

## DRAINAGE OF PLEURAL SPACE BY APICAL APPROACH AS A STEP BEFORE DEFINITIVE SURGICAL RESOLUTION OF SPONTANEOUS PNEUMOTHORAX RECURRENCE: A CASE REPORT

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Pneumothorax represents the presence of air and/or gases in the pleural space. Spontaneous pneumothorax is divided into: primary (PSP), occurring in the healthy lung, and secondary (SSP), that occurs together with some underlying lung disease. PSP is thought to occur due to a rupture of the similar to emphysema change (ELC) in the lungs and/or diffuse pleural porosity. Pleural space drainage is one of the most useful and most commonly used procedures in the treatment of PSP. The recurrence of PSP is an indication for surgical treatment. In the following case study, it has been shown that the combined approach to treating PSP recurrence with thoracic drainage through the 1<sup>st</sup> intercostal space from above, and the minimally invasive surgical approach, is purposeful and desirable.

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**Key words:** primary spontaneous pneumothorax, recurrent pneumothorax, thoracic drainage, pleurotomy, pleural abrasion

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### Introduction

Pneumothorax represents the presence of air and/or gases in the pleural space. The term pneumothorax was first introduced by Itard in 1803 and Lannec in 1819, and the diagnosis of spontaneous pneumothorax was made by Kjaergaard in 1932 (1, 2). [Spontaneous pneumothorax is divided into: primary (occurring in the healthy lungs) and secondary (in the space of some of the existing lung diseases) (3)]. The exact cause of the occurrence of primary spontaneous pneumothorax (PSP) is still unknown. PSP is thought to occur due to a rupture of similar to emphysema change (ELC) in the lungs and/or diffuse pleural porosity (4, 5). The most common symptoms and signs of the formation of primary spontaneous pneumothorax are: sudden

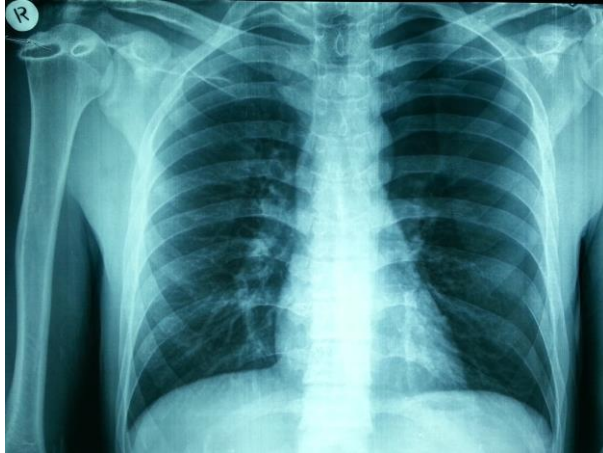
chest pain, dyspnoea, dry hacking cough, accelerated deep breathing, paroxysmal tachycardia, and weakness and fatigue (6). PSP treatment can comprise: conservative, pleural space puncture, pleural space drainage by pigtail catheter or thoracic drainage, pleural space drainage combined with Heimlich valve, drainage of pleural space combined with pleurodesis, VATS combined with chemical pleurodesis, VATS with pleurotomy and/or parietal pleura abrasion, open thoracotomy combined with chemical pleurodesis, open thoracotomy with pleurotomy and/or abrasion of the parietal pleura (7).

Pleural space drainage is one of the most useful and commonly used procedures in the treatment of PSP, and in chest surgery in general (8). The first description of the thoracic drainage was given by Hippocrates (9). In the 14<sup>th</sup> century, the drainage of pleural space was performed by Guy de Chauliac, in the 18<sup>th</sup> century by Boerhave, and Hewett in 1876 was the first to apply a completely closed system of thoracic drainage (10, 11). A widespread use of thoracodrainage was introduced during World War II (12). Standard techniques of thoracic drainage include the placement of the thoracic drain laterally at the level of the "safety triangle" (the space limited by the front edge of the m. latissimus dorsi, the lateral edge of the m. pectoralis major, the horizontal line above the level of the nipple, with a top in the base of the axilla), in the 2<sup>nd</sup> intercostal space (ICS) of the medioclavicular line and apical approach, through the 1<sup>st</sup> ICS from above (13, 14). Depending on the type and method of PSP treatment, recurrences may

range from 0% -50% of cases (6,15-17). The recurrence of PSP is an indication for surgical treatment (3).

