
Physiopathology, Microbics and Administration of the Pleural Space with Empyema Following Left Pneumonectomy: A Case Report and Discussion

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Abstract: In 2016 a middle age man has been operated urgently of left pneumonectomy because of bronchiectasiae with life-threatening empyema. The Pathologist described the entire lung destroyed by a massive inflammatory process. Almost a year later from intervention patient developed broncho - pleural fistula (BPF) on the left main bronchial stump with the onset of a dramatic empyema. After an unsuccessful attempt of endoscopic proceeding to fix the bronchial fistula with cyanoacrylate an Open Window Thoracostomy (OWT) was opened and infection disappeared. Afterwards patient went on outpatient for regular medications. Unfortunately despite of local treatment with antibiotics the pleural space resulted continuously infected and no indication to close the pleural cavity has been considered. Today patient is well and has a normal quality of life. For a patient with an OWT in good health condition also regular medications on outpatient seem reasonable and acceptable if surgery is not appropriate or refused.

Keywords: Microbiology, Broncho-pleural Fistula, Post-pneumonectomy Empyema

1. Introduction

Post-pneumonectomy empyema (PPE) represents a quite rare but serious complication. It occurs in 5% of patients submitted standard pneumonectomy and in 10% of patients submitted completion pneumonectomy [1, 2]. PPE presents a rate of mortality of 28% to 50% [3, 4] and the management can result very difficult. Most of PPE are caused by microbial infection via broncho - pleural fistula (BPF) and 80% - 100% of patients with broncho - pleural fistula develop PPE. Other theories include direct microbial invasion of the wound. Monomicrobial infections are more frequent than polymicrobial: Staphylococcus and Streptococcus are the most frequent involved pathogens. European Association of Cardiothoracic Surgeons in 2015 indicated drainage, antibiotics and even video-assisted thoracic surgery (VATS) for PPE without fistula, but in case of PPE with bronchial fistula more invasive techniques have been recommended [5-7].

Reported risk factors for BPF include an index operation for benign disease, right pneumonectomy, completion pneumonectomy, diminished pulmonary reserve and an extended lymph node dissection [8].

2. Materials and Methods

In 2014 P. R. has been referred to our Pneumological Department because of bronchiectasiae of left lung with persistent empyema and superinfection of *Aspergillus Fumigatus*. In the early 2016 this patient had a new episode of empyema and he was treated by the Radiologist with arterial embolization via angio - CT scan. Since empyema persisted and quality of life impaired a surgical resection was planned. Previous antifungal therapy has been retained mandatory to sterilize lung and pleural space. Unfortunately another episode of empyema occurred, and this time empyema was so important and life-threatening that an urgent

lung resection resulted necessary. So a left pneumonectomy was performed on 11/04/2016 as a salvage therapy. The Pathologist described the entire lung destroyed by bronchiectasiae and substituted with inflammatory tissue.

Post – operative period was uneventful, but on December 2017 cough and fever appeared and P. R. was readmitted because of left pleural empyema. CT scan and particularly bronchoscopy documented a fistula of a few millimeters of the left main bronchial stump; a chest tube was positioned and patient improved quickly (no fever, no cough). On 07/02/2018 patient was submitted to a re – do bronchoscopy and the fistula on the left bronchial stump was still present. Some sealant (cyanoacrylate) to close the fistula was put, clinical conditions maintained satisfactory so chest tube was removed. Infact further bronchoscopy on 10/02/18 was regular. On March 2018 however pleural empyema reappeared and patient was readmitted. This time open window thoracostomy was performed. Post – operative period was uneventful and domestic lavages of the pleural cavity with saline and Iodopovidone started.

Gradually and spontaneously bronco-pleural fistula has come to a macroscopic complete heal and pleural space reduced. Successively Chest X - Ray (figure 1), CT scan (Figure 2) and bronchoscopy confirmed the result and a VATS check through the thoracostomy was performed; after multiple lavages of the pleural cavity no evidence of fistula of the main bronchial stump has been found at all. Pleural space volume was exstimated around 200 cc. P. R. eventually has been discharged in good health condition, continued with his pleural domestic lavages and regularly came for outpatient control. Unfortunately patient didn't tolerate medications with gauzes in his deep chest by all means. This is probably the reason why his pleural space presented chronic deposits and infected effusion and microbiology resulted positive continuously (*Corynebacterium amycolatum*, *Streptococcus anginosus* and *Serratia marcescens*).

