

Autologous Blood Patch Pleurodesis Technique-How I do it?

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Abstract

Pleurodesis is intended to achieve a symphysis between parietal and visceral pleura, in order to prevent accumulation of either air or fluid in the pleural space. Many papers have emerged on the use of autologous blood pleurodesis for the treatment of recurrent pneumothorax and postoperative PAL following pneumonectomy. Pleurodesis with autologous blood is an easy-to-perform, painless, convenient, rapid and inexpensive but effective procedure without any need of analgesia or sedation during pleurodesis. In this paper we will try to describe in simple but detailed form the actual technique of autologous blood pleurodesis. The procedure of autologous blood pleurodesis can be carried out at bedside in the surgical ward under strict aseptic conditions using the patient's own blood taken from one his peripheral veins at the rate of 1 - 2 ml/kg body weight. Without mixing with heparin, the withdrawn blood is immediately instilled into the pleural cavity via the already placed chest tube. After the instillation of blood flush the tube with 5 - 10 ml of normal saline and keep the chest tube drain clamped (or raised above bed level) for about 30 - 60 minutes and ask the patient to lay in different position during this period. The chest tube is removed after 12 hours of cessation of air leak and confirmation of lung expansion by chest X-ray.

Keywords: Pleurodesis; Pneumothorax; Autologous Blood Patch; Chest Tube

Introduction

One of the treatment options for severe symptomatic or recurrent pneumothorax (Figure 1), post-operative persistent air leak (PAL) and recurrent pleural effusion is pleurodesis. Pleurodesis is intended to achieve symphysis between parietal and visceral pleura, in order to prevent accumulation of either air (pneumothorax) or fluid (pleural effusion) in the pleural space. Pleurodesis was done first by Spengler in early 19th century [1]. Depending upon the Type of inciting stimulus pleurodesis is of four types i.e. mechanical pleurodesis, chemical pleurodesis, immunological stimuli and laser pleurodesis [2]. A wide range of sclerosing agents has been used to achieve chemical pleurodesis. An ideal sclerosing agent [2] should be highly effective, safe, causing no or little pain/discomfort, inexpensive, widely available, easy to handle and administer, easy to sterilize with low indices of pleural infection, minimal and easily controlled morbidity and null mortality. However, none of the agents presently used meet all of these criteria and the search for such an agent is still on.

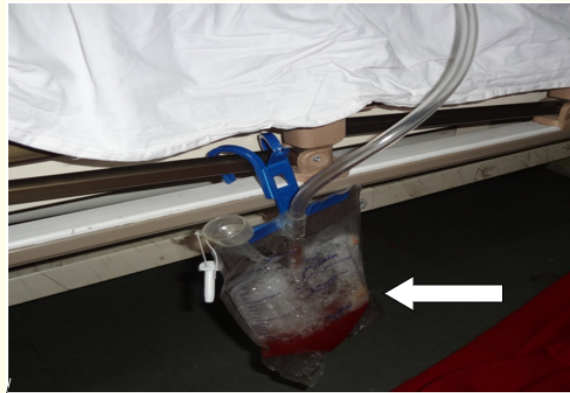


Figure 1: Persistent Air Leak in Pneumothorax.

Use of autologous blood patch pleurodesis has been first reported by Robinson et al (1987) for the treatment of PAL in patients with spontaneous pneumothorax with a success rate of 85% in a series of 25 patients [3]. Dumire R., *et al.* (1992) reported two cases in which patients with a prolonged air leak who were not candidates for thoracotomy had immediate successful treatment with an autologous “blood patch” pleurodesis [4]. Blanco Blanco I., *et al.* (1996) studied pleurodesis with the patient’s own blood; in 14 adult patients with spontaneous pneumothorax and reported that in 13 (92%) patients closure of the fistula was achieved with a recurrence rate of 28.5% (4 out of 14) over a mean follow up period of 16 months [5]. In our own study [2] of autologous blood pleurodesis versus bleomycin pleurodesis in primary spontaneous recurrent pneumothorax we concluded that when carried out under aseptic precautions, the pleurodesis with autologous blood is an easy-to-perform, painless, convenient, rapid and inexpensive procedure that is moderately effective in the short and medium term with no need of analgesia nor sedation during pleurodesis.

In last twenty years many papers [6-22] have emerged on the use of autologous blood pleurodesis for the treatment of recurrent pneumothorax and postoperative PAL following pneumonectomy. However, none of the papers have described the actual technique of autologous blood pleurodesis in detail. Since we have earlier published our study [2] of autologous blood pleurodesis versus bleomycin pleurodesis; so, in this paper we will try to describe in simple but detailed form the actual technique of autologous blood pleurodesis.

