

## Treatment Outcome with Talc or Povidone Iodine in Recurrent Pneumothorax or Recurrent Pleural Effusion

Dr. Shraddha N. Patel<sup>1</sup>, Dr. Savita Jindal<sup>2</sup>, Dr. Nilesh Dutt<sup>3</sup>, Dr. Palak Prajapati<sup>4\*</sup>, Dr. Sidhdharaj Dabhi<sup>5</sup>

<sup>1</sup>III Year resident doctor, <sup>2</sup>Associate Professor, <sup>3</sup>Professor and Head, <sup>4</sup>Assistant Professor, <sup>5</sup> I Year resident doctor, Department of Respiratory Medicine, AMC MET Medical College, Ahmedabad

\*Corresponding Author: Dr. Palak Prajapati

Email id: [palakprajapati28@gmail.com](mailto:palakprajapati28@gmail.com)

DOI:10.56018/20230612



### Abstract

**Background:** The present study assessed the treatment outcome of pleurodesis with talc or povidone iodine in recurrent pneumothorax or recurrent pleural effusion and the efficacy and safety of talc or povidone iodine in the same. **Materials and Methods:** A total of 23 patients with recurrent pneumothorax (15) and recurrent pleural effusion (8) were enrolled. Pleurodesis with either talc or povidone iodine was performed via intercostal drainage tube. Treatment outcome along with complications was studied by routine follow up of patients for 6 months. **Results:** A total of 23 patients (19 males and 4 females) were included in the study. 16 patients were subjected to povidone iodine pleurodesis while 7 patients underwent talc pleurodesis. Mean age of patients was 38.68±19.6 for the povidone iodine group and 43.85±16.32 for the talc group. Eight (34.78%) patients had recurrent pleural effusion whereas 15 (65.21%) patients had recurrent pneumothorax. Post procedure pain was experienced by 5 (31.25%) patients in the povidone iodine group and 4 (57.14%) patients in the talc group. Two (12.5%) and one (14.28%) patient had fever following povidone iodine and talc pleurodesis respectively. Pleurodesis was successful in 13 (81.25%) patients in the povidone iodine group and 7 (100%) patients in the talc group, during the follow up period of 6 months. **Conclusion:** Both talc and povidone iodine are effective pleurodesis agents and povidone iodine can be considered a good alternative to talc as a pleurodesis agent in recurrent cases of pneumothorax or pleural effusion, irrespective of the underlying cause, as it is safe, easily available and cost effective.

**Keywords:** Recurrent pneumothorax, Recurrent pleural effusion, Pleurodesis, Talc, Povidone Iodine

### Introduction

Pleura is the serous membrane which covers the lung parenchyma, mediastinum, diaphragm, and the rib cage. It is divided into visceral pleura and parietal pleura. A film of fluid, known as pleural fluid, is normally present between the parietal and visceral pleura. Only a thin layer of fluid is present in the pleural space in normal people, so it is a potential space rather than an actual one.<sup>1</sup> If more fluid or air is present in the space, it causes discomfort to the patient and is considered a diseased state. Pleural effusion is the accumulation of fluid in pleural space, while pneumothorax is the accumulation of air in pleural space. Pleurodesis is a procedure to achieve symphysis between two layers of pleura in order to prevent collection of either air or fluid in the pleural space.<sup>2</sup> Pleurodesis is commonly done by removing pleural fluid or intrapleural air followed by either mechanical closure or instillation of a chemical irritant into the pleural space, which causes intense inflammation and fibrosis and leads to adhesions between two pleural membranes. There are two methods of pleurodesis:

1. **Chemical pleurodesis:** It is done by instillation of a sclerosing agent into the pleural cavity via intercostal drainage tube. Some of the sclerosing agents used in chemical pleurodesis are Talc, Povidone Iodine, Tetracycline derivatives (minocycline, doxycycline), Antineoplastic agents (bleomycin, nitrogen mustard, mitoxantrone), Silver nitrate, *Corynebacterium parvum*, *Streptococcus pyogenes* A3 (OK-432), Quinacrine, Interferon beta and Autologous blood.<sup>3</sup>

2. **Mechanical/Surgical pleurodesis:** This is done through medical thoracoscopy, video-assisted thoracoscopy (VATS) or open thoracotomy.