### Case study

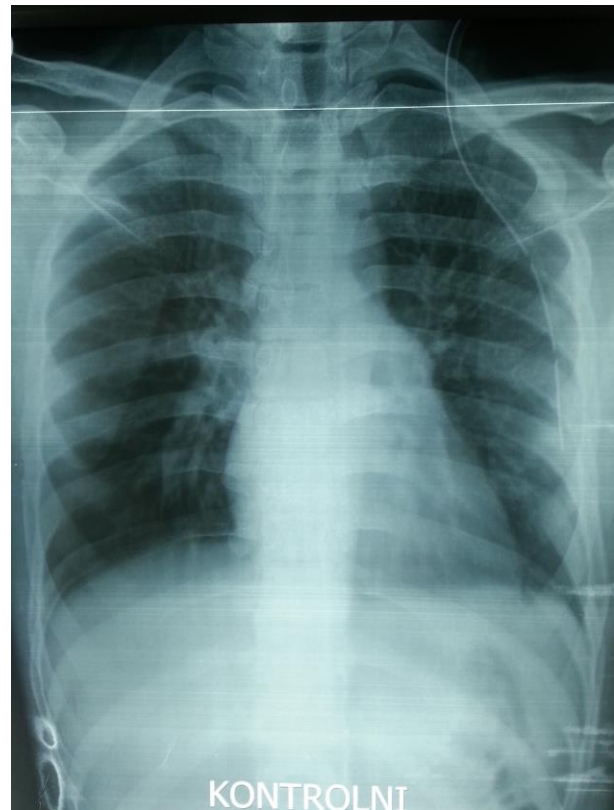
Patient I.P., 23 years old, was admitted to our facility with a clinical and Rtg case of a second PSP episode on the left (Figure 1).



**Figure 1.** Chest Rtg P-A at admission - recurrent primary spontaneous pneumothorax on the left

He stated that the day before admission, at rest, he felt a sudden, sharp pain on the left side of the chest, which was followed by dry cough and a feeling of lack of air. Previously, three months before, drainage of the left pleural space was made in the middle axillary line, in the 5<sup>th</sup> ICS on the left side due to the first episode of the PSP. Immediately after admission, the left-hand pleural space was drained through the 1<sup>st</sup> ICS from above (Figure 2). After infiltration of 10 mL of 2% Lidocaine, a skin and subcutaneous tissue cut was made at the level of the joint of the inner and middle third of the line that joins the processus spinosus vertebrae prominens and acromion (four transverse fingers, about 4 cm from the vertebrae prominens), on two transverse fingers (about 2 cm) from the front edge m. Trapezium (Figures 3 and 4). Then, the trocar was introduced from above, strictly straight, through the 1<sup>st</sup> ICS, and thoracic drain N020 Ch was inserted in the left pleural space. The drain was fixed, connected to underwater drainage and continuous vacuum aspiration of - 20 cm H<sub>2</sub>O.

Initially, air was given. Analgesic and antibiotic therapy was administered. Immediately after drainage, the general condition of the patient was stabilized, and subjectively, he did not complain of difficult breathing. Since it was a relapse of PSP, an indication for surgical treatment was established. The next day the patient underwent surgery. An acc-



**Figure 2.** Chest Rtg P-A after drainage through the 1<sup>st</sup> intercostal space above

ess to the left pleural space was enhanced by video-assisted mini-thoracotomy through the 5<sup>th</sup> ICS. On the tip of the lungs, there were emphysema-like changes and scars of previously ruptured bullae. Atypical resection of the top left lung by tissue stapler was performed, and then partial pleuralctomy to the level of thoracotomy incision and abrasion of the remaining parietal pleura.

