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Refractory pneumothorax treated by parietal pleurolysis

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Hansen, J. L. (1976). *Thorax*, **31**, 652–655. **Refractory pneumothorax treated by parietal pleurolysis.** Pneumothorax, persisting in spite of efficient drainage, may in some cases be caused by discrepancy between lung volume and size of the pleural cavity. The logical treatment is reduction of the pleural cavity simultaneously with a traditional surgical procedure on the pulmonary tissue. An increasing number of refractory pneumothoraces—both spontaneous and iatrogenic—is probably due to the fact that more people are living with and suffer the sequelae of pulmonary disease. During a 15-year survey a parietal pleurolysis, tailored to fit the size and shape of the lung, was performed in 10 patients as the main surgical procedure in 100 thoracotomies for 1130 cases of spontaneous and 62 cases of iatrogenic pneumothorax. The results were encouraging.

In the majority of patients treatment of pneumothorax presents only minor problems. Most often an intercostal intrapleural tube to a water-sealed system results in rapid, complete, and permanent expansion of the lung and closure of the air leak by adhesion to the parietal pleura. Non-expansion and recurrence are as a rule treated with pleural irritants, thoracoscopy, or—since Sycamore (1936)—thoracotomy with excision and suture of blebs, bullae or cysts. To prevent recurrence, abrasion of the pleural lining or parietal pleurectomy (Gaensler, 1956; Mitchell-Heggs and Batten, 1970; Nohl-Oser, 1974) is commonly used.

More severe problems arise if the lung is too inexpansible to fill the hemithorax, even in spite of heavy suction applied to the drains. The strong negative pressure may keep the air leaks or lung fistula open. Failure of the lung to meet the parietal pleura prevents sealing. Pleural abrasion or pleurectomy does not bring the lung any nearer to the chest wall. A parietal pleurolysis, on the other hand, makes contact and sealing possible. The tailored pleuroplasty ('the pleural tent') was described about 20 years ago by several authors (Bell, 1956; Brewer, Bai, and Jones, 1956; Hansen, 1956; Miscall *et al.*, 1956) as a space-reducing method to be used in combination with pulmonary resection. Hansen and Rattenborg (1956) devised a 5-cm anaesthetic valve to be connected to the side of the endotracheal tube in order to permit no more than the physiological difference of pressure between bronchi and lung surface. Using this, the surgeon can determine the unforced filling capacity and shape of the lung and reduce the pleural cavity accordingly.

PATIENTS

During a 15-year survey (1960–74), 570 patients with spontaneous pneumothorax and 62 with iatrogenic pneumothorax were registered in the department of thoracic surgery. In addition, 560 patients with spontaneous pneumothorax were treated in the adjoining medical department for respiratory diseases, giving a total of 1192 patients. Complications following pulmonary resection, traumatic pneumothorax, and cases of malignancy are not included.

The main types of treatment are shown in Table I. Thoracotomy was performed in 100 cases. The various procedures are tabulated in Table II. In 10 instances the lung would not fill the pleural cavity and consequently a parietal pleurolysis was performed, alone or as a supplement to another procedure on the lung. The patients were followed up for 1–11 years.

A summary of 10 patients treated by parietal pleurolysis is given in Table III. Eight patients had spontaneous pneumothorax, of which six were recurrences. In two cases the pneumothorax was

TABLE I

TREATMENT OF SPONTANEOUS AND IATROGENIC PNEUMOTHORAX

Treatment	Pneumothorax		Total
	Spontaneous	Iatrogenic	
Conservative	40	33	73
Pleural drainage only	436	23	459
Thoracotomy	94	6	100
Total			
From Dept. of Thoracic Surgery	570	62	632
From Medical Dept.	560	—	560
Total	1130	62	1192

