



Original Research Article

Safety and efficacy profile of povidone iodine pleurodesis in patients with spontaneous pneumothorax

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ABSTRACT

Introduction: Multiple agents are being used for the purpose of chemical pleurodesis with varied success and risks. Povidone iodine was also a successful agent in inducing pleurodesis in pleural effusions and pneumothoraces.

Aims and Objectives: To evaluate the efficacy and safety of povidone iodine pleurodesis through intercostal tube drainage (ICD) in patients with spontaneous pneumothorax.

Materials and Methods: This was a prospective study where povidone iodine was infused into pleural cavity through ICD in patients with spontaneous pneumothorax. Success of procedure and adverse events recorded. Patients were followed up for 12 months for recurrence of pneumothorax.

Results: A total of 38 patients with mean age of 58.6 ± 12.5 years were included in study. 28 patients had successful first procedure, six patients required repeat pleurodesis, three had failed pleurodesis and two had recurrent pneumothorax after 6 months. All patients experienced chest pain of varying severity. Two patients had ARDS.

Conclusion: Povidone iodine can be used as effective and safe agent for chemical pleurodesis in spontaneous pneumothorax.

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1. Introduction

Presence of air in pleural cavity is defined as pneumothorax, which can be broadly classified as spontaneous and traumatic.¹ Former is further classified as primary and secondary depending on underlying lung pathology. Occurrence of pneumothorax in a person with pre-existing lung pathology is termed as secondary spontaneous pneumothorax.¹ Common causes of secondary spontaneous pneumothorax are chronic obstructive lung disease (COPD), Bronchial asthma, tuberculosis, smoking, bronchiectasis, interstitial lung diseases, bullous lung diseases.^{2,3} BTS guidelines recommend insertion of intercostal tube in Secondary spontaneous pneumothorax in following conditions; bilateral pneumothorax, tension pneumothorax, breathless patient, large pneumothorax (>2cm) and failed needle aspiration in small pneumothorax.³ It is generally recom-

mended that pleurodesis should be done whenever ICD is inserted. Whereas in primary spontaneous pneumothorax it is indicated in symptomatic patients with failed needle aspiration of air.³

Rate of recurrence of pneumothorax in PSP is estimated to be 30% (16-52%).^{4,5} With such high chances of recurrence, which further increases with every future episode, it is a need to prevent recurrence of pneumothorax to reduce morbidity, mortality and health expenditure. For this purpose, pleurodesis is the established procedure where adhesion is achieved between visceral and parietal pleura by inducing inflammation.⁶ It can be done either surgically (mechanical abrasion of pleural space, apical bullectomy etc.)⁷ or chemically (introducing chemical into pleural space)⁸ although later is used commonly. Surgical intervention is better reserved for high risk and recurrent cases.⁹ Thoracoscopic pleurodesis in comparison with non-guided application of sclerosant through ICD, have high

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success rate, but limited by lack of facility at many centres and cost associated with it.¹⁰ Talc pleurodesis carries high risk of adult respiratory distress syndrome, lack of availability and high cost.¹¹ Povidone iodine is widely available, economical, safer alternative which is being commonly used recently.

There are relatively less studies in literature studying safety and efficacy of iodine pleurodesis in pneumothorax group of diseases compared to pleural effusion group. We are presenting this article to share our experience with povidone iodine pleurodesis at out centre which lacks thoracoscopy.