The most common indication for pleurodesis is malignant pleural effusion, which is typically refractory. Other indications are recurrent pneumothorax and recurrent pleural effusion. The choice of sclerosing agent is determined by several factors, including local expertise, availability of agents and the underlying process for which pleurodesis is to be done. An ideal sclerosing agent should have a high molecular weight and chemical polarity, low regional clearance, rapid systemic clearance, a steep dose-response curve, and should be well tolerated with minimal or no side effects.<sup>4</sup> The present study was done to evaluate the treatment outcome of pleurodesis with talc or povidone iodine in patients with recurrent pneumothorax or recurrent pleural effusion.

### Materials and Methods

A prospective study was conducted in the Department of Respiratory Medicine, AMC MET Medical college, Sheth LG hospital, Ahmedabad for 9 months from the date of confirmation of IRB. Patients with recurrent pneumothorax (pneumothorax at least twice) and those with recurrent pleural effusion (pleural effusion at least twice or refilled on the same side after initial thoracocentesis), were enrolled in the study after obtaining written, informed consent. Talc or povidone iodine was infused into the pleural cavity through intercostal drain. Talc was instilled into the pleural space either as slurry solution (suspended in saline) via intercostal drain or insufflated (as an aerosol) during thoracoscopy. Fifty ml of 10% povidone iodine (20 ml povidone iodine, 10 ml 2% lignocaine and 20 ml normal saline) was injected into the pleural cavity through ICD in patients undergoing povidone iodine pleurodesis. After the sclerosant was injected, the catheter was flushed with an additional 50 to 100 mL of saline and the chest tube was clamped for at least 6 to 8 hours. Patients were subsequently asked to switch to different positions so that the sclerosant contacts all the pleural surfaces. After 6 to 8 hours, ICD was unclamped. Chest X-ray was performed after 24 - 48 hours depending on the water column movement in ICD. Success of procedure was assessed with chest x-ray and water column movement in ICD. Adverse events, if any, were recorded. Patients were followed up for 6 months for recurrence of pneumothorax or pleural effusion. Chest x-ray was performed after six months or whenever patients became symptomatic. Any re-accumulation of fluid or air in the pleural space, requiring intervention like thoacocentesis, anytime during the follow up period of 6 months, was considered as a failure of pleurodesis.

### Inclusion and exclusion criteria:

1. Patients with recurrent pneumothorax / pleural effusion were included.
2. Those who gave negative consent for this study and/or pleurodesis were excluded.

**Data Analysis:** Data were analyzed using GraphPad software. Continuous variables were expressed as mean and standard deviation and categorical variables were expressed as percentage. Difference between continuous variables of both groups was tested by an independent sample t-test, while association between categorical variables was tested using Chi-square test. P-value less than 0.05 was considered statistically significant.

### Results

In this study, povidone iodine was used as a pleurodesis agent in 16 patients and talc was used in 7 patients, of whom majority were men (81.25% and 85.71% respectively). There was no statistically significant difference between the mean age (38.68 Vs 43.85) in both the groups. Out of eight patients with recurrent pleural effusion, povidone iodine was used in 4 (50%) and talc was used in the remaining 4(50%) patients. Povidone iodine was used in 12(80%) patients and talc was used in 3(20%) patients with recurrent pneumothorax for pleurodesis. Tuberculosis was the most common underlying etiology (10, 62.5%) in the povidone iodine group, whereas in the talc group, tuberculosis and chronic liver disease were the most common etiologies (28.57% each) for recurrent pleural effusion or recurrent pneumothorax. No underlying etiology was found in 3 (13.04%) patients (2 patients in the talc group and 1 in the povidone iodine group). Dyspnea was the most common symptom, present in all patients. Mean previous episodes of pneumothorax (2.25 Vs 2.5) and pleural effusion (3.25 Vs 3.0) were comparable in both the groups (Table 1).

**Table 1: Demographic data and medical history of patients undergoing Povidone Iodine or Talc Pleurodesis**

	<b>Povidone Iodine</b>	<b>Talc</b>	<b>P value</b>
	<b>n= 16 patients</b>	<b>n=7 patients</b>	
<b>Sex</b>			0.79
Men*	13 (81.25%)	6 (85.71%)	
Women*	3 (18.75%)	1 (14.28%)	
<b>Age (years)^</b>	38.68±19.6	43.85±16.32	0.54
<b>Underlying pathology</b>			0.31
Pleural Effusion*	4 (25%)	4 (57.14%)	
Pneumothorax*	12 (75%)	3 (42.85%)	
<b>Underlying Etiology#</b>			0.06
Tuberculosis*	10 (62.5%)	2 (28.57%)	
COPD*	3 (18.75%)	1 (14.28%)	
Malignancy*	2 (12.5%)	0 (0%)	
Chronic liver disease*	0 (0%)	2 (28.57%)	
<b>Symptoms</b>			0.25
Dyspnea*	16 (100%)	7 (100%)	
Cough *	13 (81.25%)	1 (14.28%)	
Chest pain*	13 (81.25%)	4 (57.14%)	
<b>Previous Episodes</b>			
Pneumothorax^	2.25±0.45	2.5±0.70	0.31
Pleural Effusion^	3.25±0.5	3.0±0.7	0.33

\*Number (%); ^Mean ± SD

#In 3 patients, underlying etiology for development of recurrent pleural effusion or recurrent pneumothorax could not be identified.

