

Original Research Article

Surgery of Primary Spontaneous Pneumothorax about 289 Cases

Khalil Ghebouli^{1*}, Kenza Bendjoudi², Mehdi Belbekri³, Mohamed Amine Kecir³, Ahmed Nekhla⁴, Karima Achou⁵

¹Department of Cardiovascular Thoracic Surgery and Organ Transplantation CHU Mustapha Algiers, Algeria

²Department of Anesthesia CHU Mustapha Algiers, Algeria

³Department of Thoracic Surgery CHU Constantine, Algeria

⁴Department of Thoracic Surgery Tizi ouzou, Algeria

⁵Department of Thoracic Surgery Beb El Oued Algiers, Algeria

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Abstract: Objectives: Primary spontaneous pneumothorax is a public health problem because of its frequency and its occurrence in a population often young. It is a pathology which natural evolution is marked by the occurrence of recurrence. The purpose of the surgical treatment of PSP is to resect the apical bulla and bleb areas. In addition, various pleural adhesion procedures are recommended to prevent recurrence. **Methods:** Between 2015 and July 2021, the results of 289 operations performed patients with PSP were examined. The variables analyzed were age, sexe, risk factor, morbidity and mortality surgical results. The average patient follow-up rate is 26 months. **Results:** Recurrent PSP largely dominated the surgical indications with a rate of 73.8%. Complications were seen at a rate of 5.1%. These complications required revision surgery in 3 cases. The recurrence rate is around 1.7%. However, the residual postoperative pain is around 10.7%. The average length of stay is around 6.8 ± 1.2 . The mortality rate was nil. **Conclusion:** Surgery for primary spontaneous pneumothorax has shown encouraging results, during which it must be performed as soon as possible once the indication for surgery has been established.

Keywords: Primary spontaneous pneumothorax, surgery, pleurodesis, pleurectomy, abrasion.

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INTRODUCTION

Spontaneous pneumothorax is defined by a spontaneous and sudden irruption of air into the pleural cavity without underlying pulmonary lesions due to the rupture of small bullous lesions or blebs, which are however not constantly found (75 to 100% of cases depending on studies) [1, 2].

It is a common condition in respiratory pathology and remains a public health problem [3, 4]. Most often well tolerated, but can be life-threatening when complicated [5]. The incidence of Primary Spontaneous Pneumothorax PSP compared to the general population is difficult to specify, because it is likely that the number of spontaneous pneumothorax progressing towards resorption without being diagnosed is not negligible. In addition, the diagnostic means implemented vary from one region or country to another.

Some series report frequencies of 2.4 to 17.8 per 100,000 inhabitants [6]. Although the main risk factors are well codified: "high height, low BMI, changes in atmospheric pressure but above all smoking to which is

added the more recent use of cannabis"; its natural evolution is marked by the risk of recurrence, the probability of which varies between 16 and 57% with an average of 30% [7]; thus constituting a point, or even an important public health problem due to the fact that the PSP mainly affects a very young population.

Therapeutically, simple aspiration and chest drainage are often used with a one-year recurrence rate of 30% [8, 9]. Thus surgical management is necessary to reduce the recurrence, however even with surgery PSP recurrence occurs in 5 to 10% of cases [10]. The main objective of this work is to evaluate the results of a series of 283 patients operating at our service.

METHODS

This is a retrospective, single-center study of 289 patients operated in our department between 2015 and 2021. The different variables studied were age, sex, risk factors, surgical indications and post-operative outcomes.

*Corresponding Author: Khalil Ghebouli

Department of Cardiovascular Thoracic Surgery and Organ Transplantation CHU Mustapha Algiers, Algeria

The average follow-up rate for our patients was 26 months. Patients are hospitalized through consultation or transfer from specialized university hospital services (pneumophthisiology department) and regional health sectors.

These are patients treated and operated for persistent PSP (persistent bubbling beyond the 5th day of tube chest), recurrent PSP (ipsi or contralateral recurrence) [11], bilateral PSP, the first episode of the PSP, for socio-professional imperatives (flight personnel or divers).

On admission, all patients underwent a complete clinical examination, a standard chest X-ray, a CT scan, and cardiorespiratory explorations (ECG, echocardiogram, respiratory functional exploration).

Once operated on, patients stay 24 to 48 hours in the intensive care unit before returning to the conventional hospitalization unit. During this period, we watch for the occurrence of post-operative complications. The assessment of results is based on clinical, radiological and biological criteria.

RESULTS

The study population is made up of 289 patients of both sexes, eligible for the inclusion criteria, and admitted to our department over a period from 2015 to July 2021.

There is a clear male predominance. The sex ratio is 8.3, in other words, there are 83 men for every 10 women.