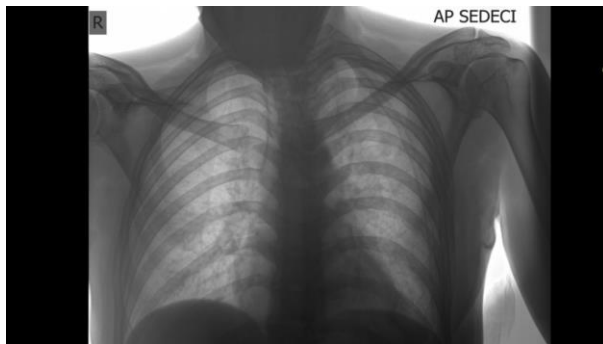


**Figure 3.** Thoracic drain placed apically on the left side of the chest



**Figure 4.** Thoracic drain placed apically on the left side of the chest

At the end of the operation, thoracic N028 Ch drain was inserted in the left pleural space, and the wound was closed in layers. Direct postoperative procedure flowed neatly. In a series of control Rtg, P-A resection of the lungs was performed, there was no air loss (Figure 5).



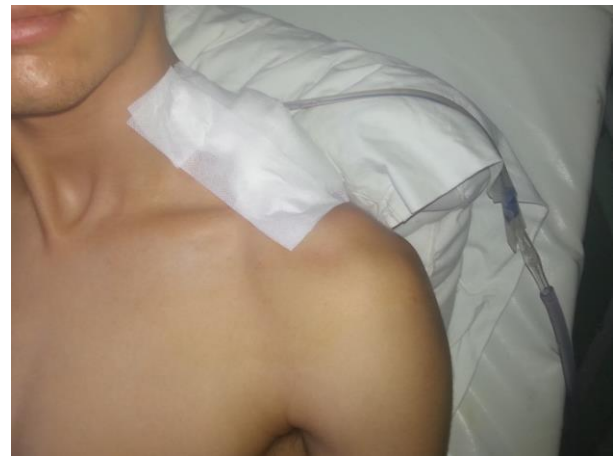
**Figure 5.** Chest Rtg P-A immediately after surgery

Blood loss was negligible (< 100 mL). The wound after minitoracotomy was healing per primam. The thoracic drain was removed and on the seventh postoperative day he was released for home treatment. During the check-up, the patient stated that he subjectively felt well. Rtg P-A corresponded to the operation performed, the lung resection was complete. Recurrence of spontaneous pneumothorax has not occurred even after two years of surgery. The patient returned completely to his everyday activities.

### Discussion

The most common place of chest drainage is the 5<sup>th</sup> ICS of the middle axillary line within the "triangle of safety" (14). However, if surgical treatment is necessary after the drainage of the pleural area, the cutaneous thoracotomy incision should be at the level of the laterally placed thoracic drain. As the place through which the thoracic drain is placed

is considered to be "dirty", it makes the planning and operational approach much more difficult. Also, among the potential complications of the lateral drainage of the chest, most frequent is placement of thoracic drain in a oblique fissure, and consequently lung and incomplete lung resection (18). Chest drainage through the 1<sup>st</sup> ICS from above at the level of scapular line, by the apical approach demands an experienced surgeon, but is therefore: relatively simple to perform, less painful, does not bother the patient during lying, early patient mobilization is facilitated, the top of the lung re-expansion is easier, the cosmetic effect is better and, most importantly, on the side of the chest remains a "clean" space if surgical treatment is required (Figure 6) (14).