Because of infection P. R. has been readmitted and started Vancomicin and Amikacin on the basis of the antibiogram in the pleural cavity. After 3 days of antibiotics i.v. pleural fluid clarifyied and patient continued his therapy once he was discharged. On 25/09/19 microbiology of the pleural cavity was repeated and resulted positive for *Candida Albicans*, *Candida parapsilosis* and multisensible *Staphylococcus Aureus*. CT scan was performed and images were evaluated with plastic surgeon with the purpose to close up the OWT. The plastic surgeon suggested to fill the pleural cavity with rectum abdominis or omentum. Dorsalis major was ruled out because of its unsatisfactory blood supply. Alternatively he proposed V. A. C. therapy. On 08/01/20 patient was re-evaluated by Infectivologist, who contraindicated further medications with antibiotics of the pleural cavity and suggested antibiotics only i.v. before, during and after surgical obliteration of the pleural space in case closing procedure should have been done. Patient has been completely informed about the clinical planning but he decided not for surgery and continued his follow – up on

outpatient.



Figure 1. Chest X - ray: no fistula no empyema but not closure feasible of left pleural space.



Figure 2. Chest CT scan: no fistula no empyema but not closure feasible of left pleural space.

3. Discussion

This patient presented infection of the pleural space after left pneumonectomy and developed pleural empyema on the basis of a fistula on the main bronchial stump. The intervention didn't present significant difficulties, despite of massive adhesiolysis from the apex to diaphragm. This was not an oncologic patient; he suffered from bronchiectasiae, healed from empyema and sepsis with OWT and so far there is no more evidence of fistula on the bronchial stump. Since we had to deal with a micro fistula, according with previous experiences [9, 10] an endoscopic procedure to seal the bronchial fistula was done but no success was reported. In fact cyanoacrylate came off from the bronchial stump after a few days. Unfortunately there are no records about

microbiology after empyema occurred at that time. Considering the good results of Laperuta et al. [11], in accord with the plastic surgeon, V. A. C. therapy was proposed to treat the pleural cavity, but patient refused. Closing the residual pleural space remained the final goal, but if infection persists no surgical intervention should be done at all. Infact in a single-institution retrospective series by Regnard and colleagues [12] 46 patients with post-resection empyema were treated with OWT; 14 of these patients also had a concomitant BPF. An OWT was the definitive treatment for 10 patients. Thirty-six patients underwent closure of OWT with muscle or omental transposition flaps: proceeding was successful in 27 patients (75%) and in the remaining 9 patients (25%) OWT were reopened to drain recurrent infections.

In a similar retrospective review of 31 patients with post-pneumonectomy empyema treated with OWT, 26 of whom also had a BPF, closure was attempted successfully in 15 of them. Factors correlating with the successful closure of an OWT included the late development of empyema and the immediate creation of an OWT after empyema has been recognized [13].

For this patient the main goal now remains to understand which way infection contaminates the pleural space: if there is no communication with the bronchial tree it is reasonable to suppose it comes from the skin, oesophageal tract, haematogenous and/or transdiaphragmatic spread. This point remains very difficult to investigate, even if in this case infection probably comes from skin.

4. Conclusion

The most important factor that containticates the closure of an OWT post pneumonectomy is persistant infection in the pleural cavity. In other words peristant infection of the pleural space determinates definitive maintenance of OWT just like in this case. Considering dimension of the bronchial fistula, kind of pathology, comorbidities and the patient will it seems reasonable that the management of post-pneumonectomy bronchial fistula should be individualized; moreover hospital volume, surgeon's volume and surgeon's specialty may influence the prognosis [14]. It is also desiderable that the approach for the clinical decision - making should be multidisciplinary. In this case as an alternative to surgery the continuous medications on outpatient seem reasonable as long as patient remains in good health. As suggested by Stern et al. the present case can be classified as a delayed post-pneumonectomy empyema with Gram - positive bacteria, that is associated with better prognosis [15].

Abbreviations

Post-Pneumonectomy Empyema (PPE), Broncho – Pleural Fistula (BPF), Video-Assisted Thoracic Surgery (VATS), Open – Window – Thoracostomy (OWT).