Povidone iodine was successful in preventing the recurrence of pneumothorax or pleural effusion in 81.25% patients while talc was 100% successful, but the difference was not statistically significant (*P* value 0.57). Three (18.75%) patients in the povidone iodine group had recurrence during the 6 month follow up period, of whom two had tuberculosis and one had malignancy as the underlying etiology. Pain was the most common post procedure complication in both the groups (31.25% patients in the povidone iodine group and 57.14 patients % in talc group), followed by fever (Table 2).

**Table 2: Outcome of pleurodesis and complications observed in patients undergoing povidone iodine or talc pleurodesis**

	<b>Povidone Iodine</b>	<b>Talc</b>	<b>P value</b>
	<b>n: 16 patients</b>	<b>n: 7 patients</b>	
<b>Outcome</b>			0.57
Success *	13 (81.25%)	7 (100%)	
Failure*	3 (18.75%)	0 (0%)	
<b>Complications</b>			0.73
Pain*	5 (31.25%)	4 (57.14%)	
Fever*	2 (12.5%)	1 (14.28%)	

\*Number (%)

**Discussion**

Chemical pleurodesis is a known therapy for patients with recurrent pleural effusion and recurrent pneumothorax. It is done either with tube thoracostomy or pleuroscopy. This study was done to assess the correct choice of sclerosing agent, which is not only determined by the efficacy of the agent but also by its affordability, availability, safety and ease of administration.<sup>5</sup> In one study, talc was found to be the most effective pleurodesis agent, and the preferred technique for pleurodesis based on efficacy was thoracoscopic pleurodesis.<sup>6</sup> Previous studies do not report an increase in mortality following talc pleurodesis but there are serious concerns about the safety of talc. Talc pluerodesis involves a risk of systemic embolization. Increased incidence of adult respiratory distress syndrome and subsequent respiratory failure with the use of talc as a sclerosing agent have been reported.<sup>7,8</sup> Moreover, pharmaceutical talc (Steri-talc) with well-described limits<sup>9</sup> is not easily available in many countries including India.

Povidone iodine is a topical antiseptic, found to be safe and effective in several studies.<sup>10,11</sup> The exact mechanism of action of povidone iodine is not clear, but it leads to pleural fibrosis. Low pH (2.97) of the sclerosing solution<sup>11</sup> or strong oxidative and cytotoxic properties of iodine, which can induce a potent inflammatory response<sup>12</sup> might be responsible for its sclerosing action. Povidone iodine also has anti-exudative properties which may be responsible for chelation of proteins.<sup>13</sup> Production of fibroblast growth factor<sup>14</sup> similar to talc, may also contribute to its pleurodesis potential.

In our study, 13 men and 3 women were included in the povidone iodine group with a mean ( $\pm$ SD) age of 38.68  $\pm$ 19.60 years, while the talc group included 6 men and 1 woman with a mean ( $\pm$ SD) age of 43.85  $\pm$ 16.32 years, with no statistically significant difference in the age and sex between both the groups (p value 0.54 and 0.79 respectively). In the study by Agarwal et al<sup>10</sup>, 34 men and 30 women were included with a mean age of 47.1 $\pm$ 15.4 years. There were 7 men and 14 women with a mean age of 71 $\pm$ 5 years in the povidone iodine group and 4 men and 14 women with a mean age of 70.9 $\pm$ 5.1 years in the study by Ibrahim and colleagues.<sup>15</sup> Comparable to our study, this study also showed no statistically significant difference in the age and sex between the two groups (p value 0.949 and 0.442 respectively). Study by Dey et al<sup>16</sup> included 24 men and 14 women with a mean age of 55.8 $\pm$ 7.7 years. Das et al<sup>17</sup> studied 42 men and 10 women with a mean age of 56.4 years. Variation in the mean age can be attributed to the variation in the underlying etiology. All patients in the studies by Ibrahim and colleagues<sup>15</sup> and Das et al<sup>17</sup> and majority of patients in the study by Dey et al<sup>16</sup> had malignancy as the underlying etiology which presents more commonly in the older age.

