# Is Thoracoplasty Still a Choice in Management of Chronic Empyema with Non-Functioning Lung Associated with or Without Bronchopleural-Fistula

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Abstract: Introduction: Chronic empyema with a non-functioning lung, often accompanied by bronchopleural fistula (BPF), presents a complex clinical challenge in thoracic surgery. Traditionally, thoracoplasty has been used to address the persistent pleural space and promote lung collapse in these cases. However, with advancements in minimally invasive techniques and alternative surgical approaches, the role of thoracoplasty has been increasingly questioned. This paper aims to assess whether thoracoplasty remains a relevant and effective treatment option in the management of chronic empyema with non-functioning lung, with or without associated BPF. <u>Methodology</u>: A comprehensive literature review was conducted, focusing on studies published in the last two decades regarding the management of chronic empyema, non-functioning lung, and bronchopleural fistula. We analysed both historical and contemporary approaches, comparing outcomes of thoracoplasty with other interventions such as pleural decortication, thoracic drainage, and endoscopic procedures. A total of 50 studies, including case reports, retrospective reviews, and clinical trials, were included in the analysis. We also reviewed surgical technique variations, patient selection criteria, and post-operative outcomes. <u>Conclusion</u>: Thoracoplasty remain in the armamentarium of modern thoracic surgery. Due to the recrudescence of TB and other infectious diseases of the chest, it is possible that the number of patients requiring this kind of surgery will increase in the near future. We believe that sooner or later any thoracic surgeon will meet a patient requiring such a procedure. Thoracoplasty may solve complicated cases with good immediate and long-term outcome. In such situations, training, careful evaluation and an accurate surgical technique are essential to achieve good results.

Keywords: Chronic empyema, non-functioning lung, bronchopleural fistula, thoracoplasty, pleural disease, thoracic surgery, management, treatment options

## 1. Introduction

Thoracoplasty is a procedure in modern thoracic surgery which is usually indicated only in desperate cases, with failed conservative treatment and in those who can not be cured through standard procedures such as rib resection or decortication. Thoracoplasty is a surgical procedure that allows the reduction in size of the thoracic cavity by removal of ribs. It was originally conceived to collapse cavities of lungs affected by tuberculosis and gained worldwide acceptance in such a setting. Subsequently, indications rapidly extended to thoracic empyema.

Since 19th century, various techniques have been developed (1, 2, 3), and finally, in 1937, Alexander (4,5) described the extra pleural subperiosteal thoracoplasty and popularised this surgical procedure as it is known today. During 1950s and 1960s, thoracoplasty lost much of its popularity after the introduction of anti-tubercular chemotherapy and the advent of procedures of muscle transposition to fill the pleural space. Moreover, it was considered a mutilating operation, leading to undesirable anatomic, functional, and cosmetic sequelae. Thus, thoracoplasty was almost completely abandoned. However, despite the bad reputation, there remain a few cases of chronic pleural infection in which

thoracoplasty is still indicated. Some patients with postresectional empyema or primary empyema in which the lung fails to re-expand are potential candidates for this operation, which can be performed alone or in combination with other procedures.

We retrospectively reviewed our recent experience with the use of thoracoplasty, including the indications, techniques and results. (5-10) At the outset, it must be clearly stated that thoracoplasty procedures address to a very small group of patients with empyema. First of all, most patients with parapneumonic effusions and empyema can be cured by antibiotics and thoracocentesis or tube-thoracostomy, with no need to perform major surgery (11). If this is required, the first option is lung decortication, which obliterates the space by re-expanding the lung and has several very important advantages: no chest wall mutilation, functional recovery of the collapsed lung, and no significant long-term sequelae (12). The possibility to perform this procedure using a minimally invasive approach makes it even more attractive by reducing the morbidity and the postoperative pain and by improving the aesthetic aspect (13).

Decortication performed through video-assisted thoracic surgery (VATS) is now the first option for most patients with empyema requiring major surgery (14). However, lung

Volume 14 Issue 6, June 2025 Fully Refereed | Open Access | Double Blind Peer Reviewed Journal www.ijsr.net

## International Journal of Science and Research (IJSR) ISSN: 2319-7064 Impact Factor 2024: 7.101

decortication (open or VATS) requires two major conditions in order to be successful. First, there must be a cleavage plane allowing to decorticate the lung; if this plane does not exist or is not clearly defined, the procedure becomes difficult or even impossible due to the bleeding and air leaks that occur during the dissection. Second, the underlying lung parenchyma must have the ability to re-expand and completely obliterate the pleural space. If these two conditions are not fulfilled, lung decortication becomes a hazardous and very risky procedure and thoracoplasty becomes an option that should be taken into consideration (9,10,15-18). In present era, most of the intra-thoracic suppurations can be managed without surgery, through antibiotics and minor procedures such as thoracocentesis or tube-thoracostomy (11)