The range corresponds to 21 years (difference between extreme ages), the average age is 23.7 ± 1.3 . The median is 23 years: 50% of the workforce is aged < 23 and 50% is > 23. The modal class or the dominant class corresponds to the 20-25 age group with a frequency of 40.77%.

The distribution of the study population according to body mass index shows an average of 19.7 ± 0.5 kg/m². The median is 20 kg/m². Weight is normal in 35% of patients while thinness was found in 62.1% of cases.

The study showed that 81.5% of patients reported the notion of exposure to active tobacco. Among them 16.5% reported the notion of withdrawal.

Of the entire study population, 97% of patients had at least one episode of pneumothorax in their history. 46.6% of the population had two previous episodes of pneumothorax. However, only three patients had no history of pneumothorax, these were two cases of bilateral pneumothorax and one case operated on in the first episode for socio-professional reasons.

Almost all of the patients, 281 patients (97%) presented at least one episode of pneumothorax, the total number of episodes distributed among the 281 patients is 504 episodes, and 72.5% of patients had previously benefited from the implementation of a chest tube.

The right side (64%) largely dominates the left side (34.3%), the bilateral form was found in (1.7%). The distribution of patients according to surgical indications revealed a predominance of recurrent pneumothorax in 73.7%, followed by resistant pneumothorax in 24.2%, bilateral pneumothorax in 1.7% and finally 0.4% for socio-professional imperatives (Table 1).

Table 1: Distribution of the Population According to Surgical Indication

Surgical indication	n	%
Recurrent pneumothorax	213	73.7
Resistant pneumothorax	70	24.2
Bilateral pneumothorax	5	1.7
Socio-Professional imperatives	1	0.4
Total	289	100

At the time of surgical exploration, bullous lesions were found in 210 patients (72.66%), pleurectomy was performed as pleurodesis in 59.2%, it was combined with bullectomy in 184 patients, alone in 19 patients.

As for pleural abrasion, it was performed in 40.8% of cases; it was combined with bullectomy in 71 patients, alone in 15 patients. In the entire study population, immediate postoperative complications occurred in 5.1% of patients.

Hemothorax represents the most frequent postoperative complication, occurring in 2.4% of patients, followed by prolonged bulling more than 3 days after the operation observed in 1.7% of patients, the lack of lung re-expansion was observed in 0.7% of patients and finally infectious complications observed in 0.3% of cases (Table 2).

Table 2: Distribution of the Population According to Surgical Complications

Complication	n	%
Hémothorax	7	2.4
Prolonged bulling	5	1.7
Lack lung re-expansion	2	0.7
Infectious complication	1	0.3
Total	15	5.1

Of all the patients who presented post-operative complications (5.1% of cases), a favorable outcome was noted in 46.7% of patients after re chest drainage, and in 33.3% after medical treatment associated with active physiotherapy. However, three patients (20%) benefited from surgical revision which consisted of evacuation of the pleural effusion in two cases and parenchymal suture in one case. The evolution of surgical revisions was

favorable, and there were no cases of death, the mortality was nil.

The distant complications represented essentially by recurrence defined by the occurrence of an ipsilateral pneumothorax three months after the surgical intervention, recurrence was observed in 5 cases (1.7%

of the population), in all cases the occurrence was after one year devolution.

The notion of residual postoperative pain was observed in 10.7% of cases. The hospital stay is calculated from the day of the surgical procedure until the day the patient leaves the hospital to continue convalescence at home. The average postoperative stay is 6.8 ± 1.2 days.

Table 3: Results of the Recurrent Rate in International Publications

Autors	Year	Evidence	n	Surgical technique	% of recurrence
Waller	1999	c	180	Bull, pl	6.6%
Ohno	2000	c	424	Bull, abr	9.4%
Cardillo	2000	c	153	Bull, pl	9.2%
Chan	2001	c	153	Bull, abr	5.7%
Roviaro	2002	c	171	Bull, pl	0.8%
Casadio	2002	c	63	Bull, pl, abr	4.8%
Lang Iazdunski	2003	c	182	Bull, abr	3%
Gossot	2003	c	185	Bull, abr	3.8%

Bull: Bullectomy; Pl: Pleurectomy; Abr: Abrasion

DISCUSSION

Our study concerns a population of 289 patients treated in the thoracic surgery department with the aim of surgical treatment of primary spontaneous pneumothorax. During this period, the patients were operated on and monitored regularly and jointly by our team and our pulmonologist colleagues at the University Hospital. The major recruitment problem lay in the initial treatment which differed from one team to another, the lack of information and the neglect of patients who only presented for surgery after several episodes of pneumothorax (up to five in our study).

The study of our series once again strongly confirmed the clear male predominance of PSP with a sex ratio of 8.3; it is comparable to that found in the international literature: 8.78 in the Rena series and 9.08 in the Hug series [12, 13]. Our study population is older since the average age is 23.7 years, unlike international publications where the average age is 21 years for Andrea [14] and 21.3 years for Hug [13].