TABLE II

THORACOTOMY FOR SPONTANEOUS AND IATROGENIC PNEUMOTHORAX

Main Procedure	Pneumothorax		Total
	Spontaneous	Iatrogenic	
Pleural abrasion	30	—	30
Excision of lung tissue	27	—	27
Pulmonary resection	10	1	11
Decortication	13	1	14
Control of bleeding	—	2	2
Parietal pleurectomy	6	—	6
Parietal pleurolysis	8	2	10
Total	94	6	100

iatrogenic (9 and 10). In all 10 cases severe emphysema or cystic disease was seen. Two patients had previously had a contralateral lobectomy or pneumonectomy performed for bronchogenic carcinoma. In most cases tube drainage had been maintained for two to six weeks and had failed to expand the lung. Incipient empyema was encountered in five patients. After operation new drains were kept for 1–8 days. One patient with cavity tuberculosis died three days after surgery of respiratory insufficiency associated with a rare type of chronic uraemia due to idiopathic renal lipofuscinosis (the fourth case described in the literature) (Lund and Olsen, 1970). The other nine patients had an uneventful recovery without recurrence of pneumothorax and were in a reasonable state of health for 1–11 years after operation. One patient, the first in this series treated in 1961, died of respiratory failure 10 years later.

The radiological size of the extrapleural space gradually diminished. The air was absorbed in two or three months and the fluid changed to fibrous tissue 2–6 cm thick in the apical region. Pulmonary function studies before operation (in three cases without pneumothorax) were compared with follow-up values without any notable changes.

SURGICAL TECHNIQUE

The pleural drains remain connected to water-sealed bottles during induction and maintenance of anaesthesia. The pleural cavity is opened through a small thoracotomy at the level of the fifth rib, with or without rib resection. The pleural cavity and the lung are examined and any lesion of the lung is handled by an appropriate technique. The unforced filling capacity of the lung is determined with the aid of the 5-cm anaesthetic valve (Hansen and Rattenborg, 1956). Without this device an experienced anaesthetist can provide a suitable light pressure with the manual ventilation bag. If a fibrous or severely emphysematous or polycystic lung is unable to fill the hemithorax or when severe air leaks are evident, the parietal pleura is dissected from the upper border of the thoracotomy, from the inside of the thoracic wall, over the cupola and on the superior mediastinum to the reflexion on the lung.

TABLE III

SUMMARY OF CASES TREATED BY PARIETAL PLEUROLYSIS FOR CHRONIC SPONTANEOUS AND IATROGENIC PNEUMOTHORAX

No.	Sex/Age	Side	Pulmonary Disease	No. of Recurrences	Drainage (days)		Follow-up (years)	Result
					Before	After		
1	M 20	R	Emphysema	4	43	1	10	Died
2	M 18	R	Polycystic lung	2	20	6	11	Good
3	F 17	L	Emphysema	3	26	3	5	Good
4	M 22	L	Cystic fibrosis	2	28	4	8	Good
5	M 27	R	Emphysema	—	16	6	5	Good
6	M 30	L	Emphysema	3	13	5	4	Good
7	M 53	R	Emphysema; left lobectomy 3 yr previously	3	14	8	9	Good
8	M 37	R	Tuberculosis	—	17	3	Died after operation	
9	F 42	L	Emphysema; subclavian catheter	—	11	7	4	Good
10	M 63	R	Pneumonitis, needle puncture; left pneumonectomy 11 yr previously	—	7	6	1	Good

Usually the pleura is thickened when a pneumothorax has existed for one or more weeks, a fact facilitating the dissection of a continuous pleural flap. The pleural tent thus formed is sutured to the upper thoracotomy margin. No drains are placed extrapleurally. The hemithorax is now divided into two compartments, an upper extrapleural and a lower intrapleural containing the lung. New drains are inserted. The thoracotomy is closed in the usual way and suction is applied to the drainage bottles.

After operation antibiotics are employed in these cases, as emphasized by Neugebauer, Fosburg, and Trummer (1971). The extrapleural space is not treated unless oozing is excessive. Needle aspiration of the space has not been needed so far in the present series.

DISCUSSION

The incidence of spontaneous pneumothorax in adults seems to be increasing, as shown in Table IV which gives the number of hospital admissions per year per 100 000 inhabitants in the City and County of Copenhagen during the past three decades.