Technique

The procedure of autologous blood pleurodesis can be carried out at bedside in the surgical ward under strict aseptic conditions as described in following points:

- 1) Explain the disease process (recurrent pneumothorax and post-operative PAL) and the need for autologous blood patch pleurodesis and its advantages and potential complications to the patient. Proceed for the procedure only after a written consent from the patient or the legal guardian (in case of minor).
- 2) Arrange before-hand all the necessary things like normal saline, surgical gloves, povidone-iodine painting solution, sterile drapes, minor surgical set, 10 ml and 60 ml syringes with needles.
- 3) Single dose of broad spectrum antibiotic (like inj. ceftriaxone) is given to the patient about half an hour before the procedure.
- 4) Usually there is no need of anesthesia, sedation or any special analgesia.
- 5) Make the patient to lay supine on the bed with the chest tube drain on the side of the bed.
- 6) In order to decrease the incidence of iatrogenic pleural infections, take care of asepsis during the whole procedure and prepare the right or left arm near ante-cubital area with povidone-iodine and drape it with the sterile linen sheets (Figure 2 and 3). Also prepare the outer portion of the already placed ICTD (chest tube) with the same povidone-iodine solution (Figure 4).

- 7) With the help of 60 ml syringe fitted with smaller needle (of 5 ml syringe) take an adequate amount of peripheral venous blood (Figure 5) from the patient's arm (ante-cubital veins).
- 8) The amount of blood used is usually 1 - 2 ml/kg body weight (average 60 - 70 ml/patient).
- 9) Heparin should not be added to this autologous blood sample.
- 10) The already placed chest tube is temporarily clamped or raised above the bed level (Figure 4). This is done to avoid the spillage and wasting of part of autologous blood into the dependent chest tube bag.
- 11) Withdrawn blood should be immediately injected into the pleural cavity via the chest tube.
- 12) For injection of blood into the pleural cavity, now fix the syringe containing autologous blood with larger bore needle of 10 ml syringe.
- 13) With the needle mounted on this autologous blood containing syringe, pierce the chest tube near the chest wall obliquely at 30 - 45 degree angle. Oblique piercing of the chest tube is done in order to ascertain that injected blood sample flows in proper direction towards the pleural cavity and to avoid any probable chance of small drain leak as may be caused by perpendicular piercing of the drain.
- 14) Now inject this autologous blood through the chest tube into the patient's pleural cavity slowly but steadily over 2 - 3 minutes (Figure 6).
- 15) After completing the instillation of this autologous blood in the pleural cavity, flush chest tube with 5 - 10 ml of normal saline in order to avoid clogging of the chest tube drain.
- 16) Also, after the instillation of blood keep the chest tube drain clamped (or raised above bed level) for about 30 - 60 minutes (Figure 7). This is done to avoid the quick drainage of this instilled blood out of the pleural cavity into the under-water seal bag.
- 17) During this time of the tube clamping, the patient is placed in different positions (like supine, prone, right lateral, left lateral, head up and head down positions) to promote homogeneous distribution of blood into the pleural cavity.
- 18) At the same time the patient should be watched for any breathlessness or worsening of symptoms. In the situation of worsening breathlessness the tube should be de-clamped and put down the level of chest.
- 19) After about 30 - 60 minutes after the instillation of blood the chest tube drain is unclamped and placed back on water seal system.
- 20) The water-seal drainage is reviewed every 12hrly for the presence of an air leak.
- 21) The chest tube is removed after 12 hours of cessation of air leak and confirmation of lung expansion by chest X-ray.
- 22) The patients can be discharged the next day.



Figure 2: Povidone-iodine painting of patient's arm.



Figure 3: Patient's arm painted and draped.



Figure 4: Povidone-iodine painting and draping of chest tube.

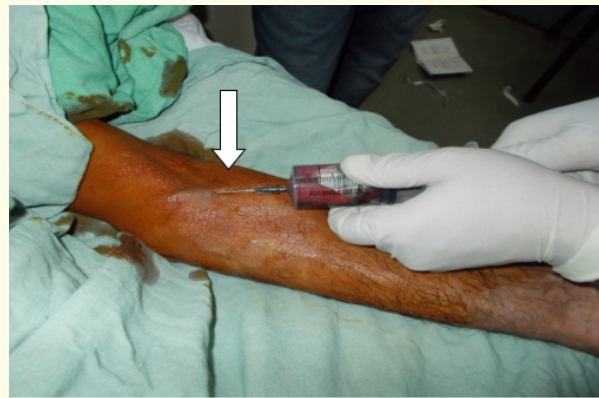


Figure 5: Autologous blood sample being withdrawn from patient's ante-cubital vein.



Figure 6: Autologous blood sample being injected into the patient's pleural cavity via the chest tube.

