

# Comparison between Needle Aspiration and Chest Tube Drainage in the Management of Primary Spontaneous Pneumothorax

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## ABSTRACT

**Objective:** To compare the effectiveness of needle aspiration and chest tube drainage in the management of primary spontaneous pneumothorax

**Subject and Methods:** A Total of 58 patients of primary spontaneous pneumothorax PSP were divided into two groups as per management modality. Group A was treated with needle aspiration NA and group B was managed with chest tube drainage CTD. Frequency of gender and current smoker was noted. Mean and standard deviation was calculated for age and body mass index BMI. Clinical characteristics like hospitalization days, immediate and 1 week success rate and recurrence was noted on proforma. Frequency of minor postoperative complication was observed for both groups.

**Results:** The majority of patients were males in both groups. Mean age of patients was  $47.29 \pm 5.68$  for NA group and  $49.28 \pm 6.25$  for CTD group. Immediate and 1 week success rate was 17 (58.6%) 27 (93.1%) for NA group, while in CTD group it was 22 (75.86%) and 28 (96.5%) respectively. Mean hospitalization time for NA group was  $1.42 \pm 0.38$ , and for CTD it was  $4.62 \pm 1.12$ . 1 year recurrence rate was higher in NA group than the CTD group.

**Conclusion:** Considering its advantages, NA was recommended as first line management in the patients of PSP.

**Keywords:** Needle Aspiration, Chest Tube Drainage, Primary, Spontaneous Pneumothorax, Hospitalization, Success, Recurrence.

## INTRODUCTION

Itard and Laennec initially pioneered the word "pneumothorax" in 1803 and 1819, respectively, to describe air in the pleural cavity (i.e., interspersed between the lung and the chest wall). The majority of pneumothorax occurrences at the time were caused by TB, although few were identified as happening in apparently robust people ("pneumothorax simple").<sup>1</sup> Based on whether or not there is an antecedent lung illness, the ailment is classified as primary spontaneous pneumothorax (PSP) or secondary spontaneous pneumothorax (SSP).<sup>2</sup>

In 1932, Kjaergard was the first to report a primary spontaneous pneumothorax (PSP) in an apparently healthy person. It has an approximate worldwide occurrence of 18–28 per 100 000 males and 1.2–6 per 100 000 women.<sup>3,4</sup> PSP occurs when bullae breaks down without any prior pulmonary illness, whereas secondary pneumothorax occurs when injured lung tissue breaches and is most commonly seen in individuals with pulmonary disease, such as pulmonary emphysema.<sup>5</sup>

Action is necessary to clear the intra-pleural air when a spontaneous pneumothorax produces substantial dyspnoea. The initial management of SP is centered on evacuation of pleural air; the necessity and urgency of which depends on the size of the pneumothorax, the patient's degree of symptoms, the presence of structural lung disease, and the general condition of the patient.<sup>6</sup> Chest tube drainage (CTD), needle aspiration (NA), video-assisted thoracic surgery and open surgical treatments are the most prevalent therapy choices.<sup>7,8,9</sup>

Because of its remarkable effectiveness in expanding the lungs of patients and relieving problems, CTD is considered the mainstay therapy for SP.<sup>10</sup> Physicians, on the other hand, have praised aspiration via needle or NA for its ease of usage and speedy results, as well as for decreasing patient aggravation.<sup>11</sup>

The solution is to remove air from the pleural cavity utilizing simple aspiration or chest tube drainage (CTD). CTD necessitates hospitalisation, surgical skill, and a significant financial investment, whereas needle aspiration is a simple treatment that may be performed outside.<sup>12</sup> Whilst there is no consensus on the best therapy for individuals with their first episode of SP, the bulk of doctors recommend chest tube drainage. Although manual air aspiration has been advocated, there is a dearth of comparative

and safety evidence to support its usage. Needle aspiration is a quick and painless procedure that may be done on an outpatient basis.<sup>13</sup>

This current study aims to compare the effectiveness of needle aspiration and chest tube drainage in the management of primary spontaneous pneumothorax in terms of success rate, recurrence rate, hospitalization time and complications encountered.

## MATERIAL AND METHODS

This observational study was performed at General Surgery Unit of Abbasi Shaheed Hospital at Karachi Medical and Dental College Karachi from February 2021 to March 2022. A total of 58 patients were randomly divided into two groups of 29 each.

Group A was treated with Needle Aspiration method.

Group B was treated by Chest tube drainage method.

### Inclusion Criteria:

- Either Gender.
- Patients with age of 18 and above.
- Patients diagnosed with symptoms of primary spontaneous pneumothorax.

### Exclusion Criteria:

- Patients with tension pneumothorax and hydropneumothorax
- Bilateral respiratory failure
- Patients with bilateral pneumothorax
- Patients indicated for mechanical ventilation
- Not willing to participate in the study

**Data Collection Procedure:** Demographic data of all patients including age, gender, BMI, smoking status and stay in hospital will be recorded. Before the intervention, patients underwent chest radiography to confirm the primary SP diagnosis. During hospital admission, as a standard treatment, 3 L/min-1 supplementary oxygen administered for all patients.

