Thoracoscopic pleurodesis using iodopovidone versus pleural abrasions in management of recurrent pneumothorax

Enas Elsayed Mohamed *, Alaa El Din A. Abd Alla 

Chest Diseases Department, Faculty of Medicine, Alexandria University, Egypt

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Abstract

Introduction: Spontaneous pneumothorax is classified as either primary or secondary, recurrent pneumothorax may require further corrective and/or preventive measures such as pleurodesis.

Aim of the work: The aim of this work was to compare the effectiveness of chemical pleurodesis using iodopovidone and mechanical pleurodesis by thoracoscopic pleural abrasions in management of recurrent spontaneous pneumothorax.

Patients and methods: Thirty patients with documented recurrent spontaneous pneumothorax were enrolled in this study after obtaining informed consents. The patients were divided into two groups each contains 15 patients. All patients were subjected to the following: full history taking, thorough clinical examination, laboratory investigations including prothrombin activity and INR, radiological evaluation and thoracoscopic intervention was done using rigid thoracoscope and videography unit.

Results: The success rate of iodopovidone pleurodesis in this study ranged from 88.7% after 1 week to 92.3% after 1 month. Whereas, the success rate of mechanical pleurodesis ranged from 73.3% after 1 week to 90.9% after 1 month. There was no significant statistical difference between the results of the follow up between the 2 groups after 1, 7, 30 and 90 days.

Conclusion: Chemical pleurodesis using iodopovidone was as effective as mechanical pleurodesis by thoracoscopic pleural abrasions in management of recurrent spontaneous pneumothorax.

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Introduction

Spontaneous pneumothorax is usually due to rupture of a small subpleural bleb into the pleural cavity and affects mainly young men. After simple drainage, recurrence occurs in about 50% of cases. The risk of recurrence increases after each new pneumothorax. Secondary pneumothorax complicates an underlying pulmonary disease, especially chronic obstructive pulmonary disease with emphysema. A new form of secondary
pneumothorax has emerged in the recent years in acquired immune deficiency syndrome (AIDS) patients with pneumocystis carinii pneumonia [1]. Spontaneous pneumothorax is classified as either primary or secondary. Primary spontaneous pneumothorax is associated with subpleural bullous changes and occurs predominantly between the ages of 20 and 40 years [2]. Secondary spontaneous pneumothorax occurs as a complication of intrathoracic disease. This complication typically presents after the fourth decade of life. Secondary pneumothorax may develop spontaneously with diseases such as emphysema, chronic bronchitis, pulmonary fibrosis, and malignancy. Spontaneous pneumothorax due to malignancy has been reported in patients with sarcoma, lung cancer, germ cell tumors, Hodgkin’s lymphoma, and non-Hodgkin’s lymphoma [1–3]. Recurrent pneumothorax may require further corrective and/or preventive measures such as pleurodesis. If the pneumothorax is the result of bullae, then bullaectomy (the removal or stapling of bullae or other faults in the lung) is preferred [1].

The ipsilateral recurrence rate after primary spontaneous pneumothorax ranges from 30% after a first attack to 80% after a second attack, indicating the need for preventative measures to guard against recurrence. This can be achieved with pleurodesis [8,9].

Pleurodesis was first reported at the beginning of the 20th century [10] and over the last 100 years, a wide variety of agents has been used for the procedure. In the recent past, iodopovidone has been found to be a very effective and acceptable agent for pleurodesis. The effectiveness of iodopovidone in pleurodesis has already been demonstrated by various studies from across the world [11–15].

Aim of the work

The aim of this work was to compare the effectiveness of chemical pleurodesis using iodopovidone and mechanical pleurodesis by thoracoscopic pleural abrasions in management of recurrent spontaneous pneumothorax.

Subjects and methods

Study population and subjects

Thirty patients with documented recurrent spontaneous pneumothorax, admitted to the chest department, Alexandria University hospital were enrolled after obtaining informed consents. All patients had a prothrombin activity >70%.

Study measurements

The patients were divided into two groups each contains 15 patients. All patients were subjected to the following:

- Thorough clinical examination including: general examination and local chest examination.
- Laboratory investigations including prothrombin activity and INR.
- Radiological evaluation was carried out by:
  - Plain X-ray chest postero-anterior and lateral views.
  - Computed tomographic (CT) scan of the chest with focus made on the side and amount of pneumothorax, pleural lesions, underlying lung lesions, metastasis and any other lesions that could be detected.

Thoracoscopic procedure

Thoracoscopic examination was done using rigid thoracoscope and videoscopy unit (camera [KARL STORZ ENDOSKOPE TELECAM PAL 20211020], light source [HENKE-SASS WOLF GMBH D-7200 TUTTINGEN]), video recorder and television.

The procedure was done in an especially equipped procedure room in chest department, Alexandria University.

