

Single Session Pleurodesis in Malignant Pleural Effusion

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Received September 09, 2020; Revised October 10, 2020; Accepted December 07, 2020

ABSTRACT

Chemical pleurodesis is frequently indicated to relieve symptoms imposed by large/recurrent malignant pleural effusion (MPE). Traditionally, a drain is left in the pleural space till the cessation of fluid accumulation before pleurodesis. Chest ultrasound can detect an amount of pleural fluid as less as 50 ml and can verify that pre-requisites of successful pleurodesis are fulfilled. This is important to accomplish the task in a single session after complete drainage of pleural fluid in cases with malignant pleural effusion. The technique demonstrated a high success rate (88.2%). The mean duration from the start of pleural drainage till pleurodesis was 1.65 ± 0.70 h ranging from 1 to 3 h. A duration of 2.5 h or less was statistically proposed as a cut off value not to exceed to predict success (sensitivity 100%, specificity 100%).

An ultrasound-guided completion of the process of pleurodesis in a single session with shorter duration of pleural fluid drainage and shorter hospital stay can be done on a day-care basis. It is efficient, safe, and cost-effective. This technique is strongly recommended to replace the traditional practice of keeping the indwelling pleural drain for several days waiting for the cessation of pleural fluid reaccumulating. An ultrasound-derived Absent Sliding Score can be used as early as day 1 and day 15 to confirm pleural adherence and to expect the outcome of pleurodesis.

Keywords: Pleurodesis, Malignant effusion, Chest ultrasound

INTRODUCTION

Malignant pleural effusion is a common complication of advanced stages of malignancies [1]. Large and/or recurrent effusion adds to morbidity, and prevention of reaccumulating through pleurodesis improves the quality of life of those patients.

Malignant pleural effusion can be managed in different ways, including clinical observation, thoracentesis, placement of an indwelling pleural catheter, and chemical pleurodesis. The optimal strategy depends on a variety of clinical factors [2]. The most important requirement for successful pleurodesis is the satisfactory apposition of the parietal and visceral pleurae [3]. Traditionally, the pleural drain is left in situ till a minimal pleural fluid of 50–100 ml is collected over 24 h before pleurodesis is started. This process usually takes several days, and this is confirmed with serial chest X-rays. Chest ultrasound is sensitive in detecting an amount of pleural fluid as less as 50 ml and can confirm apposition of the pleural surfaces [4]. This raises the idea of rapid pleurodesis technique, rapidly drain the pleural space as rapid as the patient tolerates, then pleurodesis and pigtail removal.

REVIEW

A collaborative effort from the American Thoracic Society, Society of Thoracic Surgeons, and Society of Thoracic Radiology made recommendations in favor of:

1. Using ultrasound to guide pleural interventions.
2. Not performing pleural interventions in asymptomatic patients with MPE.
3. Using either an indwelling pleural catheter (IPC) or chemical pleurodesis in symptomatic patients with MPE and suspected expandable lung [5].

Rapid pleurodesis technique did some from these latter recommendations. Pleural fluid complete drainage in 17 cases with malignant pleural effusion was done and

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Citation: Khalil MM & Ezzelregal HG. (2021) Single Session Pleurodesis in Malignant Pleural Effusion. *J Infect Dis Res*, 4(1): 186-189.

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confirmed by chest ultrasound. Pleural aspiration was done as much and as rapid as the patient tolerates to accomplish the task of successful rapid pleurodesis. An oral form of doxycycline was used as a sclerosant. Injection of 30 ml of 2% lidocaine into the pleural space through the pigtail followed by injection of doxycycline. An oral form of doxycycline was used, at a dose of 10 mg/kg body weight. The particles of doxycycline capsules were evacuated under complete aseptic technique in a container, then dissolved in 30 ml normal saline and instilled through the pigtail, followed by 20 ml of normal saline to clean the pigtail and to push all dissolved doxycycline to the pleural space. The pigtail was then clamped for two hours. The pleural cavity was reassessed by US with aspiration of any remaining fluid, and the pigtail was removed.

A previously known Pleural Adherence Score (PAS) on day one was recorded: Pleural Adherence Score was scored in nine zones (upper, middle, and lower zones in the anterior, lateral, and posterior chest wall) across the affected hemithorax in real-time ultrasonography as present (= 0), questionable (= 1), or absent (= 2), generating a total Pleural Adherence Score of 18 for the hemithorax [4]. Reassessment by ultrasound 15 days after pleurodesis: Recording of absence/presence of sliding sign in the 9 standard points as (A, B, C):

- A. absent sliding in more than 6 areas
- B. absent in 6 areas to more than 3 areas
- C. absent in 3 areas or less generating a newer simpler Absent Sliding Score (ASS) of 9 points for the hemithorax.

The rate of success of rapid pleurodesis technique was assessed two months after the procedure was 88.2%; complete success with no reaccumulating of pleural fluid in 76.5% (13 patients) of the cases, and a minimally encysted collection in 11.7% (2 patients) which was considered as a satisfactory success. In the technique of rapid pleurodesis, the success of pleurodesis was evaluated by three methods. The first was done on day one by calculating the previously described PAS. The second was two weeks after the procedure by ultrasonographic assessment of absent pleural sliding (ASS) aiming to simplify the previously mentioned PAS: A (absent sliding in more than 6 areas) was present in 52.6%, B (absent sliding in 4 to 6 areas) was present in 42.1%, and C (absent sliding in 3 or less areas) was present in 5.3% of cases. The last one was the traditional one with radiographic assessment for the ipsilateral reaccumulating of pleural fluid. This was done using chest ultrasonography two months after the procedure. In this work, a highly significant correlation was found between these grades of absent sliding (A, B) after 2 weeks and PAS (p value < 0.001). With the increase in PAS, there was an increase in the absent sliding grade. This is really expected as both are indicating pleural adhesions. So, this grade can be used to replace PAS as a more simplified score. Ultrasonographic evaluation of absent

sliding sign as an indicator of the success of pleurodesis has two advantages: firstly, earlier evaluation of the outcome and, secondly, direct confirmation of the effect of the instilled sclerosant, namely pleural adhesion. The validity of this method was reported in previous studies [6-9].