Repeated Chest X Ray were performed at postoperative day one and seven to evaluate complete lung expansion and confirm successful treatment.

Postoperative complications including bleeding, pleural effusion, subcutaneous emphysema and recurrence were also recorded.

After administering local anaesthetic with 2% lignocaine in the 2nd intercostal region in the mid clavicular line on the diseased side of the chest, needle aspiration was performed. An intravenous cannula (16G or bigger and at least 3 cm long) was placed perpendicular to the chest wall in the pleural area. Once the needle was removed, the intravenous cannula was linked to a three-way stopcock, then an intravenous tubing set was attached at 3 o'clock, a 50 cc syringe at 6 o'clock, and the lower end of the intravenous tubing was placed under water seal. Air was then aspirated and evacuated from the water seal via an intravenous set. When the patient got agitated or coughed heavily, the aspiration was discontinued.

A 12–28 Ch (usually 14–20 Ch) chest tube was inserted and coupled to a chest drainage unit with water seal for CTD. The 4th or 5th intercostal gap at the mid-axillary line were the most typically used placement locations. A chest radiography was taken immediately after the drain was inserted to assess the location and initial impact of the drain. Suction was used only if the re-expansion of the lung was minor, and only at the doctor's judgment. The chest radiograph was taken again the next morning, usually after the water seal in the chest drainage system stopped bubbling. Before removing the drain, it was left to be clamped for a few hours.

## RESULTS

Table 1: Demographic Variables

	Group a Na	Group b Ctd
Age	47.29 ± 5.68	49.28 ± 6.25
Gender		
Male	25 (86.20%)	27 (93.10%)
Female	04 (13.79%)	02 (6.89%)
Bmi (kg/m <sup>2</sup> )	23.41±1.94	22.62±2.17
Current smoker	13 (44.82%)	16 (55.17%)

Table 2: Clinical Characteristics and Findings of the Study

Variable	Group a Na	Group b Ctd
Success rate	17 (58.6%)	22 (75.86%)
Immediate	27 (93.1%)	28 (96.5%)
One week		
Hospitalization days	1.42±0.38	4.62±1.12
Recurrence	05 (17.24%)	02 (6.89%)

Table 3: Detailed Complication of the Study Groups

Complications	Group a Na	Group b Ctd
Wound infection	00	03
Bleeding	02	05
Subcutaneous emphysema	00	02

## DISCUSSION

The British Thoracic Society supports the administration of simple percutaneous aspiration in all SP patients needing treatment, but the American College of Chest Physicians opposes such suggestions and recommend CTD.<sup>10,14</sup> For the first episode of PSP in young children, Moritimoto recommended thoracoscopic surgery, but others propose simple aspiration as the primary therapeutic option.<sup>15</sup>

This prospective observational study finds that the length of hospitalization was significantly less in NA group as compared to CTD group. In a study identical to ours, Tarar J<sup>16</sup> found that patients treated with needle aspiration took significantly less time to resolve than those treated with tube drainage. According to Devanand A<sup>17</sup> systematic study, using simple aspiration rather than chest tube culminated in a shortened hospital stay. The opportunity for outpatient therapy makes simple aspiration appealing. In contrast to our findings, Andrivet et al<sup>18</sup> conducted a trial of 61 individuals with SP and found no substantial variation in hospitalisation. The lengthier hospital admissions in NA patients

studied in the Andrivet trial resulted in a 72-hour delays in management in certain patients, resulting in a bias in the mean hospital admission time.<sup>18</sup> In a research comparing needle aspiration to intercostal tube drainage, Harvey J<sup>19</sup> discovered that those who received needle aspiration experienced considerably less days in the hospital than those who had chest tube drainage.

In this trial, the CTD group had a slightly higher initial success rate than the NA group. However, there was no substantial change in the one-week success rate between the two groups. In response to our findings, Thelle A<sup>2</sup> indicated that NA had a considerably better instant response rate than CTD for PSP. There were no differences between the two treatment groups after one week. Thelle's data was identical to ours in terms of 1 week success rate, but not in terms of immediate success rate. In a pilot trial, Noppen et al<sup>20</sup> found that NA and CTD methods had the same immediate and one-week success rates in the management of PSP.

The overall 1 year recurrence rate was seen higher in NA group as compared to CTD group in this current study. Chan SS<sup>21</sup>, in his research, found quicker resolution of pneumothorax with needle aspiration but there was no disparity regarding one-year recurrence rate. Similarly, a 27.2% recurrence rate was found in NA group in a study which was performed by Rehana K<sup>13</sup>, this data is quite similar to our findings in terms of recurrence rate.

Few minor complications were seen emerged in CTD group as compared to NA group. CTD group showed cases with complications like wound infection, bleeding and surgical emphysema, while NA group was only encountered with 2 cases of bleeding, that could be due to inappropriate insertion of needle.

## CONCLUSION

When compared to chest tube drainage, needle aspiration required less hospitalisation and had fewer complications. While CTD had a somewhat higher initial success rate. However, there was no statistical significance in the success rate after one week. Given its benefits, we recommend NA as a first-line therapy for patients with primary SP.

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