Each patient was positioned lying down in a lateral decubitus position with the involved side facing upwards and graded doses of midazolam 15 mg diluted in 15 cc normal saline was given to the patient. The entire lateral chest wall was scrubbed with iodopovidone. After raising a 2 cm subcutaneous wheal and anaesthetizing the skin, subcutaneous tissues, muscle planes, rib periosteum and parietal pleura by about 20 cc of 1% lidocaine a 2 cm transverse skin incision was made by a scalpel parallel to the rib along the intercostal space chosen for tube insertion in the wheal. Blunt dissection of the intercostal tissues was performed by spreading straight Kelly clamp both parallel and perpendicular to the underlying muscles, which were separated, and the parietal pleura was gently palpated by the index finger and was penetrated by the Kelly clamp. The trocar and cannula was grasped and inserted through the incision, down the preformed tract, penetrating the pleural membrane into the pleural cavity.

Once in place, the cannula was removed and the rigid thoracoscope, connected to a video camera in order to display the whole procedure on a monitor and can be recorded on a video tape by a video recorder, was introduced through the trocar.

Inspection of the pleural cavity was then done by the rigid thoracoscope. The parietal pleura including the costal, diaphragmatic sometimes mediastinal pleura as well as the visceral pleura were thoroughly examined for any lesions such as nodules, plaques, adhesions, thickening, mottling or atelectasis. Multiple forceps biopsies were taken from any suspicious gross pathological lesion in the parietal pleura. The visceral pleura was not biopsied. The biopsies were then sent for histopathological diagnosis. Then a suction catheter connected to thoracic drainage device [HOSPIVAC s.m350 REF210358] is introduced through the cannula to induce lung expansion.

Twenty cubic centimeter of lidocaine (1% concentration) were instilled into the pleural cavity through the chest tube to anaesthize the pleura. Under strict aseptic technique, 50 cm3 of iodopovidone (10% concentration) was added to 50 cm3 normal saline in a sterile bowl and aspirated into the 50 cm3 Tommy’s syringe. The syringe was attached to the rigid cannula and the solution was instilled into the pleural cavity, then the remaining 50 cm3 of the solution was instilled in the same manner in the first 15 patients.
Chemical pleurodesis using iodopovidone versus mechanical pleurodesis in management of recurrent pneumothorax

(group I). While performing multiple thoracoscopic pleural abrasions in the parietal pleura using rough brush forceps in the other 15 patients (group II).

Then a suction catheter connected to thoracic drainage device [HOSPIVAC sm350 REF210358] was introduced through the cannula to induce lung expansion.

After the procedure, a clamped chest tube was connected to the suction tube of the drainage device and fixed in position to the skin of the chest wall using zero silk interrupted vertical mattress sutures. Well-cared dressing was applied. The dressing was routinely changed and inspected daily.

Chest radiograph was done daily to assure full lung re-expansion. Once this latter was achieved, the chest tube was removed. After removing the chest tube, a plain chest radiograph was obtained.

Follow up plain X-rays chest PA view were performed 1730 and 90 days after the procedure to assess initial, early and late success of pleurodesis.

Results

This study included thirty patients. They were divided into two groups each contains 15 patients. Table 1 demonstrated comparison between the two studied groups according to demographic data, symptoms and radiological findings as regarding sex, in the first group 12 (80.0%) were males and 3 (20.0%) were females while in the second group 9 (60.0%) were males and 6 (40.0%) were females, with no significant statistical difference between the two groups (p = 0.427). The mean age in the first group was 44.80 ± 12.17 years and 43.67 ± 10.47 years in the second group, with no significant statistical difference between the two groups (p = 0.787). As regarding symptoms, dyspnea and chest pain were found in all patients of the two studied groups. As regarding the radiological findings, right sided pneumothorax was detected in 9 (60.0%) patients of the first group and in 7 (46.7%) patients of the second group. Whereas, left sided pneumothorax was detected in 6 (40.0%) patients of the first group and in 8 (53.3%) patients of the second group, with no significant statistical difference between the two groups (p = 0.715) Fig. 1.

Table 2 and Fig. 2 demonstrated the follow up findings of the two groups, after 1 day, in the first group; full lung re-expansion. Once this latter was achieved, the chest tube was removed. After removing the chest tube, a plain chest radiograph was obtained.

Follow up after 3 months revealed that, full lung expansion was maintained in the 10 (100%) cases.

There was no significant statistical difference between the results of the follow up between the two groups after 1730 and 90 days.

Discussion

The exact mechanism of pleurodesis by a sclerosing agent is not completely understood. However, it has been shown that the initial events that take place after the intrapleural administration of a sclerosing agent include the denudation of mesothelial cells and the subsequent development of an exudative pleural effusion [16,17]. Thereafter, the complex sequence of events that take place include an acute inflammatory response to the local injury, followed by the regeneration of the damaged cells, and the wound strength is established by the migration of connective tissue cells, the synthesis of extracellular matrix proteins and finally, collagenisation [18].

