An effective method of pleurodesis involving absorbable mesh for repetitive catamenial pneumothorax

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Abstract

Catamenial pneumothorax (CPX) is an aetiologically very complex disease for which the treatments for pneumothorax and endometriosis are generally adapted. However, emphasizing secondary prevention, we developed a new method. This powerful new technique for prevention of pneumothorax during menstruation by surgical pleurodesis using absorbable mesh is presented. CPX is a relatively rare disease characterized by recurrent pneumothorax during menstruation. Although pathological diagnosis is desirable, CPX is clinically defined as recurrent pneumothorax synchronized with the menstrual cycle. Unfortunately, conventional therapy, including hormonal treatment and surgical procedures, seems to be associated with a high rate of recurrence; there is no well-established treatment for CPX. Recently, we developed a useful and effective operative method for spontaneous pneumothorax, with which one can remove the lesion site and sew a polyglactin mesh on the lung concurrently by endoscopic linear cutter under video-assisted thoracoscopic surgery, dressing the lung with polyglactin mesh to reinforce the stump and facilitating pleural adhesion for secondary prevention. We have used this method to resect pathological lung lesions and promote pleurodesis to prevent recurrence. In addition, polyglycolate felt was placed to cover the lesion site in the diaphragm in four cases of repetitive and treatment-resistant CPX as surgical pleurodesis, and successful results were obtained.

Keywords: Catamenial pneumothorax – Recurrence – Absorbable mesh – Pleurodesis

INTRODUCTION

Catamenial pneumothorax (CPX) is an aetiologically complicated and relatively rare disease. It is characterized by recurrent pneumothorax during menstruation with a high rate of recurrence when managed by various existing treatment approaches.

A new method for secondary prevention of CPX by surgical pleurodesis using absorbable mesh under video-assisted thoracoscopic surgery (VATS) is presented. Since this method is a palliative operation that involves an invasive procedure, patients must be carefully selected and, in the present study, had to fulfil the following criteria: frequent, recurrent, untreated cases (at least three episodes) or treatment-resistant cases.

MATERIALS AND METHODS

This method is performed under general anaesthetics with one-lung ventilation and a three-port approach under VATS.

When the pathological lesions, which are suspected endometrial implants, are seen on the lung, a small, 10 mm diameter foramen is made in the centre of the polyglactin mesh (VICRYL* MESH 15 × 15 cm, Ethicon Inc., Somerville, NJ, USA), and the lesion is threaded through the foramen. Then, the lung is resected at the overlapping site of the mesh and normal lung by an endoscopic linear cutter (Echelon 60, Ethicon Endo-Surgery, LLC., Guaynabo, Puerto Rico, USA), and the mesh is sewn onto the lung (Fig. 1A).

Suturing of the mesh onto the other portions of the lung is also performed. A 5 mm diameter hole is made in the mesh to minimize lung resection for suturing. In this way, the surface of the lung is widely covered by two sheets of polyglactin mesh. The positions of the hole in the mesh and on the suture site of the lung can be adjusted, depending on the location of the pathological lesion, to cover the surface of the lung as widely as possible.

If there are no apparent pathological lesions on the lung, the apex of segment 1 (S1) and the apex of segment 6 (S6) are the best parts of the lung to which the mesh should be sutured. To maximize coverage of the surface of the lateral side of the lung, a 5 mm diameter hole must be placed at the centre of the mesh when suturing is performed at the apex of S1, but the hole must be placed at the midpoint of the centre and the corner on the diagonal line when suturing at the apex of S6 (Fig. 1B).

Whether or not a diaphragmatic lesion site is present, the polyglycolate felt (NEOVEIL sheet type 100 × 100 × 0.15 mm, Gunze Ltd., Ayabe, Kyoto, Japan) is inserted to cover the diaphragm, since occult lesions are possible (Fig. 2). Multiple lesion sites were detected in all cases, and the lesion site was perfectly covered with the felt. Wide resection of the diaphragm, which is a high-risk procedure that would also severely decrease respiratory function, must be avoided.


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Finally, the stability of the mesh was confirmed by ventilation of the lung on the affected side.

DISCUSSION

Currently, four major hypotheses regarding CPX are described in the literature. The first mechanism involves a congenital diaphragmatic cribriform change [1]. The second mechanism involves multiple diaphragmatic penetrations caused by migration of endometrial tissue through retrograde flow from the uterus via the peritoneal cavity [2]. During menstruation, the cervical plug dissipates, and air can flow into the abdominal cavity transvaginally and through diaphragmatic pores, causing pneumothorax. The third mechanism involves transvenous metastasis of endometrial tissue to the lung parenchyma, causing regional defects on the pleural surface and giving rise to air leaks [3]. The fourth mechanism involves secretion of prostaglandin F2 during menstruation, which causes tetanic contraction of bronchioles and vasculature, leading to damage of alveolar tissue and resulting in air leaks [4]. Nevertheless, the pathogenic mechanism is likely very complex, and there is no simple explanation [5].

According to the above description, manipulation of both the visceral pleura and the diaphragm is needed to increase the likelihood of preventing recurrent pneumothorax [6]. We used polyglactin mesh to cover the lung to induce rigid fibrotic adhesions with the inside of the thoracic wall [7], because the mesh is not very sticky and is easy to spread on the lung surface. On the other hand, we put polyglycolate felt on the lesion site of the diaphragm and covered it to coat the diaphragm and promote adhesions to the basal lung.

However, when no abnormalities are observed on the diaphragmatic surface, this procedure should nevertheless be performed because occult lesions are possible and interruption of the transdiaphragmatic pathway may provide a good result [8].

This material was chosen because, once it sticks to the diaphragm properly, it is hard for it to slide aside and suturing is unnecessary.

This method was used in four treatment-resistant CPX cases, and successful results were achieved.

It has been 5 years since the last operation, and none of the four patients has shown recurrence or side effects, and they continue to be free from hormonal treatment. All postoperative respiratory function results were within normal limits. There were no decreases in respiratory function compared with the preoperative examinations in all patients.

The advantage of this method is that it is a less-invasive and more certain technique than conventional pleural decortication or ablation, and there are no side effects associated with hormonal treatment.

However, there are still some problems with this method. The cost of three meshes is high, and pleurodesis may become an obstacle to thoracotomy if the patient develops a thoracic disease requiring a later surgical procedure. Still, if appropriately

Figure 1: (A) Initially, a 10 mm diameter foramen is made in the centre of the polyglactin mesh. The prepared mesh is folded concertina-style and inserted intrathoracically and spread. The lesion site is threaded through the foramen, resection of the peripheral lung is performed, and the mesh is sutured on the residual lung by endoscopic linear cutter. (B) A 5 mm diameter foramen is placed at the midpoint of the centre and the corner on the diagonal line of the mesh for S6 suturing to cover the lateral side of the lower lobe efficiently.

Figure 2: Regardless of the existence of a diaphragmatic lesion site, polyglycolate felt is inserted to cover the diaphragm. To avoid the loss of respiratory function, resection of the diaphragm is not performed.
done, we believe that this method will prove to be effective and valid for the treatment of recurrent CPX.

Conflict of interest: none declared.

REFERENCES