The rate of success in rapid pleurodesis technique was higher than that reported in other studies which used tetracycline as a sclerosant. The success rate was 61%, there was recurrence with loculation in 16% of the cases, and 23% of patients had unsuccessful and significant reaccumulating of pleural fluid [10].

The success in rapid pleurodesis technique was also different from Mourad et al. who used tetracycline pleurodesis with a success rate of 60% [11]. Others showed success rates of 76% [1] and 80% [12]. The latter was carried on a smaller number of patients, 10 patients, and provided no information about the duration of keeping the pleural drain in situ. The higher success rate in rapid pleurodesis technique was attributed to the technique of pleurodesis used which ascertained almost complete evacuation of the pleural space with good apposition of the pleural surfaces before the instillation of the sclerosant agent and the short duration of the procedure which would avoid mesothelial irritation occurring with the presence of the drain in the pleural space for a prolonged time. Activation of the pleural mesothelial cells by malignant cells, bacteria, and chemokines mediated activation results in increased capillary permeability and formation of pleural fluid [13].

Different and more recent debates about the indwelling pleural catheter either alone or with pleurodesis with many opinions and recommendations. Some stated that Indwelling pleural catheters are an established management option for malignant pleural effusion and have advantages over talc slurry pleurodesis. The optimal regimen of drainage after indwelling pleural catheter insertion is debated and ranges from aggressive (daily) drainage to drainage only when symptomatic [14]. Others demonstrated that, the outpatient administration of talc through an indwelling pleural catheter for the treatment of malignant pleural effusion resulted in a significantly higher chance of pleurodesis at 35 days than an indwelling catheter alone, with no deleterious effects [15].

Some authors defined the same as a promising strategy in MPE. Considering talc as the best sclerosing agent alone or in combination with indwelling pleural catheter [16]. These differences may be related to different patient characteristics, the underlying lung and pleural condition or the primary tumor.

The main issue and advantage of the single-session technique pleurodesis was to shorten the duration of pleural fluid aspiration and to remove the pigtail as rapidly as possible to avoid further mesothelial irritation especially by bacteria with prolonged pigtail insertion. No other from

these recent studies considered the impact of duration of pleural fluid drainage on pleurodesis outcome.

In single session pleurodesis, drainage of 2815 ± 881.55 ml of pleural fluid was done over a range of 1 to 3 hours (1.65 ± 0.70 hours) depending on the clinical state of each patient. There was no significant correlation between the outcome of pleurodesis and the amount of the pleural fluid drained, but there was a highly significant correlation with the duration of fluid drainage (p value 0.001). No previous data were found about how the duration of pleural fluid aspiration could affect the outcome of pleurodesis. In single session pleurodesis, a duration of 2.5 hours or less was statistically proposed as a cut off value not to exceed for successful pleurodesis with sensitivity of 100% and specificity of 100%.

Corcoran and colleagues innovated a Pleural Adherence Score (PAS) derived by chest ultrasound to facilitate the early prediction of long-term outcomes after chemical pleurodesis using talc pleurodesis in MPE. They found that there was a significant difference between the mean total Pleural Adherence Score at day one for patients with successful and failed pleurodesis 13.36 versus 6.75, respectively, with a p value of 0.0023. A total Pleural Adherence Score of 10 or more at day one (sensitivity 82%, specificity 91%) was used as the cut off for hypothetical pleurodesis success after chest tube removal [5]. In single session pleurodesis, a total Pleural Adherence Score of 11 or more after 24 hours from pleurodesis (sensitivity 93%, specificity 50%) was statistically proposed as a cut off value for pigtail removal and expected successful pleurodesis. PAS 10 or 11, both could be presented as An Absent Sliding Score.

An important positive outcome in single session pleurodesis, was the mean time of hospital stay related to the procedure which was 9.88 ± 3.12 hours. This time included the time needed for the preparation for, the performance of the procedure, and the time needed for the observation for complications/discomfort after the procedure. This shortened total hospital stay was due to the intended rapid complete pleural drainage and pleurodesis. This technique definitely offers a greatly cost-effective outcome compared to the traditional procedure.

Wide-scale implementation of the rapid pleurodesis technique on a larger number of patients and longer follow-up periods are recommended to validate the efficiency of this single-session pleurodesis.

CONCLUSION

An ultrasound-guided completion of the process of pleurodesis in a single session with shorter duration of pleural fluid drainage and shorter hospital stay can be done on a day-care basis. It is efficient, safe, and cost-effective. This technique is strongly recommended to replace the traditional practice of keeping the indwelling pleural drain

for several days waiting for the cessation of pleural fluid reaccumulating. An ultrasound-derived Absent Sliding Score can be used as early as day one and day 15 to confirm pleural adherence and to expect the outcome of pleurodesis.

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