

# Patching persistent pneumothorax in a neonate

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## Abstract

**Introduction:** Though autologous blood patch (ABP) pleurodesis is widely used in adults, its use in children is uncommon, with only one reported in a neonate thus far. Here, we report a late-preterm neonate with persistent air leak and concurrent *Aspergillus* infection, who was successfully treated with ABP, and we review the literature on pleurodesis.

**Case report:** A late-preterm baby girl born at 35 weeks of gestation was referred with respiratory distress since birth. She required intubation and high-frequency oscillatory ventilation (HFOV) as she did not respond to conventional ventilation. On day 2 of life (D2), she developed left pneumothorax and, on D3, right pneumothorax, requiring intercostal chest tube drains (ICDs). The child was extubated on D14, and the right ICD was removed on D18. However, the left pneumothorax persisted. Computerized tomography revealed right-sided consolidation and pneumatoceles, and persistent left pneumothorax. ABP was done on D23 and D25, with resolution of pneumothorax and removal of ICD on D27. Concurrently, pleural fluid cultures done on D16, D23 and D25 grew *Aspergillus terreus*, which was treated with voriconazole. The child is well at 3 months follow-up.

**Conclusion:** ABP for persistent pneumothorax is a safe, easy and inexpensive bedside procedure. Though its therapeutic role is well established in adults and older children, its use in neonates, especially in preemies, is less explored. The results are satisfactory, and it may be a feasible alternative to surgery when used in select neonates.

## Keywords

Pneumothorax, persistent, autologous, blood, neonate, surgery.

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## How to cite

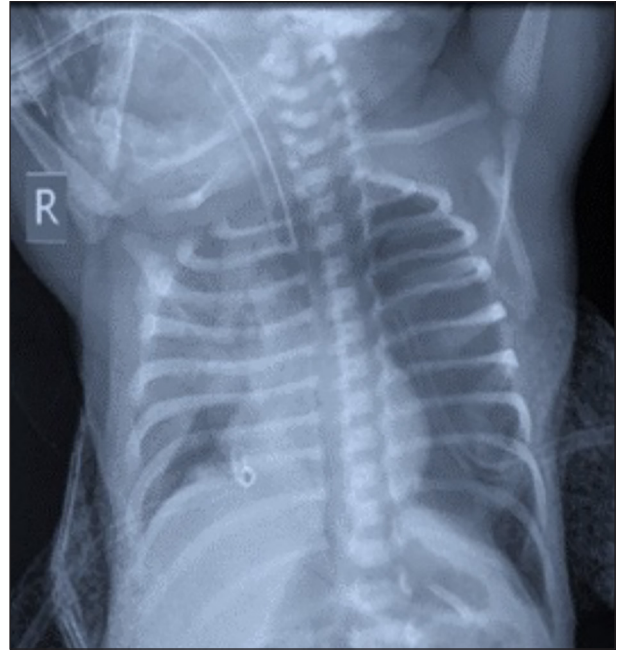
Bose S, Rao V, Nalina A, Shubha AM. Patching persistent pneumothorax in a neonate. *J Pediatr Neonat Individual Med.* 2023;12(2):e120214. doi: 10.7363/120214.

## Introduction

Pleurodesis is an established treatment for “persistent pneumothorax” (persistent air leak [PAL] for more than 5 days) [1, 2]. Autologous blood patch (ABP) pleurodesis has been widely used in the adult population, with limited studies in children and only one in a neonate reported so far. Here, we report a late-preterm neonate having persistent pneumothorax and concurrent *Aspergillus* infection who was successfully treated with ABP pleurodesis.

## Case report

A late-preterm baby girl born at 35 weeks of gestation by Caesarian section (indication: non-progression of labour) weighing 2.1 kg was referred to our Neonatal Intensive Care Unit for worsening respiratory distress on day 1 of life (D1). The baby had a respiratory distress syndrome (RDS) score of 7/10 at admission, required resuscitation, bag-mask ventilation, intubation and mechanical ventilation: initially synchronous intermittent mandatory ventilation (SIMV) and subsequently high-frequency oscillatory ventilation (HFOV). She received the appropriate dose of surfactant. On D2, she had an episode of desaturation with reduced air entry on the left side and a left pneumothorax, which improved with left intercostal chest drain (ICD) insertion. Right-sided pneumothorax was noted on D3, and a right ICD was placed (**Fig. 1**). The baby remained on HFOV till 7 days, following which she was gradually weaned to SIMV and extubated on D14. With improvement in ventilation, good lung expansion and nil ICD drainage, the right ICD was removed on D18. On the contrary, the left pneumothorax persisted in spite of treatment with antibiotics, ICD manipulation and reinsertion with ICD connected to an underwater seal. Following this, three-bottle continuous suction was tried for 2 days, but with no improvement. Chest X-ray (CXR) showed persistence and increase of left pneumothorax (**Fig. 2**), and contrast-enhanced computerized tomography (CECT) documented worsening of pneumothorax on the left side with right-sided consolidation and pneumatocèles. In