- For pleural empyema: in cases not amendable to decortication - usually chronic cases with no cleavage plane and sub adjacent lesions in the parenchyma limiting the re-expansion of the lung;
- 2) For pulmonary lesions (abscesses, tuberculosis, aspergilloma etc.): in cases not amendable to lung resection- usually a combination of poor biological and cardio-pulmonary status (including pulmonary hypertension), contralateral disease, fixed and adherent lesions with major technical difficulties
- 3) Absence of a cleavage plane allowing the surgeon to decorticate the lung
- 4) Inability of the lung to re-expand and completely fill the pleural space
  - a) Postoperative empyema, where decortication is not possible or has failed,
  - b) Presence of bronchial fistula

## 2. Material and Methods

#### **Patients:**

Data of all patients undergoing thoracoplasty at the Laxmipat Singhania Institute Of Cardiology, GSVM Medical College, Kanpur, between FEB 2024 to NOV 2024, were both retrospectively and prospectively reviewed. All patients had thoracoplasty as part of the treatment of an infected, unresolving pleural or pulmonary space. In cases of primary empyema, we performed thoracoplasty only in patients with persistent pleural space when decortication either was not feasible or had failed. Intercostal drainage was first used to achieve control of the infection. Finally, we proposed thoracoplasty in rare cases of unresolving cavernostomy, with persistent multiple bronchiolar fistulas, to obliterate the residual space and to seal the fistulas. In all cases, when complete obliteration was obtained and the BPF was sealed, thoracoplasty proved to be the definitive treatment.

#### **Surgical Technique**

Thoracoplasties were performed in one or two stage. An extra-musculoperiosteal thoracoplasty, as originally described by Alexander (4), was our technique of choice. A postero-lateral incision was made and extended vertically upward to expose the upper ribs. The scapula was elevated to expose the costal grill. To achieve satisfactory collapse of the cavity, a sufficient number of ribs were resected in a sub-periosteal extra-pleural manner. A sloping resection of the

anterior portion of the costal arches was performed, with progressively less anterior rib being removed as the resection progressed downward. The first rib was removed, when possible, in all patients with apical space. Apicolysis, as described by Semb (19), was performed in all cases with apical space: it consisted of extra-pleural division of adhesions between the pleural dome at the apex and the soft tissues to achieve vertical collapse and to approximate the soft tissues to the mediastinum. The transverse process was never resected.

However, special care was taken to remove the back ends of the ribs, and in case of large posterior spaces, ribs were disarticulated from the costo-vertebral joint.



## 3. Results & Discussion

50 patients underwent thoracoplasty. There were 44 men (158%) and 6 women (12%), with a mean age of 28years (range, 22 to 51 years). 8 patients (16%) received thoracoplasty in the treatment of a post-resectional empyema with residual cavity. Original operations were pneumonectomy and lobectomy in 3 and 5 patients, respectively.

Total no of patients- 50

Total No	. of patient- 50 44 88%		
Male	44	88%	
Female	6	21%	

Indications

Primary Empyema		42	84%
Post Resectional Empyema		8	16%
	Pneumonectomy	3	6%
	Lobectomy	5	10%

BPF was present in 32 patients (64%) at the time of detection of empyema. No attempts to re-suture the bronchus for direct closure of the fistula were made. 8 patients (16%) underwent thoracoplasty for primary non-tuberculous empyema with persistent pleural space. In 2 patient intercostal drainage successfully controlled the infection, but subsequent decortication failed to re-expand the lung. On an average 7 costal arches were removed

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(range, 6 to 9). The first rib was removed in 21 patients (42%).

Postoperative mortality was 6%: 3 patient died 11-15 days after thoracoplasty due to adult respiratory distress syndrome. Five patients (10%) experienced postoperative complications, acute pneumonia in 2 patients, subscapular abscess, atelectasis, and blood loss in 1 each. Median hospital stay was 15 days. The overall success rate was 94%, if death is included.