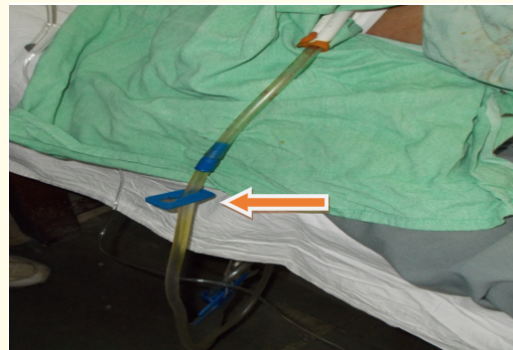


Figure 7: Temporary clamping of chest tube.

Troubleshooters of the procedure:

- 1) Proper explanation of the procedure will decrease the patient's anxiety and improve his cooperation during the procedure.
- 2) Heparin should not be added to this autologous blood sample as one of the mechanisms of stoppage of air leak is the immediate clotting of blood inside the pleural cavity and plugging of the air-leak site.
- 3) Withdrawn blood should be immediately injected into the pleural cavity via the chest tube to avoid clotting of blood in the syringe and the subsequent clogging of chest tube.
- 4) While injecting the autologous blood into the chest tube, keep the distal end of chest tube raised so that blood does not go towards the under-water seal chest tube bag.
- 5) Sometimes after piercing the chest tube drain the needle gets blocked. In that case the blocked needle on the syringe can be replaced immediately by a fresh one. But the repeat piercing should be again done along the previous needle prick tract in order to avoid the multiple needle punctures of the tube and also to prevent the repeated needle blockade.
- 6) Occasionally after the instillation of a part of autologous blood sample into the patient's pleural cavity, there occurs an accumulation of this injected blood in the chest tube drain. To help this accumulated blood to go into the pleural cavity ask the patient to take deep breaths and change the posture of the patient on the bed. Also do the milking of the chest tube towards the pleural cavity.

- 7) In rarest of rare situations there may be a theoretical need of replacing the clogged chest tube to decrease the breathlessness caused due to development of tension pneumothorax. So, a fresh chest tube should be kept available before the start of procedure.
- 8) The procedure should be done only when there is decrease in massive air leak as massive air leak will rapidly throw the instilled blood out of pleural cavity with resultant failure of pleurodesis.
- 9) After instillation of blood into the pleural cavity cover the needle prick site of the chest tube with plastic adhesive tape to avoid any drain leak (though extremely rare possibility)
- 10) In case of failure of cessation of air leak or recurrence of air leak after the autologous blood patch pleurodesis, the same procedure can be repeated or the patient could be given the option of pleurodesis with some other sclerosing agent or directly surgical correction of PAL.

Post-procedure monitoring

During and after the procedure patient should be monitored clinically keeping close watch on pulse, respiratory rate and oxygen saturation on pulse-oximeter. For this, the patient can be connected to a monitor (if available) during the procedure. Patient should be watched for development of post-procedure chest pain, breathlessness and fever. There should be regular assessment of the stoppage of air leak and the drainage contents. After stoppage of the air leak and before removal of chest tube, repeat an X-ray chest to ensure that the lung has expanded and there is no persistent pneumothorax.

Inclusion criteria

Patients of all age groups and both sexes who have radiologically confirmed primary or even the secondary type of significant and persistent or recurrent pneumothorax with lungs having the ability of re-expansion and give a valid consent for the procedure can undergo the procedure of autologous blood patch pleurodesis.

Exclusion criteria

Patients who did not consent for the procedure or patients having broncho-pleural fistula and trapped lung or with an active source of infection or with recent history of septicemia and patients on corticosteroids or immune-suppressants should be excluded.

Potential complications

Though there is no risk of anaphylaxis, severe chest pain and progressive respiratory failure as seen in bleomycin pleurodesis, the autologous blood patch pleurodesis may be associated with following complications:

- 1) Failure of cessation of air leak.
- 2) Recurrence of pneumothorax due to failure of pleurodesis.
- 3) Infection of pleural cavity and empyema formation (rare).
- 4) Tube clogging and tension pneumothorax (very rare).
- 5) Reactive pleural effusion (very rare).

Drawback

Main drawbacks of autologous blood pleurodesis are the lack of consensus on certain technical considerations, such as:

- 1) Optimum amount of blood to be instilled, i.e. whether 50 ml or 100 ml and whether 1 ml/kg or 2 ml/kg of body weight.
- 2) Number of instillations to perform i.e. whether single or multiple
- 3) And if multiple instillations are carried out, what should be the interval between them.

Conclusion

Pleurodesis with autologous blood is an easy-to-perform, painless, convenient, rapid and inexpensive but effective procedure without any need of analgesia or sedation during pleurodesis. The procedure of autologous blood pleurodesis can be carried out at bedside in the surgical ward under strict aseptic conditions using the patient's own blood at the rate of 1 - 2 ml/kg body weight. After the instillation of blood tube is flushed with normal saline, chest tube drain clamped for about 30 - 60 minutes and patient is asked to change body positions during this period.

Conflict of Interest

The authors declare that they have no conflict of interest.

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