CASE REPORT

Initial Experience with Autologous Blood Patch Pleurodesis for Persistent Air Leak in Children: Case Report

Bárbara Mota[1], Sofia Vasconcelos-Castro[2], Paulo Ribeiro Santos[3], João Maciel[4], Miguel Soares-Oliveira[2]

Port J Pediatr 2021;52:55-8
DOI: https://doi.org/10.25754/pjp.2021.20019

Abstract

Primary spontaneous pneumothorax is commonly encountered in hospital practice. Occasionally, despite adequate treatment, a pneumothorax may persist or recur. Should the leak persist over five days, it is defined as a persistent air leak, which is associated with increased morbidity. Most cases of persistent air leak are successfully managed with conservative methods. However, sometimes, more invasive procedures are required. The current guidelines for treatment are primarily surgical. However, for patients who have had a failure of surgical management, pleurodesis with a variety of substances is another option, including autologous blood patch. This procedure works through a patch effect in which coagulated blood seals the air leak. It is a simple, painless, inexpensive, and effective treatment, extensively studied in the adult population but infrequently used in the pediatric population. This case report documents a successfully treated clinical case of persistent air leak with autologous blood patch in one adolescent patient.

Keywords: Adolescent; Pleurodesis; Pneumothorax/complications; Pneumothorax/therapy; Treatment Outcome

Introduction

Pneumothorax can occur as a spontaneous process or secondary to an underlying condition, when alveolar air penetrates the pleural space, resulting in the equalization of air pressure, collapsing a part of the lung.[1]

The treatment of spontaneous primary pneumothorax is still under debate, but most agree that persistence or recurrence should be managed surgically, usually through minimally invasive thoracic surgery.[2,3]

Despite adequate surgical treatment, an air leak may still occur in up to 26% of cases and is defined as a persistent air leak if it persists for more than five days.[1] Persistent air leak is a condition that adds morbidity, complications, and increases the duration of hospital stays and the treatment costs. A prolonged hospital stay may also increase the risk of respiratory infections, empyema, and deep venous thrombosis.[2]

There are many therapeutic options available for treating persistent air leak. Conservative treatment with chest drains, for as long as necessary, is the standard. However, a surgical redo of the pleurodesis and/or pleurodesis with different chemical agents have been suggested.[3]

The autologous blood patch technique via chest drain, although rarely used in children, is a well-established procedure in adults, performed for more than 30 years.[4] It is based on the instillation of a fresh whole blood sample obtained from the patient and its injection via the pre-existing chest tube.[5] This technique helps to seal air leaks with blood components through a fibrinous and inflammatory response[1] and has proven to be a simple, inexpensive, efficacious, and safe method.

In children, there are limited reports of its use to treat post-surgical persistent air leak.[1] We present the first successful pediatric case of an autologous blood patch treated at our hospital.

Case Report

A 16-year-old male patient, with no relevant past medical history, non-smoker, presented to the emergency department with left-sided chest pain, dyspnea, and no fever. His oxygen status was 98% and he had no significant changes on chest auscultation. The chest

1. Pediatrics Department, Centro Materno-Infantil, Centro Hospitalar Universitário São João, Porto, Portugal
2. Department of Pediatric Surgery, Centro Hospitalar Universitário São João, Porto, Portugal
3. Pediatrics Department, Unidade de Vila Real, Centro Hospitalar de Trás-os-Montes e Alto Douro, Vila Real, Portugal
4. Centre of Cardiothoracic Surgery, Hospital de São João, Porto, Portugal
Corresponding Author
Bárbara Mota
https://orcid.org/0000-0002-9691-3511
barbaramota@hotmail.com
Alameda Professor Hernâni Monteiro, 4200-319 Porto, Portugal
Received: 06/05/2020 | Accepted: 11/10/2020 | Published: 03/01/2021

X-ray revealed a small volume pneumothorax on the left and chest computed tomography then described a small bleb on the apex of the left lung. The failure of the treatment with oxygen within the first 24 hours led to the insertion of a chest tube with the complete resolution of the pneumothorax in three days.

One month later, the adolescent returned with a recurrence of the left pneumothorax. He was then submitted to thoracoscopic atypical apical lung resection (removal of bullae) and apical pleural mechanical abrasion. The procedure itself had no complications but the hospital stay was complicated with persistent air leak (Fig. 1). A suction chest tube drain was inserted (-20 cm water). Although it was considered as functioning, there was no considerable drainage and the air leak persisted. At day 17 of the hospital stay, the patient underwent an autologous blood patch procedure with 50 mL of fresh blood being withdrawn from his own vein and administrated as a bolus through the chest tube with the patient in the Trendelenburg position, without complications. The adolescent was discharged three days later, after chest drain removal, with a complete left pulmonary expansion as seen in a chest X-ray (Fig. 2).