2. Materials and Methods

This study was a prospective type of observational study conducted at Shridevi Institute of Medical Sciences and Research Hospital over a period of two years. All consecutive patients who presented with pneumothorax and requiring ICD insertion were included in study. Those not giving consent for pleurodesis, HIV positive patients, persistent air leak and patients with poor general condition were excluded from study. After explaining the procedure and risks associated with it, a written informed consent was taken from each patient. 24 hours after confirming expansion of lung by chest X ray, patient was subjected to pleurodesis. Pleural anaesthesia was achieved with instillation of 15 ml Lignocaine solution diluted to 50 ml with normal saline and tube was kept blocked for 10 mins with change of positions. Followed by instillation of 20 ml povidone iodine solution diluted to 100 ml with saline. Again, tube was blocked for four hours with change of postures to alternating supine, prone and decubitus positions. After four hours, tube was unclamped and connected to underwater seal drainage system. Also, avoidance of anti-inflammatory drugs especially Non-Steroidal Anti Inflammatory Drugs (NSAID) and corticosteroids was done in the period of 24 hours prior and 48 hours after procedure. Lung expansion was confirmed with repeat chest X ray after 48 hours and ICD was removed. If pneumothorax is noted in repeat X ray, repeat pleurodesis was done after confirming lung re-expansion. Failure of second procedure was termed as pleurodesis failure. Immediate adverse events i.e., within 24 hours of procedure and late adverse events till discharge were recorded. Patients were monitored for 12 months post discharge from hospital for recurrence of pneumothorax and repeat pleurodesis was done after obtaining written informed patients consent. Data was collected and statistical analysis was done with MS Excel 2019.

3. Results

Out of 43 included patients with pneumothorax, five patients were excluded and remaining 38 patients were subjected to

pleurodesis. Demographic and basic clinical profile of study population are shown in Table 1.

Cause of pneumothorax was Primary spontaneous pneumothorax in five, COPD in 12, Tuberculosis (healed and active cases) in 14, Bronchiectasis (Non tubercular) in three, Bullous lung disease in two, lymphangioliomyomatosis (LAM) in one and interstitial lung disease in one. Mean duration to obtain lung expansion was 2.6 ± 4.25 days and mean duration of removal of ICD was 1.92 ± 1.5 days in patients with successful first attempt of pleurodesis.

Out of 38 patients, 27 (71.05%) patients had successful pleurodesis in first attempt, eight (21.08) had repeat procedure and three (7.89%) patient's procedure was failure. In the follow up period of one year two patients with COPD had recurrence of pneumothorax; one after 3 months and another after seven months. In patients with failed first attempt, Tuberculosis was most commonly noted in five patients followed by COPD in two and one with LAM. Failed pleurodesis was noted in two patients of tuberculosis and one with bronchiectasis.

Adverse events noted in patients after procedure are shown in Table 2. Pain was the most common event noted which ranged from 20 to 100 in visual analogue scale for pain with mean value of 52.37. Onset was pain noted after 2 hours of procedure and peak pain was experienced between 5 and 12 hours. Intravenous tramadol was used for analgesia. Serious life-threatening adverse event of Acute respiratory distress syndrome picture was noted in two, both cases required mechanical ventilation and were successfully extubated after two days. Whereas transient dyspnea with hypoxia was noted in 7 patients who required oxygen supplementation. All of the other adverse events were managed symptomatically.

Table 1: Demographic and clinical profile of study population

Mean age	58.6±12.5 years
Gender	
Male	29 (76.32%)
Female	9 (23.68%)
Smoking History	
Yes	22 (57.89%)
No	16(42.1%)
Symptoms	
Dyspnea	38 (100%)
Chest pain	15 (39.47%)
Cough	18 (47.37%)
Expectoration	9 (23.68%)
Fever	4 (10.53%)
Laterality of pneumothorax	
Right	24 (63.16%)
Left	14(36.84%)

Table 2: Adverse events noted after procedure

Pain	36 (94.73%)
Dyspnea	16 (42.10%)
Cough	12 (31.57%)
Expectoration of blackish sputum	4 (10.52%)
Fever	6 (15.78%)
Transient hypoxia	7 (18.42%)
Empyema	1 (2.63%)
ARDS	2 (5.26%)
Drainage of bloody fluid	13 (34.21%)
Reappearance of air leak	3 (7.89%)
Vomiting	5 (13.15%)

4. Discussion

Pneumothorax is relatively a common pathological condition defined by collection of air in pleural cavity.¹ Depending on size of pneumothorax and underlying lung reserve, symptoms may vary from asymptomatic to compromise in hemodynamic status.² Pneumothorax management is based on principles of evacuating air from pleural cavity, preventing further air leak and prevention of recurrence of pneumothorax.⁸ Drainage of air can be done by observation, needle aspiration and tube drainage.³ Air leak are mostly managed conservatively whereas multiple bronchoscopic and thoracoscopic techniques are evolving in cases of prolonged air leak.¹² Prevention of recurrence is achieved by achieving symphysis between two pleural surfaces, called as pleurodesis. In a randomised study by Chen et al., where pneumothoraces were managed by simple aspiration ICD (n=106, control) and drainage with minocycline pleurodesis (n=108) and later recurrences were compared.¹³ Within 12 months minocycline group recorded less incidence of recurrence (29.2%) compared to group with no pleurodesis (49.1%).¹³