References

- [1] Eerola S, Virkkula L, Varstela E. Treatment of postpneumonectomy empyema and associated bronchopleural fistula. Experience of 100 consecutive postpneumonectomy patients. *Scand J Thorac Cardiovasc Surg.* 1988; 22: 235-9.
- [2] Massard G, Lyons G, Wihlm JM, Fernoux P, Dumont P, Kessler R et al. Early and long – term results after completion pneumonectomy. *Ann Thorac Surg.* 1995; 59: 196-200.
- [3] Higgins GA, Beebe GW. Bronchogenic carcinoma. Factors in survival. *Arch Surg.* 1967; 94: 539-49.
- [4] Patel RL, Townsend ER, Fountain SW. Elective pneumonectomy: factors associated with morbidity and operative mortality. *Ann Thorac Surg.* 1992; 54: 84-8.
- [5] Scarci Marco, Udo Abah, Piergiorgio Solli, Aravinda Page, David Waller, Paul van Schil, Franca Melfi et al. “EACTS expert consensus statement for surgical management of pleural empyema”. *European journal of cardio-thoracic surgery* 48, no. 5 (2015): 642–653.
- [6] Antonio Mazzella, Alessandro Pardolesi, Patrick Maisonneuve, Francesco Petrella, Domenico Galetta, Roberto Gasparri, Lorenzo Spaggiari. Bronchopleural Fistula After Pneumonectomy: Risk Factors and Management, Focusing on Open-Window Thoracostomy. *Semin Thorac Cardiovasc Surg.* Spring 2018; 30 (1): 04-113.
- [7] Domenico Galetta, Lorenzo Spaggiari. Video-Thoracoscopic Management of Postpneumonectomy Emyema. *Thorac Cardiovasc Surg* 2018; 66 (08): 701-706.
- [8] Deschamps C, Bernard A, Nichols FC, Allen MS, Miller DL, Trastek VF et al. Empyema and bronchopleural fistula after pneumonectomy: factors affecting incidence. *Ann Thorac Surg.* 2001; 72: 243-8.
- [9] Peter H. Hollaus, MD, Franz Lax, MD, Phd, Dan Janakiev, MD, Paolo Lucciarini, MD, Elfi Katz, MD, Alois Kreuzer, Md, and Nestor S. Pridun, MD. Endoscopic Treatment of Postoperative Bronchopleural Fistula: Experience with 45 Cases. *Ann Thorac Surg* 1998; 66: 923-7.
- [10] O. Bylicki, J-M Peloni, D Loheas, J Turc, F Petitjean, M Puidupin, P Mulsant, J-M Dot. Endoscopic management of broncho - pleural fistula in a patient with acute respiratory distress syndrome after pneumonectomy. *Rev Pneumol Clin.* 2012 Aug; 68 (4): 269-72.
- [11] Paolo Laperuta, Filomena Napolitano, Alessandro Vatrella, Rosa Maria Di Crescenzo, Antonio Cortese, Vincenzo Di Crescenzo. Post-Pneumonectomy broncho-pleural fistula successfully closed by open-window thoracostomy associated with V. A. C. therapy. *Int J Surg.* 2014; 12 Suppl 2: S17-S19.
- [12] Regnard JF, Alifano M, Puyo P, Fares E, Magdeleinat P, Levasseur P. Open window thoracostomy followed by intrathoracic flap transposition in the treatment of empyema complicating pulmonary resection. *J Thorac Cardiovasc Surg.* 2000; 120: 270-5.
- [13] 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: 288-92.

- [14] Danail B Petrov, Dragan Subotic, Georgi S Yankov, Dinko G Valev, Evgeni V Mekov. Treatment Optimization of Post-pneumonectomy Pleural Empyema. *Folia Med (Plovdiv)*.2019 Dec 31; 61 (4): 500-505.
- [15] Jean-Baptiste Stern, Ludovic Fournel, benjamin Wyplosz, Philippe Girard, Malik Al Nakib, Dominique Gossot, Agathe Seguin-Givelet. Early and delayed post-pneumonectomy empyemas: Microbiology, management and prognosis. *Clin Respir J*. 2018 Apr; 12 (4): 1753-1761.