Discussion

Primary spontaneous pneumothorax is commonly encountered in hospital practice.[6]

The ongoing guidelines recommend management with chest tube drainage followed by surgical repair as the gold standard for treatment,[6] although new trials have suggested that the conservative management of primary spontaneous pneumothorax was not inferior to interventional management, with a lower risk of serious adverse events.[7] Elective surgery is commonly undertaken to reduce the risk of recurrent pneumothorax after a second episode or when initial medical management is ineffective.[6] Current indications for this invasive treatment are second (that is, recurrent) ipsilateral pneumothorax, bilateral pneumothorax, and professions at risk (*e.g.* pilots and divers).[6,8]

Although most cases of pneumothorax resolve with thoracostomy tube drainage, many continue days after the initial event. If an air leak lasts longer than five days, it is termed a persistent air leak.[6,8]

Persistent air leak remains an important complication following spontaneous pneumothorax, surgical lung resection, complicated lung infection or trauma,[4] and is associated with significant morbidity, a prolonged hospital stay, and increased health care costs.[5]

For patients who have had a failure of surgical management, pleurodesis with a variety of substances is another option, including talc, tetracycline, chemotherapeutic agents, and autologous blood patch.[1]

Previous research has described a decline in lung function following chemical pleurodesis in adults[9] and the long-term effects of the use of these substances in children are not well understood. Due to the low incidence of persistent air leak, there are currently no specific guidelines regarding persistent air leak in the pediatric population.[4]

Autologous blood patch pleurodesis has been studied extensively in adults and some authors even propose it as a possible gold standard for the treatment of persistent air leak.[9]

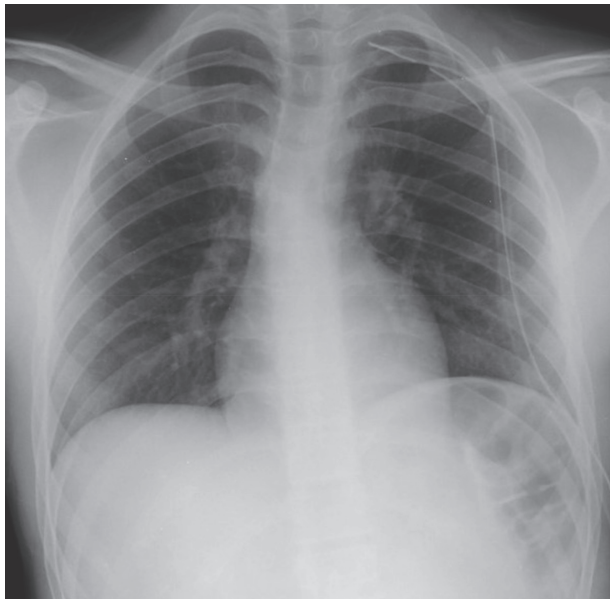

Figure 1. Chest X-ray with persistent air leak

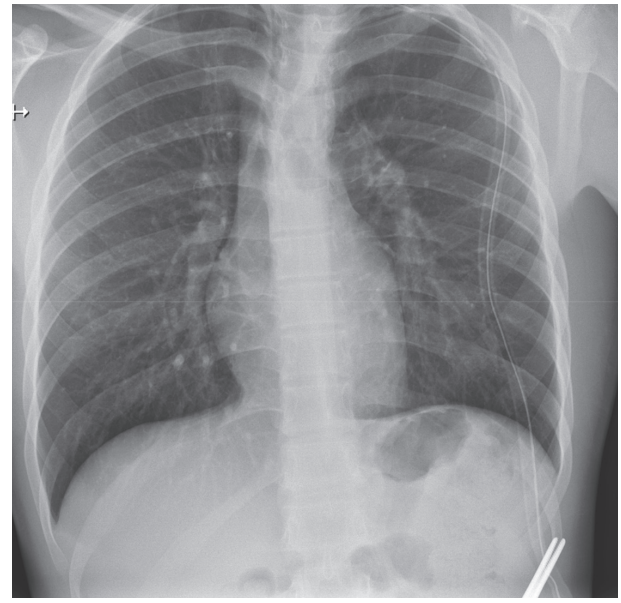

Figure 2. Chest X-ray with complete left pulmonary expansion

Autologous blood patch works through a patch effect where coagulated blood seals the air leak, and it is a simple, painless, inexpensive, and effective treatment for patients with persistent air leak.[4] The most common complications of autologous blood patch are fever, recurrent pneumothorax, and empyema. In fact, in adults, post procedural empyema has been a concern since blood in the pleural cavity may provide a nutrient rich environment for microbial growth but the general incidence remains low in the adult population (0%-0.9%).[5,8,9]

However, we did not observe any of the previously described complications in our patient.

Unlike other pleurodesis techniques, it does not require sedation or analgesia and can be repeated.