**Figure 6.** Thoracic drain placed apically on the left side of the chest

Contraindications to drainage through the 1<sup>st</sup> ICS are relative: the presence of pleural adhesions, patient is refusal, patient is collapse during the preparation and execution of the procedure, coagulopathy or therapy with oral anticoagulants and infection at the site of the placement of drain (19). Potential complications during drainage by apical approach can be (similar to lateral drainage) infectious caused by technical causes (of which the most undesirable are: a. subclaviae injury, Horner syndrome, n. phrenicus and n. ulnaris injuries (18). It has been proven that catheters and drains of smaller diameter are more comfortable for the patient, more precise, with a lower rate of infectious complications and with significantly better clinical effect as compared to large-diameter drains (20, 21).

In the described case, the indication for surgical treatment was clear, but it was preoperatively necessary to relieve the patient from the discomforts caused by the relapse of the PSP. First of all, it was decided to place the thoracic drain of small diameter by apical approach. In this way, all the abovementioned advantages of apical access to the pleural space were utilized, and the patient was free from the discomfort. After the stabilization of the patient, the planned operation was performed. A video-assisted mini-toracotomy has proven to be very useful as it

is less traumatic and provides good visibility and access to the pleural space. The atypical resection of the top by ELC tissue stapler, with partial pleurotomy and abrasion of the remaining parietal pleura was performed in accordance with the recommendations and principles of modern clinical practice (22). From the presented case, it can be seen that the combined approach to treatment of PSP recurrence with thoracic drainage through the 1<sup>st</sup> ICS from above, and a minimal-invasive surgical approach, is worthwhile. The patient recovered very quickly and completely and returned to his previous life activities. The recurrence of PSP was not registered even after two years from the operative treatment.

### Conclusion

Primary spontaneous pneumothorax occurs due to a rupture of the similar to emphysema changes in the lungs and/or diffuse pleural porosity. The drain-

age of the pleural space is one of the most useful and commonly used procedures in the treatment of pneumothorax. Chest drainage by apical approach is simple to perform, is less painful, does not bother the patient during lying, early mobilization of the patient is facilitated, the top of the lung re-expansion is easier, the cosmetic effect is better and, most importantly, on the side of the chest remains a "clean" space, if surgical treatment is required. Recurrence of primary spontaneous pneumothorax is an indication for surgical treatment. In the above presented case study, it has been shown that the combined approach to the treatment of PSP recurrence with thoracic drainage through the 1<sup>st</sup> intercostal space from above, and a minimally invasive surgical approach, is purposeful and desirable.

### Disclosure:

The authors declare no conflict of interest.

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**Prikaz bolesnika**

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## **DRENAŽA PLEURALNOG PROSTORA APIKALNIM PRISTUPOM KAO KORAK PRE DEFINITIVNOG HIRURŠKOG REŠAVANJA RECIDIVA SPONTANOG PNEUMOTORAKSA: PRIKAZ SLUČAJA**

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Pneumotoraks predstavlja prisustvo vazduha i/ili gasova u pleuralnom prostoru. Spontani pneumotoraks se deli na: primarni (PSP), na terenu zdravih pluća i sekundarni (SSP), na terenu neke od postojećih bolesti pluća. Smatra se da PSP nastaje zbog rupture u plućima, nalik promena sličnih emfizemu (ELC) i/ili difuzne pleuralne poroznosti. Drenaža pleuralnog prostora je jedna od najkorisnijih i najčešće primenjivanih procedura u lečenju PSP. Pojava recidiva PSP predstavlja indikaciju za hirurško lečenje. U prikazu slučaja koji sledi pokazano je da je kombinovani pristup lečenju recidiva PSP torakalnom drenažom kroz prvi međurebarni prostor odozgo i minimalno-invanzivnim hirurškim pristupom svrsishodan i poželjan.

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**Ključne reči:** *primarni spontani pneumotoraks, recidiv pneumotoraksa, torakalna drenaža, pleurektomija, abrazija pleure*