Despite the fact that our country is made up of a young population in two thirds, the explanation in our opinion is that the number of spontaneous pneumothorax progressing towards resorption without being diagnosed is not negligible. In addition, the diagnostic means implemented vary from one region or country to another.

PSP remains a pathology that affects a population with a very specific morphotype, it is often a very thin, slender patient whose thoracic musculature is very poorly developed, this is reflected by a low body mass index (BMI), in our series. The average BMI is 19.7 ± 0.5 kg/m², more than 62% of the population had a BMI less than 18.5 kg/m², this rate is close to the rate described in the other series.

Smoking also seems to be a primary factor, in fact the smoker/non-smoker ratio is 4.42, this ratio remains relatively low probably due to the fact that in our country smoking mainly affects males, in addition, this is a very young population who, out of fear, deny the fact of smoking or having smoked.

Although no study has shown the influence of the affected side on the recurrence of pneumothorax, in ours we found that 64.1% of PSP occurs on the right side, studies carried out in this direction will be desirable in the future.

As for the operative indications, they are very well codified, the main one being recurrent pneumothorax found in 73.7% of our patients. This rate appears higher than that announced in the Celalettin series [15] (49.5%) and the Gossot series [16] (65.9%).

Immediate complications in our series are mainly represented by hemothorax in 2.4% of patients, followed by persistent air leak in 1.7% of patients; the lack of lung reexpansion was observed in 0.7% of patients and finally come the infectious complications observed in 0.3% of cases. According to the series by Liu P. L *et al.*, [17] of 757 patients treated by CTVA, the complications consisted of wall infection in 2.11% of cases, localized wall hemorrhage in only 1 case, localized emphysema in 2 others; persistent air leak was reported in 4.10% of cases.

In our series, the rate of postoperative hemothorax is linked to the existence of a bridle, and the performance of pleurodesis by pleurectomy in 59.2% of cases, a technique known to be hemorrhagic.

Bullectmoia associated with pleurodesis remains the gold standard in the management of PSP [16,

18, 19, 20]. In our series, all patients with a macroscopically individualizable bullous lesion benefited from this procedure; in the absence of bullous lesions, pleurodesis by pleurectomy or pleural abrasion was the rule.

Several studies have demonstrated the benefit of pleurodesis. Hatz *et al.*, [21], compared VATS resection of bullae/blebs without pleurodesis in 72 patients with resection and pleurodesis in 37 patients, and observed 4.6% recurrences in the first group and no recurrences in the second group. Loubani and Lynch [22] observed 20% recurrences after isolated bullectomy and only 4% recurrences after bullectomy plus pleurodesis. Finally, Horio *et al.*, observed a recurrence rate of 16% in 50 patients treated by bullectomy and only 1.9% in 53 patients treated by bullectomy plus pleurodesis [19].

However, limited and inconsistent evidence is available regarding whether a pleurectomy or abrasion is the most effective procedure.

In Delpy J *et al.*, study [23], the recurrence rate was lower after thoracotomy 2% versus 4% in CTVA, the effect of CTVA on recurrence is still a matter of debate in the literature.

In a retrospective study, Shaikhrezai *et al.*, [24] regarding 664 cases, found that the recurrence rate after CTVA for PSP was only 1.8%. In contrast, in a recent meta-analysis, Barker *et al.*, [25] showed that the overall relative risk of recurrence for patients operated on by CTVA was 4.7 without evidence of heterogeneity in the trial results, but the number of patients was too few to draw precise conclusions. For Horio *et al.*, [19] CTVA may increase the recurrence rate due to small overlooked bubbles.

Patients operated using CTVA are younger and less likely to have comorbidities than those who undergo Thoracotomy. CTVA is also associated with fewer mechanical pleurodesis procedures, fewer respiratory complications, less postoperative pleural bleeding, and more recurrences. The higher recurrence rate could therefore be attributable to a less aggressive pleurodesis technique.

According to the Imperatori *et al.*, study [26] in the female sex, prolonged bubbling beyond 7 days and smoking were risk factors for recurrence of pneumothorax after symphysis by thoracoscopy.

According to Delpy J *et al.*, [23], the recurrence rate was higher in men, asthmatics, patients with a psychiatric history and for straight symphyses or without bulla resections.

Regarding recurrence, our study showed a low rate of around 1.7%. The analysis of the international

literature showed a recidivism rate ranging from 0.8% to 9.4% as summarized in Table 3.

CONCLUSION

Patients with PSP require surgical treatment for various indications, and one of the main goals is to prevent recurrence. However, recurrent pneumothorax may develop in some patients despite surgery. "Bullectomy combined with pleurodesis" remains the gold standard for the management of PSP.

Conflicts of Interest: The authors declare no conflicts of interest

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