Few studies have shown that an autologous blood patch can be an effective treatment for persistent air leak in children.[5,9] It has been performed in our hospital in adults as an alternative to classical pleurodesis techniques and was successfully performed for the first time for a post-surgical persistent air leak in the pediatric population, showing that this procedure might be a valid, safe, and painless choice for children and adolescents as it has been in other parts of the globe.[5] One of the reasons why this technique might still be neglected, especially in the pediatric population, could be the lack of clinical reports and clinical studies published, showing the importance of these publications in order to extend this procedure.

WHAT THIS CASE REPORT ADDS

- Persistent air leak remains a difficult complication following spontaneous pneumothorax in the pediatric population.
- Persistent air leak is associated with significant morbidity, a prolonged hospital stay, and increased health care costs.
- With the gold standard still being surgical correction, alternative less invasive procedures have been developed, such as the autologous blood patch procedure.
- An autologous blood patch works through a patch effect where coagulated blood seals the air leak, and is a simple, painless, inexpensive, and effective treatment for patients with persistent air leak.
- Pediatric patients potentially stand to benefit from this approach as they avoid exposure to exogenous substances, and it should be investigated further to extend its use.

Conflicts of Interest

The authors declare that there were no conflicts of interest in conducting this work.

Funding Sources

There were no external funding sources for the realization of this paper.

Provenance and peer review

Not commissioned; externally peer reviewed

Consent for publication

Consent for publication was obtained.

Confidentiality of data

The authors declare that they have followed the protocols of their work centre on the publication of patient data.

References

1. Zhang HT, Xie YH, Gu X, Li WP, Zeng YM, Li SY, et al. Management of persistent air leaks using endobronchial autologous blood patch and spigot occlusion: A multicentre randomized controlled trial in China. Respiration 2019;97:436-43. doi: 10.1159/000495298.
2. Pathak V, Quinn C, Zhou C, Wadie G. Use of autologous blood patch for prolonged air leak in spontaneous pneumothoraces in the adolescent population. Lung India 2018;35:328-31. doi: 10.4103/lungindia.lungindia_462_17.
3. Cobanoglu U, Melek M, Edirne Y. Autologous blood pleurodesis: A good choice in patients with persistent air leak. Ann Thorac Med 2009;4:182-6.doi: 10.4103/1817-1737.56011.
4. Andrade FM, Pereira MR, Kilesse RL, Santos Farnetano BD. Autologous blood patch pleurodesis: An effective but underused method. Lung India 2018;35:341-2. doi: 10.4103/lungindia.lungindia_51_18.
5. Lillegard JB, Kennedy RD, Ishitani MB, Zarroug AE, Feltis B. Autologous blood patch for persistent air leak in children. J Pediatr Surg 2013;48:1862-6. doi: 10.1016/j.jpedsurg.2012.12.040.
6. Bintcliffe OJ, Hallifax RJ, Edey A, Feller-Kopman D, Lee YC, Marquette CH, et al. Spontaneous pneumothorax: Time to rethink management? Lancet Respir Med 2015;3:578-88. doi: 10.1016/S2213-2600(15)00220-9.
7. Brown SG, Ball EL, Perrin K, Asha SE, Braithwaite I, Egerton-Warburton D, et al. Conservative versus interventional treatment for spontaneous pneumothorax. N Engl J Med 2020;382:405-15. doi: 10.1056/NEJMoa1910775.
8. Dugan KC, Laxmanan B, Murgu S, Hogarth DK. Management of persistent air leaks. Chest 2017;152:417-23. doi: 10.1016/j.chest.2017.02.020.
9. Navarro Mingorance A, Pastor Vivero MD, León León MC, Reyes Domínguez SB, Fuster Soler JL. Pleurodesis con sangre autóloga: una solución, segura y eficaz para el tratamiento de neumotórax persistente. An Pediatr 2016;85:157-8. doi: 10.1016/j.anpede.2015.11.011.

Experiência Inicial em Crianças de Pleurodese de Sangue Autólogo no Tratamento de Fuga de Ar Persistente: Caso Clínico

Resumo

O diagnóstico de pneumotórax espontâneo primário é comum na prática clínica. Por vezes, apesar do tratamento adequado, o pneumotórax pode persistir ou recorrer. Se a fuga de ar persistir mais de cinco dias é designada por fuga de ar persistente, estando associada a maior morbilidade. A maioria dos casos de fuga de ar persistente é adequadamente tratada com métodos conservadores. No entanto, por vezes são necessários procedimentos mais invasivos. As recomendações atuais para tratamento são primariamente cirúrgicas. No entanto, após falência cirúrgica, a pleurodese com uma variedade de substâncias pode ser uma opção, incluindo o uso de sangue autólogo. Este procedimento atua através de um efeito de tampão, em que o sangue coagulado faz a selagem da fuga de ar. É um tratamento simples, económico e eficaz, bem documentado na população adulta mas raramente usado na população pediátrica. Este artigo documenta um caso clínico de fuga de ar persistente eficazmente tratada com a técnica de sangue autólogo num adolescente.

Palavras-Chave: Adolescente; Pleurodese; Pneumotórax/complicações; Pneumotórax/tratamento; Resultado do Tratamento