**Figure 1.** Bilateral pneumothorax with bilateral intercostal chest drains (ICDs) *in situ*.

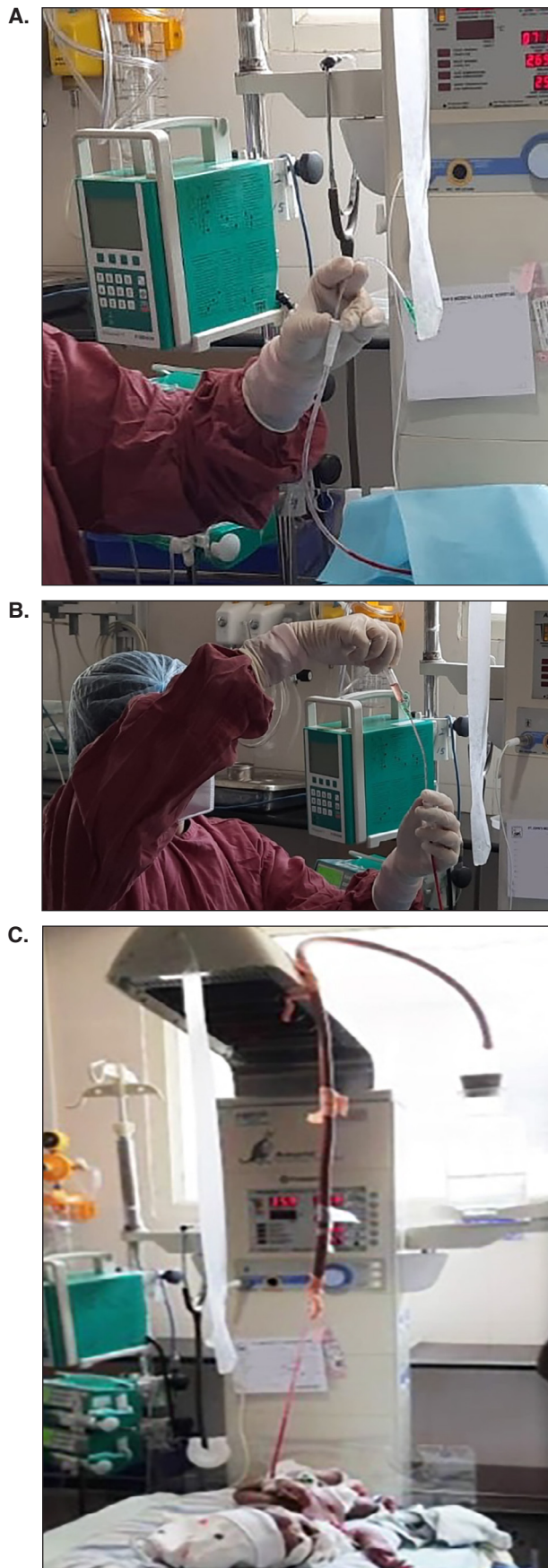


**Figure 2.** Persistent left pneumothorax.

view of the PAL, ABP pleurodesis was done. She received intravenous vancomycin and amikacin and the blood culture was sterile; however, serial pleural fluid cultures (done on D16, D23 and D25) revealed *Aspergillus terreus*, which was treated with voriconazole.

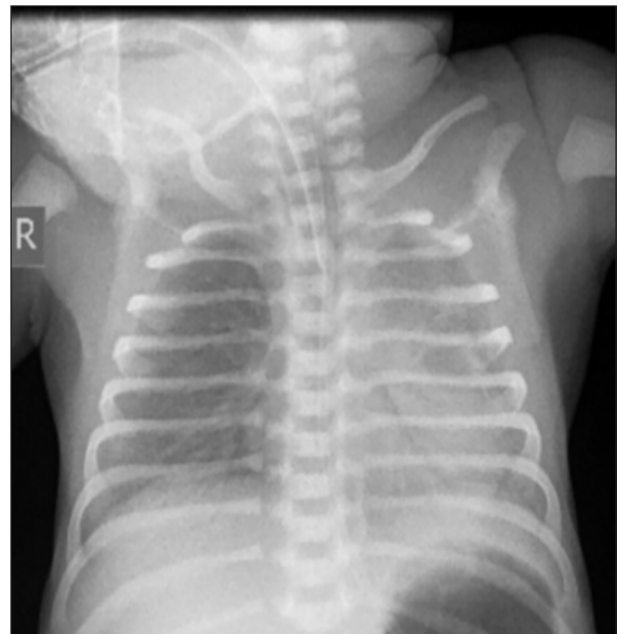
### *Autologous blood patch procedure*

A no. 6 infant feeding tube (IFT) was railroaded through the pre-existing left ICD (no. 12 suction catheter) (**Fig. 3A**). 2 ml/kg of freshly collected



