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TREATMENT OF SPONTANEOUS PNEUMOTHORAX WITH A NARROW GAUGE TUBE

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**Summary –** Based on their statistical analysis of the clinical data relating to the different treatment methods used in 88 cases of spontaneous pneumothorax admitted to a Respiratory Department, the authors conclude that the use of a narrow gauge chest tube is at least as effective from a therapeutic and prognostic point of view as a large gauge tube. These large gauge tubes are more traumatic and have a greater percentage of potential complications.

**Key words** **–** Pneumothorax (PNX), collapsed lung, surgical chest tube, chest drain, thoracic catheter, pleural catheter, narrow gauge tube

Introduction

Pneumothorax (PNX) is a common occurrence in hospital practice and its frequency, particularly secondary PNX, is constantly increasing. This may be attributed to the rise in road traffic accidents, increased drug use, and a greater number of invasive diagnostic and therapeutic procedures (1). It is, in fact, estimated, that the frequency ranges from 1-6% in subclavian vein cannulation, from 1-5% in transbronchial biopsies, and is about 30% in transparietal needle aspiration (2).

Nowadays, regardless of its cause, PNX is treated with watchful waiting in the case of a small pneumothorax and with a chest drain if larger or if characterized by positive pressure.

We analyzed cases of spontaneous pneumothorax admitted to our department in the last five years, focusing particularly on the treatment conducted and the results obtained.

Materials and methods

The research featured patients admitted to our department over the last five years suffering from a spontaneous PNX.

As far as treatment is concerned, watchful waiting is conducted, with complete bed rest, possibly supplemented by the prone posture to facilitate adhesion of the two pleural membranes.

Chest drainage is performed with a ‘surgical’ large gauge Argyle catheter or with a Matthys catheter (3) (manufactured by Plastimed, fig. 1). Both types of chest drain are inserted after preparation with intramuscular Atropine and local anesthesia with Carbocaine in an intercostal space between the third and sixth rib on the mid or anterior axillary line. In the case of Matthys, no surgical incision of the skin is required due to the small size of the instrument.

After inserting the drain, the outer end, equipped with a three-way tap, is connected to a tube ending in a sterile vessel, with at least two centimeters of saline covering the tip at that end. A control x-ray is immediately conducted and the patient is started on broad-spectrum antibiotics.

X-ray controls are repeated according to clinical need and in any case are taken at least every 48 or 72 hours.

Once the lung has completely re-inflated, the tube is closed for 24 hours. If healing continues, the tube is removed.

We analyzed the data relating to the type of treatment performed and compared the results, particularly focusing on the number of days until resolution, any complications, and the number of relapses following hospitalization.

Results

The results obtained are shown in tables 1, 2, 3, 4, and 5. Table 1 shows the characteristics of the population studied. Treatment type is analyzed in table 2.

Table 3 shows the number of days until resolution of pneumothorax for each type of treatment performed. This table features fewer cases than the total, as it was not possible to accurately establish the time the pathological process took to resolve 14 of the cases. Table 4 records the number and type of complication observed, while table 5 shows the total number of relapses observed within one year of hospitalization.

Comparisons were made between the various treatments and statistically significant results are shown in bold.

There are no significant differences between the various treatments in terms of the number of complications and relapses.

The number of days it took for resolution of the pneumothorax, however, was significantly reduced using the Matthys catheter compared to the two other methods. While it is easy to explain this result when compared to watchful waiting,

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Table 1 – Cases by age and sex. | | | | | | |
|  | 20 | 21-30 | 31-50 | 51-70 | >71 | Tot. |
| M | 9 | 15 | 17 | 17 | 7 | 65 |
| F | 7 | 8 | 6 | 2 | 0 | 23 |
| Tot. | 16 | 23 | 23 | 19 | 7 | 88 |

Table 2 – Treatment types.

|  |  |  |  |
| --- | --- | --- | --- |
| MATTHYS |  | 27 | (30.7%) |
| ARGYLE |  | 21 | (23.9%) |
| CONSERVATIVE |  | 36 | (40.9%) |
| COMBINED |  | 4 | (4.5%) |

Table 3 **–** Days for resolution by treatment type 2 = 34.0278 (signif.) p <0.01.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Days | Matthys | Argyle | Conserv. | Combin. | Total |
| < 8 | 17 (70.8%) | 8 (47%) | 2 (6.7%) | 1 | 28 |
| 8-15 | 6 (25 %) | 7 (41.2%) | 20 (66.7%) | 0 | 33 |
| 15-25 | 0 | 1 (5.9%) | 7 (23.3%) | 1 | 9 |
| > 25 | 1 (4.2%) | 1 (5.9%) | 1 (3.3%) | 1 | 4 |
| Total | 24 (100%) | 17 (100%) | 30 (100%) | 3 | 74 |

it is more difficult to understand the disadvantage of the larger tube. Our interpretation is that, especially earlier on, we used Matthys catheters to treat smaller pneumothoraxes, while larger ones, which were therefore more prolonged in terms of resolution, were treated with Argyle. However, as we expected, the Argyle catheters do still have a statistically significant lower resolution time compared to the more conservative treatment of watchful waiting.

We did not evaluate the results of ‘combined’ pleurodesis treatments due to the small number of cases.