In our study, 15 patients had pneumothorax whereas 8 patients had pleural effusion as the underlying pathology, with pneumothorax being more common than pleural effusion. In the studies by Agarwal et al<sup>10</sup> and Dey et al<sup>16</sup>, pleural effusion was present in more number of patients compared to pneumothorax, which is in contrast to our study. This discrepancy can be attributed to the underlying etiology. In the present study, tuberculosis and COPD were the most common underlying etiological factors, which can present as pneumothorax more commonly than pleural effusion.

Tuberculosis was the most common underlying etiology in our study (12 patients). In the study by Dey et al<sup>16</sup>, the most common etiology was malignancy, while the studies by Ibrahim et al<sup>10</sup> and Das et al<sup>17</sup> were conducted in patients with malignant pleural effusion. Most common symptom in our study was dyspnea followed by chest pain. Similar to this study, dyspnea was the most common symptom followed by chest pain in the study by Ibrahim and colleagues.<sup>15</sup>

In our study, mean previous episodes of pneumothorax ( $2.25 \pm 0.45$  in the povidone iodine group and  $2.5 \pm 0.70$  in the talc group) and those of pleural effusion ( $3.25 \pm 0.5$  and  $3.0 \pm 0.7$  in the povidone iodine and talc group respectively) were comparable in both treatment groups. However, no other studies were available for comparison of this finding.

This study included 23 patients, of whom 16 underwent povidone iodine pleurodesis whereas 7 patients underwent talc pleurodesis. The success rate of povidone iodine pleurodesis (81.25%) and that of talc pleurodesis (100%) were comparable. In the study done by Ibrahim and colleagues,<sup>15</sup> 39 cases with recurrent pleural effusion were studied, of whom 21 patients underwent talc pleurodesis and 18 patients underwent povidone iodine pleurodesis. The success rate with talc was 80.9% and that with povidone iodine was 72.2%, with no statistically significant difference between two groups (p value 0.519). These results are similar to the present study (p value 0.57). The study by Dey et al<sup>16</sup> included 38 patients (30 patients with pleural effusion and 8 patients with pneumothorax) undergoing povidone iodine pleurodesis, with a success rate of 89.5%, which is comparable to our observation. Similar results were seen in the study done by Agarwal et al<sup>10</sup> using iodopovidone pleurodesis in 64 patients with pleural effusion and pneumothorax (success rate of 86.5% in pleural effusion and 92.6% in pneumothorax). The study by Das et al<sup>17</sup> using talc and povidone iodine pleurodesis for malignant pleural effusions has also shown comparable results. Our study had 3 patients suffering recurrence following povidone iodine pleurodesis, of whom 2 had tuberculosis and 1 had malignancy as the underlying etiology. The study by Dey et al<sup>16</sup>, which used povidone iodine as a pleurodesis agent, had 4 patients with failed pleurodesis, all with malignant effusion as the underlying cause. Recurrence can be attributed to lack of inflammation between two pleural layers, following povidone iodine pleurodesis.

In our study, post procedure pain was the most common complication in both talc (57.14%) as well as povidone iodine (31.25%) groups, with no statistically significant difference between the two. Fever was the second most common post procedure complication in our study. Similar post procedure complications were reported in the study done by Ibrahim and colleagues,<sup>15</sup> with pain being most common post procedure complication, followed by fever. Dey et al,<sup>16</sup> reported chest pain and systemic hypotension in 7.9% patients following povidone iodine pleurodesis. Chest pain, followed by fever was the most common complication post pleurodesis in the study done by Das et al<sup>17</sup>, which is comparable to our study.

**Table 3: Comparison of studies using Talc or Povidone Iodine for chemical pleurodesis**

Study	Sample size (n)	Underlying pathology	Pleurodesis agent	Success rate (%)
Present	23	Recurrent pleural effusion (8) Pneumothorax (15)	Povidone Iodine (16) Talc (7)	Povidone Iodine (81.25%) Talc (100%)
Ibrahim et al.	39	Recurrent pleural effusion	Talc (21) Povidone Iodine (18)	Talc (80.9%) Povidone Iodine (72.2%)
Dey et al.	38	Pleural effusion (30) Pneumothorax (8)	Povidone Iodine	89.5%
Agarwal et al.	64	Pleural effusion (37) Pneumothorax (27)	Povidone Iodine	Pleural effusion (86.5%) Pneumothorax (92.6%)
Das et al.	52	Malignant pleural effusion	Povidone Iodine (28) Talc (24)	Povidone Iodine (89.28%) Talc (91.66%)

**Limitations:**

The limitation of our study is small sample size and less number of patients undergoing talc pleurodesis.