**Figure 3.** A. Railroading of no. 6 infant feeding tube (IFT) through no. 12 suction catheter (intercostal chest drain [ICD]). B. Instillation of blood followed by saline into the IFT. C. Post-procedure ICD suspended 60 cm overhead.

venous blood was infused through the IFT and then flushed with 2 ml saline (**Fig. 3B**). The ICD was then suspended at a height of around 60 cm to prevent retrograde efflux of the instilled blood into the chest tube (**Fig. 3C**). It was re-connected to the underwater seal after half an hour. The procedure was done on D23 and D25. The ICD was removed on D27 after confirming the resolution of the left pneumothorax and complete expansion of the left lung (**Fig. 4**). Thereafter, the child had an uneventful recovery, and at 3 months of age she is well and thriving.



**Figure 4.** Post autologous blood patch (ABP) pleurodesis – resolution of left pneumothorax and good lung expansion.

## Discussion

Preterm neonates have a higher incidence of pneumothorax ranging from 3.8% to 9% [3], and a higher rate of recurrence of 28% as against 10% in term babies, with a mortality of 38.6% [4]. In our case, a late-preterm neonate developed bilateral pneumothorax on D2 and D3 as a result of a probable barotrauma, which responded to ICD placement. However, the left-sided air leak recurred and persisted in spite of ICD repositioning and changing to a bigger caliber tube, with only transient improvement. Pneumothorax remained even after the baby was weaned off mechanical ventilation. Chemical pleurodesis is a well-described treatment for PAL. The process introduces inflammatory substances

in the pleural space, such as talc, tetracycline, doxycycline, mitomycin, Adriamycin®, silver nitrate or bacterial components [5]. The neonatal PAL cases reported in the literature have been treated either with fibrin glue injection [6, 7], povidone-iodine [8], selective bronchial occlusion/intubation and high-frequency ventilation [9] or by surgery. Fibrin glue is a biological tissue adhesive acting as an effective sealant and topical hemostatic agent. Bradycardia, hypercalcemia, diaphragmatic paralysis, contralateral pneumothorax and local skin necrosis were the complications documented among the 8 neonates who underwent fibrin glue injection for PAL [7]. Povidone-iodine used for pleurodesis acts by chelation of proteins and enhanced sclerosis; its strong oxidative and cytotoxic properties induce a potent inflammatory response that helps to seal air leaks, but it carries a potential risk of hypothyroidism [8]. ABP pleurodesis was first performed by Robinson in adults (1987) for spontaneous pneumothorax, with a success rate of 59-100% [10]. Autologous blood causes a patch effect by direct sealing of the air leak with coagulated blood initially and subsequently by inflammation and scarring [11]. Fever, pleural effusion and empyema are the most frequently reported complications in adults following ABP pleurodesis [10]. Blood clots blocking the catheter can cause tension pneumothorax [12]. Hence, flushing the tube after the procedure with normal saline is recommended [10]. For the same reason, clamping of the chest tube is not advised after the procedure. Instead, it is suggested that the chest tube be suspended 60 cm overhead to prevent the drainage of blood via the tube while simultaneously allowing escape of air from the chest. The tube is then connected to an underwater seal after 4 hours. This was used by Huseynov, who reported the first case of neonatal persistent pneumothorax treated with an ABP [13]. ABP avoids the use of exogenous and potentially toxic chemical substances. Additionally, it is inexpensive, easy to perform, and well-tolerated in children [14].

## Conclusion

ABP pleurodesis in our neonate was a safe and effective bedside procedure, not requiring sedation, with no short-term adverse effects. Though its therapeutic role is well established in adults and older children, its use in neonates, especially in preemies, is less explored. Thus far, results are

satisfactory and it may be a feasible alternative to surgery when used in select neonates. However, more studies are required to form a consensus on the optimal timing of the procedure, number of sessions and clamping or suspension of the ICD post-procedure.

## Abbreviations

ABP: autologous blood patch  
 CECT: contrast-enhanced computerized tomography  
 CXR: chest X-ray  
 D: day of life  
 HFOV: high-frequency oscillatory ventilation  
 ICD: intercostal chest drain  
 IFT: infant feeding tube  
 PAL: persistent air leak  
 RDS: respiratory distress syndrome  
 SIMV: synchronous intermittent mandatory ventilation

## Institutional ethical clearance

Institutional ethical clearance: IEC 139/2022.

## Informed consent

Informed consent was obtained by the parents of the baby.

## Declaration of interest

The Authors declare that there is no conflict of interest. Funding: not funded.

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