Chemical pleurodesis is done by instillation of chemical agent into pleural space which induces inflammation and by virtue of healing, adhesion between two pleural surfaces is achieved. Chemical to be introduced can be instilled either via tube thoracostomy or through thoracoscopic guidance. Multiple agents are being tried for purpose of chemical pleurodesis; Talc, Bleomycin, Povidone iodine, Tetracycline, Minocycline, autologous blood patch, Silver nitrate, Corynebacterium parvum and Quinacrine.⁶ Talc was the most commonly used agent since long time with high success rate, but now it's being used less commonly in its natural form due to its issues with high incidence of ARDS and infections from lack of sterilisation measures.¹⁴ Now graded talc is being used which is applied through thoracoscopy with less incidence of ARDS, again its use in resource limit places is limited to its expensive nature and need of thoracoscopy suit.¹⁴

Mechanism of action of povidone iodine pleurodesis is not clearly established. Probable mechanism proposed

includes induction of inflammation on pleural surfaces by virtue of enhanced sclerosing properties of Iodine, low PH of sclerosing solution, oxidative and cytotoxic properties of Iodine. Also, Iodine is thought to have anti exudative property due to its nature of inducing chelation of proteins.¹⁵⁻¹⁷ Induction of pleurodesis by Talc by production of fibroblast growth factor production could also be applied to Iodine pleurodesis.¹⁸

Efficacy of pleurodesis by Povidone iodine has been published in various studies conducted on both pneumothorax and pleural effusion. In Our study among 38 patients, three had failed pleurodesis and two came with relapse pneumothorax within 12 months making success rate of 86.84% (33/38). In a review article R Aggarwal et al. reports the efficacy of povidone iodine pleurodesis between 70-100% quoted from various studies, with pooled success rate being 88.7%.¹⁹ Also, authors found no significant difference between pleurodesis done by instilling Iodine via ICD or thoracoscopy (322/361) and also whether pleurodesis done in pneumothorax or pleural effusion (131/138) (p=0.05).¹⁹

Most common side effect reported was chest pain of varying severity.¹⁹ Other minor possible adverse events of concern reported are hypotension,²⁰ thyrotoxicosis²¹ and allergic reactions. In our study we also noted a peculiar side effect complained by four patients i.e., expectorating blackish sputum after few minutes of procedure and the complaint lasted for six to 12 hours post procedure. Among four, two patients went for severe respiratory distress with coarse crepitations, bilateral alveolar infiltrates in X-ray requiring mechanical ventilation. Both patients were extubated and discharged successfully making mortality rate of the study zero. Above event is of a concern of sclerosant leak into lung parenchyma. Seven other patients had severe chest pain and coughing associated with hypoxia which lasted for 30 mins to 6 hours and resolved as pain reduced. Both these adverse events have not been reported elsewhere in literature. ARDS is a known complication of Talc pleurodesis which was seldom reported with iodine.²² ARDS in talc is believed due to multiple factors including release of inflammatory mediators like IL-8,²³ pulmonary and systemic absorption of talc (most likely in smaller particle of talc).²⁴ Bouchama demonstrated Talc particles in bronchial washings after talc pleurodesis,²⁵ which was also reported by Milanez et al.²⁶ Co-relating the same, we noticed four patients had blackish sputum which could be the leaked iodine. Many studies conducted have focussed on efficacy of the procedure which might have made to neglect this particular adverse event.

5. Conclusions

Povidone iodine pleurodesis done via intercostal tube is cost effective procedure with excellent success rate. Adverse effects are minimal but life threatening ARDS should be

foreseen, although it is a rare complication.

6. Source of Funding

None.

7. Conflicts of Interest

None declared.

8. Acknowledgment

Nil.

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