M, Pona CD, Rossi G, Rizzi A, Rocco G. Predictors of successful closure of open window thoracostomy for postpneumonectomy empyema. *Ann Thorac Surg.* 2006;82(1):288-92.
12. Andrews NC. Thoracomedial plication: a surgical technique for chronic empyema. *J Thorac Cardiovasc Surg.* 1961;41:809-16.
13. Icard P, Le Rochais JP, Rabut B, Cazaban S, Martel B, Evrard C. Andrews thoracoplasty as a treatment of post-pneumonectomy empyema: experience in 23 cases. *Ann Thorac Surg.* 1999; 68(4):1159-63.
14. Boțianu AM, Boțianu PV. Modified thoraco-mediastinal plication (Andrews thoracoplasty) for post-pneumonectomy empyema: experience with 30 consecutive cases. *Interact Cardiovasc Thorac Surg.* 2013;16(2):173-7.
15. Miller JI, Mansour KA, Nahai F, Jurkiewicz MJ, Hatcher CR Jr. Single-stage complete muscle flap closure of the postpneumonectomy empyema space: a new method and

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- possible solution to a disturbing complication. *Ann Thorac Surg.* 1984;38(3):227-31.
16. Rand RP, Maser B, Dry G, Vallieres E. Reconstruction of irradiated postpneumonectomy empyema cavity with chain-link coupled microsurgical omental and TRAM flaps. *Plast Reconstr Surg.* 2000;105(1):183-6.
 17. Takanari K, Kamei Y, Toriyama K, Yagi S, Torii S. Management of postpneumonectomy empyema using free flap and pedicled flap. *Ann Thorac Surg.* 2010;89(1):321-3.
 18. Michaels BM, Orgill DP, Decamp MM, Pribaz JJ, Eriksson E, Swanson S. Flap closure of postpneumonectomy empyema. *Plast Reconstr Surg.* 1997;99(2):437-42.
 19. Boțianu PVH, Ianosi E, Chirtes R, Kecskes L, Boțianu AM. Complex procedure (thoraco-mediastinal plication, muscle transposition and omentoplasty) for a post-pneumonectomy empyema with large bronchial fistula. *Pneumologia.* 2015 (E-pub ahead of print).
 20. Schneiter D, Cassina P, Korom S, Inci I, Al-Abdullatif M, Dutly A, Kestenholz P, Weder W. Accelerated treatment for early and late postpneumonectomy empyema. *Ann Thorac Surg.* 2001;72(5):1668-72.
 21. Schneiter D, Grodzki T, Lardinois D, Kestenholz PB, Wojcik J, Kubisa B, Pierog J, Weder W. Accelerated treatment of postpneumonectomy empyema: a binational long-term study. *J Thorac Cardiovasc Surg.* 2008;136(1):179-85.
 22. Hollaus PH, Lax F, Wurnig PN, Janakiev D, Pridun NS. Videothoracoscopic debridement of the postpneumonectomy space in empyema. *Eur J Cardiothorac Surg.* 1999;16(3):283-6.
 23. Gossot D, Stern JB, Galetta D, Debrosse D, Girard P, Caliandro R, Harper L, Grunenwald D. Thoracoscopic management of postpneumonectomy empyema. *Ann Thorac Surg.* 2004;78(1):273-6.
 24. Ng T, Ryder BA, Maziak DE, Shamji FM. Treatment of postpneumonectomy empyema with debridement followed by continuous antibiotic irrigation. *J Am Coll Surg.* 2008;206(3):1178-83.
 25. Hamid UI, Jones JM. Closure of a bronchopleural fistula using glue. *Interact Cardiovasc Thorac Surg.* 2011;13(2):117-8.
 26. Chamié F, Nigri DH, Haddad R. New frontier for intracardiac devices: endobronchial occlusion of bronchopleural fistula with CERA device. *Catheter Cardiovasc Interv.* 2014;83(2):315-8.
 27. Andreetti C, D'Andrilli A, Ibrahim M, Ciccone AM, Maurizi G, Mattia A, Venuta F, Rendina EA. Effective treatment of post-pneumonectomy bronchopleural fistula by conical fully covered self-expandable stent. *Interact Cardiovasc Thorac Surg.* 2012;14(4):420-3.
 28. Pairolero PC, Arnold PG, Trastek VF, Meland NB, Kay PP. Postpneumonectomy empyema. The role of intrathoracic muscle transposition. *J Thorac Cardiovasc Surg.* 1990;99(6):958-66.
 29. Stamatis G, Martini G, Freitag L, Wencker M, Greschuchna D. Transsternal transpericardial operations in the treatment of bronchopleural fistulas after pneumonectomy. *Eur J Cardiothorac Surg.* 1996;10(2):83-6.
 30. Porhanov V, Poliakov I, Kononenko V, Selvaschuk A, Bodnya V, Semendiaev S, Mamelov M, Marchenko L. Surgical treatment of short stump bronchial fistula. *Eur J Cardiothorac Surg.* 2000;17(1):2-7.
 31. Leschber G, Klemm W, Merk J. Video-mediastinoscopic resection of a long bronchial stump and reclosure of bronchial insufficiency after pneumonectomy. *Eur J Cardiothorac Surg.* 2009;35(6):1105-7.
 32. Bobocea AC, Paleru C, Lovin C, Dănăilă O, Bolca C, Stoica R, Cordoș I. Videomediastinoscopic transcervical approach of postpneumonectomy left main bronchial fistula. *Pneumologia.* 2012;61(1):44-7.
 33. Zahid I, Routledge T, Billè A, Scarci M. What is the best treatment of postpneumonectomy empyema? *Interact Cardiovasc Thorac Surg.* 2011;12(2):260-4.