TABLE IV

HOSPITAL ADMISSIONS IN COPENHAGEN CITY AND COUNTY FOR SPONTANEOUS PNEUMOTHORAX IN ADULTS: NUMBER PER YEAR PER 100 000 INHABITANTS

Period	City	County
1941–45	2	
1946–50	4	
1949–53		4·4
1959–63		6·8
1960–74	12	

The figures for the County are quoted from Nissen (1969); those for the City are taken from the yearly hospital reports (1941–50) and calculated from the present material (1960–74). A marked increase in the number of cases is seen. During 30 years the yearly number of hospital admissions has increased five or six times. This can hardly be explained by better diagnosis and certainly not by easier access to hospitals. Several authors (Withers *et al.*, 1964; Nissen, 1969) have shown that spontaneous pneumothorax is more common in tall and slender persons. A supposed increase in the number of cases of spontaneous pneumothorax should not, however, necessitate a change of treatment. Nohl-Oser (1974) thinks that the use of synthetic plastic catheters for pleural drainage, causing no irritation or adhesions, may explain the increasing number of complicated pneumothoraces. In the present series rubber drains were employed routinely (except in a few rubber sensitive patients). The need for a change of treatment in some patients may more probably be explained by the fact that more and more people are living with chronic lung disease or the sequelae of previous pulmonary disease. A pneumothorax in patients of this type is more difficult to handle than is the simple type. Lichter (1974) has demonstrated this clearly.

There is no doubt that there is an increase of iatrogenic pneumothorax following such procedures as diagnostic lung puncture and positive pressure ventilation. Recently, Steier *et al.* (1974) reported a larger number of iatrogenic than of spontaneous pneumothoraces.

Whether iatrogenic or spontaneous, a pneumothorax in a patient with severely reduced pulmonary expansibility may benefit from a space-reducing parietal pleurolysis as a supplement to traditional surgical treatment.

REFERENCES

Bell, J. W. (1956). Management of the postresection space in tuberculosis: Role of pre- and post-resection thoracoplasty. *Journal of Thoracic Surgery*, **31,** 580.

Brewer, L. A., Bai, A. F., and Jones, W. M. G. (1956). The development of the pleural partition to prevent overexpansion of the lung following partial pulmonary resection. *Journal of Thoracic Surgery*, **31,** 165.

Gaensler, E. A. (1956). Parietal pleurectomy for recurrent spontaneous pneumothorax. *Surgery, Gynecology and Obstetrics*, **102,** 293.

Hansen, J. L. (1956). Parietal pleurolysis (the pleural tent) as a simultaneous space-reducing procedure in combination with pulmonary resection. *Acta Chirurgica Scandinavica*, **112,** 485.

Hansen, J. L. and Rattenborg, C. (1956). The five centimetre anaesthesia valve. *Acta Chirurgica Scandinavica*, **112,** 507.

Lichter, I. (1974). Long-term follow-up of planned treatment of spontaneous pneumothorax. *Thorax*, **29,** 32.

Lund, T. and Olsen, S. (1970). Idiopathic renal lipofuscinosis. *Acta Pathologica et Microbiologica Scandinavica*, Section A, Pathology, 78, 414.

Miscall, L., Duffy, R. W., Nolan R. B., and Klopstock, R. (1956). The pleural tent as a simultaneous tailoring procedure in combination with pulmonary resection. *American Review of Tuberculosis*, **73,** 831.

Mitchell-Heggs, P. F. and Batten, J. C. (1970). Pleurectomy for spontaneous pneumothorax in cystic fibrosis. *Thorax*, **25,** 165.

Neugebauer, M. K., Fosburg, R. G., and Trummer, M. J. (1971). Routine antibiotic therapy following pleural space intubation. *Journal of Thoracic and Cardiovascular Surgery*, **61,** 882.

Nissen, H. (1969). Pneumothorax spontaneus. Munksgaard, Copenhagen (Thesis in Danish with an English summary).

Nohl-Oser, H. C. (1974). Die Behandlung des komplizierten Spontanpneumothorax mittels axillärer Thorakotomie. *Thoraxchirurgie und vasculäre Chirurgie*, **22,** 450.

Steier, M., Ching, N., Roberts, E. B., and Nealon, T. F., Jr. (1974). Pneumothorax complicating continuous ventilatory support. *Journal of Thoracic and Cardiovascular Surgery*, **67,** 17.

Sycamore, L. K. (1936). Recurrent spontaneous pneumothorax. *American Journal of Roentgenology*, **36,** 844.

Withers, J. N., Fishback, M. E., Kiehl, P. V., and Hannon, J. L. (1964). Spontaneous pneumothorax. *American Journal of Surgery*, **108,** 772.

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