Patients were followed up in an out-patient setting, with improvement of the quality of life. Mean follow-up was 18 months (range, 1 to 32months). All patients presented with some degree of thoracic deformity and scoliosis. However, in 43 cases (86%) morphologic squeal were neither severe nor symptomatic and he cosmetic result was considered acceptable by the patients. All patients complained of a restriction in shoulder mobility during he early postoperative period, which progressively improved with extensive physical rehabilitation. A residual reduction in shoulder mobility was generally well accepted by the patients. Only 1 patient experienced a frozen shoulder syndrome, with disability and chronic pain (resection of ribs 2 to 8). None of our patients showed progressive pulmonary failure related to thoracoplasty.

# 4. Conclusion

Thoracoplasty remain in the armamentarium of modern thoracic surgery (19). Due to the recrudescence of TB and other infectious diseases of the chest, it is possible that the number of patients requiring this kind of surgery will increase in the near future. We believe that sooner or later any thoracic surgeon will meet a patient requiring such a procedure. Thoracoplasty may solve complicated cases with good immediate and long-term outcome. In such situations, training, careful evaluation and an accurate surgical technique are essential to achieve good results (20, 21, 22)

The purpose of thoracoplasty is to achieve pleural space obliteration. At present, persistent pleural space in postresectional empyema and unresolving primary empyema with trapped lung are the more common indications for thoracoplasty.

Available studies in the last 25 years have shown that thoracoplasty can be an excellent therapeutic option, in selected patients. An adequate drainage of the space for the control of infection is mandatory for successful thoracoplasty (23,24). In our experience post-tubercular empyema was the most common indication for thoracoplasty. The indication of thoracoplasty for primary empyema is accepted but uncommon (24). If infection is controlled but the lung does not re expand and decortication is not feasible or has failed, thoracoplasty can be indicated. Originally it had been recommended that thoracoplasty be performed in two or three stages to reduce surgical trauma (24). Nowadays, improved surgical and anaesthesiology techniques, as well as perioperative care, allow thoracoplasty to be safely performed in one stage or two stage (23,24). Controversy exists as to whether the first rib should be resected. In agreement with others (88-90], we believe that excision of the first rib allows good collapse of the apex without causing significant scoliosis.

However, whether or not the first rib is resected, extrafascial apicolysis is fundamental to collapse the apex and should always be performed (23,24). In our experience, the combination of resection of the first rib and apicolysis obtained adequate apical collapse in all cases. To maximise paravertebral collapse, the resection of transverse processes has been advocated (83,31, 86), but such a procedure has been also related to development of severe scoliosis [89-90]. In our study we obtained satisfying posterior collapse leaving transverse processes in place, as already reported by others (83,84). Our policy of performing a multistep treatment may partly explain the low mortality (3.8%) and morbidity rates (19%).

One patient died because thoracoplasty was undertaken as a salvage operation in a clinical setting of uncontrolled sepsis and progressive respiratory insufficiency. Some authors reported physiologic changes negatively affecting the function of the contralateral lung (23, 24, 25), especially in case of thoracoplasty after pneumonectomy.

Meticulous surgical technique, tailored thoracoplasty, and early postoperative rehabilitation are important in limiting such problems. In conclusion, properly performed thoracoplasty still remains a safe and effective solution for difficult intrathoracic space problems with or without BPF.

# References

- Abolhoda A; Bui T.D.; Milliken J.C. & Wirth G.A. (2009) Pedicled latissimus dorsi muscle flap: routine use in high-risk thoracic surgery, Tex Heart Inst J; 36(4):298-302
- [2] Abolhoda A.; Wirth G.A.; Bui T.D. & Milliken J.C. (2008) Harvest technique for pedicled transposition of latissimus dorsi muscle: an old trade revisited, Eur J Cardiothoracic Surg; 33(5):928-30
- [3] Bjork V.O. (1954) Thoracoplasty, a new osteo plastic technique, J Thorac Surg; 28(2):194-211
- [4] Alexander J. (1936) Some advances in the technic of te
- [5] Arnold P.G.; Pairolero P.C. & Waldorf J.C. (1984) The serratus anterior muscle: intrathoracic and extrathoracic utilization, Plast Reconstr Surg; 73(2):240-8
- [6] Fuchs P.; Schreiner W.; Wolter T.P.; Autschbach R.; Sirbu H. & Pallua N. (2011) A fourmuscle- flap for thoracomyoplasty in patients with sacrificed thoracodorsal vessels, J Plast Reconstr Aesthet Surg; 64(3):335-8
- [7] Gao J.; Wang Y.L.; Lu S.Q.; Cai A.B., Yang Z.F., Han Z.Y., Li J.J., Wen Y.M., Geng F.Y. & Wang W.Z. (2010) Management of sternal osteomyelitis and mediastinal infection following median sternotomy, Chin Med J (Engl);123(20):2803-6
- [8] Garcia-Yuste M.; Ramos G.; Duque J.L.; Heras F.; Castanedo M.; Cerezal L.J. & Matilla J.M. (1998) Open-window thoracostomy and thoracomyoplasty to manage chronic pleural empyema, Ann Thorac Surg; 65(3):818-6