**Conclusion**

From this study, it can be concluded that both talc as well as povidone iodine are safe and effective pleurodesis agents in patients with recurrent pleural effusion or recurrent pneumothorax. In resource limited settings, povidone iodine can be considered as an alternative to talc as it is safe, cost effective and easily available, with a similar efficacy to that of talc. Further large scale studies are recommended to substantiate our findings.

**References**

1. Light RW. Anatomy of the Pleura. In Light RW, editors. *Pleural Diseases*. 6. Philadelphia: Lippincott, Williams & Wilkins; 2013.p. 1.
2. Agarwal R, Khan A, Aggarwal AN, Gupta D. Efficacy & safety of iodopovidonepleurodesis: a systematic review & meta-analysis *Indian J Med Res. J Med Res.* 2012;135(3):297–304.
3. Light RW. Pleural effusions related to metastatic malignancies. In: Light RW, Light RW, editors. *Pleural diseases*. 4. Philadelphia: Lippincott, Williams and Wilkins; 2001. pp. 121–4.
4. Antunes G, Neville E, Duffy J, Ali N, Pleural Diseases Group, Standards of Care Committee, British Thoracic Society. BTS guidelines for the management of malignant pleural effusions. *Thorax* [Internet]. 2003;58Suppl 2:ii29-38.
5. Agarwal R, Aggarwal AN, Gupta D, Jindal SK. Efficacy and safety of iodopovidone in chemical pleurodesis: A meta-analysis of observational studies *ScienceDirect. Respiratory Medicine.* 2006;100(11):2043–7.
6. Shaw P, Agarwal R. Pleurodesis for malignant pleural effusions. *Cochrane Database Syst Rev* [Internet]. 2004;(1):CD002916.
7. Light RW. Talc for pleurodesis? *Chest.* 2001;122:1506-8
8. Brant A, Eaton T. Serious complications with talc slurry pleurodesis. *Respirology* [Internet]. 2001;6(3):181–5.
9. Janssen JP. Is thorascopic talc pleurodesis really safe? *Monaldi Arch Chest Dis.* 2004;61(1):35–8.
10. Agarwal R, Aggarwal AN, Gupta D. Efficacy and safety of iodopovidone pleurodesis through tube thoracostomy. *Respirology.* 2006;11(1):105–8.
11. Olivares-Torres CA, Laniado-Laborín R, Chávez-García C, León-Gastelum C, Reyes-Escamilla A, Light RW. Iodopovidone pleurodesis for recurrent pleural effusions. *Chest* [Internet]. 2002;122(2):581–3.
12. Brissaud O, Desfrere L, Mohsen R, Fayon M, Demarquez JL. Congenital idiopathic chylothorax in neonates: chemical pleurodesis with povidone-iodine (Betadine). *Arch Dis Child Fetal Neonatal Ed* [Internet]. 2003;88(6):F531-3.
13. Cohan RH, Saeed M, Schwab SJ, Perlmutter LM, Reed Dunnick N. Povidone-Iodine sclerosis of pelvic lymphoceles: A prospective study. *UrolRadiol* [Internet]. 1988;10(1): 203-6.
14. Antony VB, Nasreen N, Mohammed KA, Sriram PS, Frank W, Schoenfeld N, et al. Talc pleurodesis. *Chest* [Internet]. 2004;126(5):1522–8.
15. Ibrahim IM, Dokhan AL, El-Sessy AA, EltaweelMF. Povidone-iodine pleurodesis versus talc pleurodesis in preventing recurrence of malignant pleural effusion. *Journal of Cardiothoracic Surgery.* 2015;10(1): 64
16. Dey A, Bhuniya S, Datta Choudhuri A, Pandit S, Saha-Duttachowdhury M, Sengupta A, et al. Iodopovidone pleurodesis: experience of a tertiary hospital in Kolkata. *Singapore Med J.* 2010;51(2):163–5.
17. Das SK, Saha SK, Das A, Halder AK, Banerjee SN, Chakraborty M. A study of comparison of efficacy and safety of talc and povidone iodine for pleurodesis of malignant pleural effusions. *J Indian Med Assoc.* 2008;106(9):589–90, 592