The success rate of iodopovidone pleurodesis in this study ranged from 88.7% after 1 week to 92.3% after 1 month, which is almost similar to the efficacy of talc pleurodesis, and other inexpensive agents used for chemical pleurodesis, which include silver nitrate and quinacrine 32. Importantly, iodopovidone is not only inexpensive, but is also associated with minimal side effects [11,19,20].

The efficacy of pleurodesis with iodopovidone without any significant adverse effects was 91.6% in a study conducted by Morales-Gomez et al. [12] and 64.2% in a study conducted by Kelly-Garcia et al. [13]. In both these series, pleurodesis was performed through tube thoracostomy, iodopovidone proved to be an extremely effective and safe agent for their pleurodesis. The efficacy of iodopovidone is at par with that of talc, but there is no fear of severe complications, such as acute respiratory distress syndrome, which occurs especially if the talc used has a smaller particle size (< 15 μm).

Moreover, pleurodesis with iodopovidone can be performed under local anaesthesia with excellent tolerance and acceptability [18].

In a study by Dey et al. [21], who said that some difficulty was experienced in the form of increased resistance while injecting the total volume of fluid 50 ml lidocaine solution and 100 ml iodopovidone solution in the patients with recurrent pneumothorax. It is possible that patients with pneumothorax

### Table 1

<table>
<thead>
<tr>
<th></th>
<th>Iodopovidone</th>
<th>Mechanical abrasions</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>Male</td>
<td>Female</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>12 (80.0%)</td>
<td>9 (60.0%)</td>
<td>0.427</td>
</tr>
<tr>
<td>Female</td>
<td>3 (20.0%)</td>
<td>6 (40.0%)</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>44.80 ± 12.17</td>
<td>43.67 ± 10.47</td>
<td>0.787</td>
</tr>
<tr>
<td>Dyspnea</td>
<td>15(100.0%)</td>
<td>15(100.0%)</td>
<td>–</td>
</tr>
<tr>
<td>Chest pain</td>
<td>15(100.0%)</td>
<td>15(100.0%)</td>
<td>–</td>
</tr>
<tr>
<td>Radiological findings</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right pneumothorax</td>
<td>9(60.0%)</td>
<td>7(46.7%)</td>
<td>0.715</td>
</tr>
<tr>
<td>Left pneumothorax</td>
<td>6(40.0%)</td>
<td>8(53.3%)</td>
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</table>

Data are expressed in numbers (%) or mean ± SD.
require lower amounts of the sclerosing agent for pleurodesis but this difficulty was not experienced in the present study.

The success rate of mechanical pleurodesis in this study ranged from 73.3% after 7 days to 90.9% after 1 month. Similar result was detected by Wochenschr[22], stated that thoracoscopic mechanical pleurodesis is an effective palliative method for the treatment of recurrent pleural effusions and recurrent pneumothorax, with a minimum number of complications and a short period of hospitalization. After Thoracoscopic mechanical pleurodesis there is significant improvement in

![Figure 1](image1.png)

**Figure 1** Comparison between the two studied groups according to symptoms and radiological findings.

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Comparison between the two studied groups according to follow up chest X-ray.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>After 1 day</td>
</tr>
<tr>
<td>Iodopovidone</td>
<td>(n = 15)</td>
</tr>
<tr>
<td>Full lung expansion</td>
<td>14(93.3%)</td>
</tr>
<tr>
<td>Persistent pneumothorax</td>
<td>1(6.7%)</td>
</tr>
<tr>
<td>Recurrent pneumothorax</td>
<td>–</td>
</tr>
<tr>
<td>Mechanical abrasions</td>
<td>(n = 15)</td>
</tr>
<tr>
<td>Full lung expansion</td>
<td>12(80.0%)</td>
</tr>
<tr>
<td>Persistent pneumothorax</td>
<td>3(20.0%)</td>
</tr>
<tr>
<td>Recurrent pneumothorax</td>
<td>–</td>
</tr>
<tr>
<td>P</td>
<td>0.598</td>
</tr>
</tbody>
</table>

Data are expressed in numbers (%).

![Figure 2](image2.png)

**Figure 2** Comparison between the two studied groups according to follow up chest X-ray.
respiratory functions, and for the patient it represents a relatively simple surgical procedure. In addition, similar to Chen et al. [23], who reported that pleural abrasion, is as effective as apical pleurectomy and either technique is appropriate for treating primary spontaneous pneumothorax patients with high recurrence risk.

In the present study, no significant statistical difference was detected between the results of the follow up between the two groups after 1730 and 90 days following iodopovidone and mechanical pleurodesis. This was in agreement with Sephripour et al. [24], who reported that there is a very similar outcome profile in the comparison between mechanical and chemical pleurodesis, with modest evidence suggesting lower rates of recurrence with chemical tule pleurodesis. The reverse was detected by Hamdy et al. [25], who reported that pleurodesis using minocycline instillation via thoracoscopy is more effective than mechanical abrasions induced by brushing.

In conclusion, chemical pleurodesis using iodopovidone is as effective as mechanical pleurodesis by thorascoscopic pleural abrasions in management of recurrent spontaneous pneumothorax.

References