## Volume 14 Issue 6, June 2025

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www.ijsr.net

#### International Journal of Science and Research (IJSR) ISSN: 2319-7064 Impact Factor 2024: 7.101

- [9] Hollaus P.H.; Huber M.; Lax F.; Wurnig P.N.; Böhm G. & Pridun N.S. (1999) Closure of bronchopleural fistula after pneumonectomy with a pedicled intercostal muscle flap, Eur J Cardiothorac Surg; 16(2): 181-6
- [10] Holst J. (1952) Technique of so-called dome thoracoplasty; preliminary report, Nord Med; 19:48(38): 1290-3
- [11] H. E. Davies, A. Rosenstengel, and Y. C.G. Lee, "The diminishing role of surgery in pleural disease," Current Opinion in Pulmonary Medicine, vol. 17, no. 4, pp. 247-254, 2011.
- [12] M. Gokce, E. Okur, V. Baysungur, G. Ergene, G. Sevilgen, and S. Halezeroglu, "Lung decortication for chronic empyaema: effects on pulmonary function and thoracicasymmetry in the late period," European Journal of Cardio-Thoracic Surgery, vol. 36, no. 4, pp. 754-758, 2009.
- [13] B. C. Tong, J. Hanna, E. M. Toloza et al., "Outcomes of video-assisted thoracoscopic decortication," Annals of Thoracic Surgery, vol. 89, no. 1, pp. 220-225, 2010.
- [14] A. Chambers, T. Routledge, J. Dunning, and M. Scarci, "Is video-assisted thoracoscopic surgical decortication superior to open surgery in the management of adults with primary empyema?" Interactive Cardiovascular and Thoracic Surgery, vol. 11, no. 2, pp. 171-177, 2010.
- [15] Hopkins R.A.; Ungerleider R.M.; Staub E.W. & Young W.G.Jr. (1985) The modern use of thoracoplasty, Ann Thorac Surg; 40(2): 181-7
- [16] Horrigan T.P. & Snow N.J. (1990) Thoracoplasty: current application to the infected pleural space, Ann Thorac Surg;50(5):695-9
- [17] Hountis P.; Dedeilias P. & Bolos K. (2009) The role of omental transposition for the management of postoperative mediastinitis: a case series, Cases J; 23;2(1):142
- [18] Icard P.; Le Rochais J.P.; Rabut B.; Cazaban S.; Martel B. & Evrard C. (1999) Andrews thoracoplasty as a treatment of post-pneumonectomy empyema: experience in 23 cases, Annal of Thorac Surg; 68(4): 1159-63
- [19] Stobernack A; Achatzy R. &Engelmann C (1997) Delayed complication after extrapleural pneumonolusis for lung Tb; Chirurg; 68(9):921-7
- [20] Schreiner W.; Fuchs P.; Autschbach R.; Pallua N. & Sirbu H. (2010) Modified technique for thoracomyoplasty after posterolateral thoracotomy, Thorac Cardiovasc Surg;58(2):98-101
- [21] Y. Batianu P.V-.; Dobrica A.C.; Butiurca A. & Botianu A.M.(2010) Complex space-filling procedures for intrathoracic infections - personal experience with 76 consecutive cases, Eur J Cardiothorac Surg; 37(2):478-81
- [22] Thingnam S.K.; Mohite P.N.; Raju G.; Ranade S.D. & Saklani R. (2011) Triple reinforcement of bronchial stump, Thorac Cardiovasc Surg; 59(3):169-71
- [23] Peppas G, Molnar TF, Jeyasingham K, Kirk AB. Thoracoplasty in the context of current surgical practice. Ann Thorac Surg 1993;56:903-9.
- [24] Deslauriers J, Grégoire J. Thoracoplasty. In: Patterson GA, Pearson FG, Cooper JD, et al, eds. Pearson's

thoracic and esophageal surgery, 3rd ed. Philadelphia: Churchill Livingstone Elsevier, 2008: 1159-69.

[25] Gaensler EA, Strider JW. Progressive changes in pulmonary function after pneumonectomy: The influence of thoracoplasty, pneumothorax, oleothorax and plastic sponge plombage on the side of the pneumonecto my. J Thorac Surg 1951;22: 1-34.