Discussion

The alternatives currently available to treat pneumothorax are:

1. Watchful waiting
2. Pleural catheter placement with or without 'negative pressure' aspiration
3. Surgery

In our experience, the first option is rarely practiced. The second option is generally preferred and in recent years, therefore, treatment of PNX has become the domain of surgeons. A 'surgical' chest tube is not very comfortable, is painful, and can be a source of more serious and frequent complications, depending on its diameter. Leaving aside clinical rarities, the most frequent drawbacks seem to be hemothorax, empyema, parenchymal lacerations or injuries to intercostal vessels (4).

In recent years, we have used

Table 4 – Complications observed by treatment type 2 = 11.1425 (N 8) p>0.01.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | | | | |  |
| Complic. | Matthys | Argyle | Conserv. | Combin. | Total |
| no  Subcut. | 21 (77.8%) | 15 (71.43%) | 33 (91.7%) | 3 | 72 |
| emphysema | 1 (3.7%) | 3 (14.3%) | 2 (5.5%) | 0 | 6 |
| Chest  pain | 1 | 0 | 0 | 0 | 1 |
| No resolution | 3 (11.1%) | 2 (9.5%) | 0 | 1 | 6 |
| Total | 27 | 21 | 36 | 4 | 88 |

Table 5 – Number of relapses by treatment type 2 = 6.3430 (N 8) p>0.01.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Relapses | Matthys | Argyle | Conserv. | Combin. | Total |
| no | 24 (88.9%) | 18 (85.7%) | 35 (97.2%) | 3 | 80 |
| one | 2 (7.4%) | 3 (4.28%) | 1 (2.8%) | 1 | 7 |
| two | 1 | 0 | 0 | 0 | 1 |
| Total | 27 (100%) | 21 (100%) | 36 (100%) | 4 | 88 |

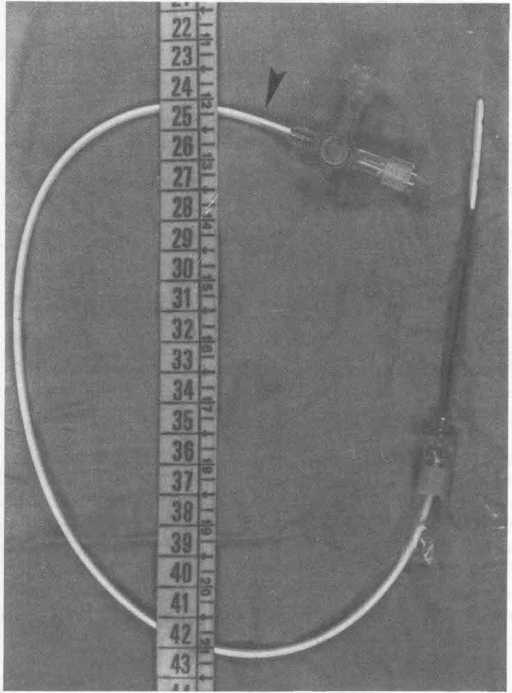


Figure 1 – Matthys narrow gauge disposable chest tube ready for insertion. The arrow shows the point mentioned in the text.

Matthys narrow gauge tubes to treat spontaneous pneumothorax. They are smaller and less traumatic. As far as complications and subsequent relapses are concerned, we have not seen any statistically significant difference between the use of this medical aid compared to the other more tried and tested methods. The fact that there was no difference leads us to doubt the fact that chest drains, by 'irritating' the pleura, actually prevent subsequent relapses.

The three deaths that occurred were attributed to concomitant diseases – two bronchogenic neoplasms and one bilateral bronchopneumonia with unilateral parapneumonic empyema *–* not to the treatment of the PNX.

The therapeutic usefulness of this pleural catheter, evaluated through the number of days taken to resolve the PNX, was found to be at least comparable to that of large gauge catheters and superior to watchful waiting alone.

The use of the Matthys pleural catheter can bring the majority of pneumothorax patients back to the domain of pneumology, allowing for a quicker patient recovery time and thus for shorter hospitalizations, resulting in an economic advantage for both the hospital and the patient. In our experience, all PNXs that arise in young people, even complete PNXs, where not complicated by bleeding, can be successfully treated with this type of chest drain in a short period of time. Older people can also be treated with this therapeutic aid, provided that the lung does not need to be re-inflated very quickly (which is not always without risk). In practice, the only contraindication to the use of a narrow gauge catheter was the co-occurrence of a massive pleural effusion, particularly a bloody effusion, due to the ease with which it becomes blocked compared to larger gauge drains. In all cases where the exploratory puncture of the pleura detected the presence of bloody effusion, we did not use Matthys. In reality, it is not a contraindication, but rather a prudent exclusion (5,6).

Based on our experience, following placement of the chest drain, it is advisable to take care (and encourage the patient to take care) not to bend the catheter at the point where it connects with the tap (see fig. 1 *–* arrow), which represents a "locus minoris resistenteae" and may easily become deformed, reducing its evacuating effectiveness.

Conclusions

In the last five years, our department treated 88 cases of PNX using different treatment methods depending on the affected area. The statistical analysis of the results highlighted that treatment with smaller catheters (Matthys type) is at least as effective from a therapeutic and prognostic point of view as the use of large gauge tubes, which are more traumatic. In light of our experience, the use of Matthys tubes therefore appears justified in all cases of PNX, including those which affect large areas (provided that they are not complicated by effusions of a certain size) in order to reduce the time spent in hospital and therefore the inconvenience and cost of treating this disease.

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