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## Application of MatrixRIB in the operation of secondary thoracic deformity caused by empyema

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### Abstract

Empyema is an ancient and serious thoracic infectious disease. In the early years, this disease was more common. With the wide application of highly effective antibiotics, this disease has been very rare. However, in some remote areas, the disease is still common. Empyema is a kind of intrathoracic lesion, but it can affect the chest wall, leading to secondary depression and scoliosis. In the past, the treatment of empyema was mainly to remove the lesions in the chest, and no one dealt with the chest wall deformity. This is an obvious defect of previous operations. Considering the harm of chest wall deformity, we think it is necessary to correct the deformity. After the removal of intrathoracic lesions, we used MatrixRIB to reconstruct the chest wall, and achieved satisfactory results. This paper introduces the operation of a 24-year-old male patient with empyema complicated with secondary thoracic deformity and scoliosis.

**Keywords:** Empyema, secondary thoracic deformity, operation, MatrixRIB, scoliosis

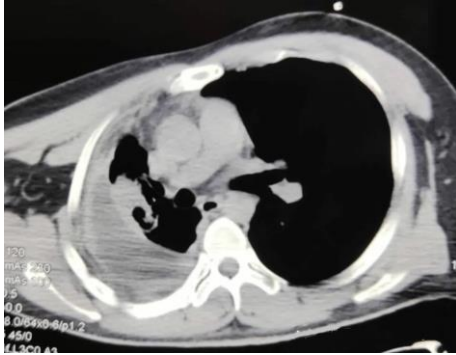
### Introduction

MatrixRIB is a material developed for rib fracture fixation<sup>[1]</sup>. During clinical use, we find that it can be widely used for reconstruction of chest wall, which will facilitate the implementation of some chest wall operations<sup>[1-5]</sup>. Empyema is a serious disease in thoracic surgery, which can lead to secondary chest wall depression<sup>[6]</sup>. Until now, the operation for empyema is only the removal of the lesions in the thoracic cavity, but no one dealt with the thoracic deformity<sup>[6-8]</sup>. Obviously, the residual thoracic deformity will continue to bring suffering to patients, which is a problem that cannot be solved by previous operations. Our department is an independent chest wall surgery department, and our main work is to complete various chest wall operations<sup>[9-11]</sup>. The operation of chest wall deformity is one of the main contents of our work. In addition to completing various primary deformities operations, secondary deformity operations are also our main work. Empyema is a disease we often encounter. In order to obtain ideal surgical effect, we treated the intrathoracic lesions and chest wall deformity simultaneously. When the deformity was corrected, we used MatrixRIB to reconstruct the chest wall and achieved satisfactory results. In this article, we introduce the operation of a 24-year-old male patient who have both empyema and secondary thoracic deformity.

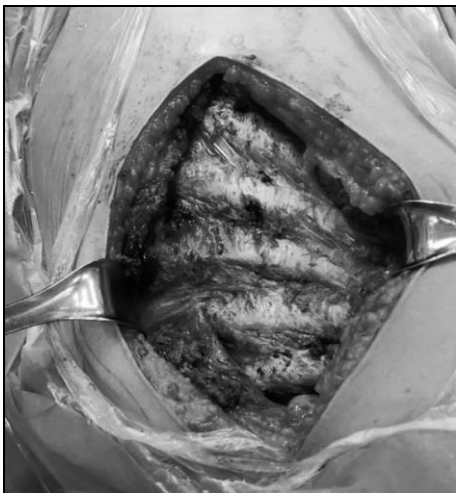
### Case Report

The patient was a 24-year-old male. At the age of 9, he suffered from tuberculous pleurisy. He received conservative treatment, but the effect was not good, and gradually became empyema. His right chest wall depression with scoliosis began at the age of 16. Without effective treatment, the lesion gradually worsened. One year before admission, the patient had obvious dyspnea, so he was admitted to our hospital for surgical treatment. The preoperative physical examination showed that the chest wall was asymmetric, the right side was sunken, and the spine was scoliosis. The auscultation showed that the right respiratory sound was low. Imaging examination showed that the chest was asymmetric, with right chest wall depression and right empyema (Fig 1). The patient was diagnosed as empyema with secondary thoracic deformity and scoliosis before operation, and his operation was performed under general anesthesia. Left lateral decubitus position was adopted, and a longitudinal axillary incision was used. The soft tissues and muscles of the chest wall were dissected to expose the ribs (Fig 2).

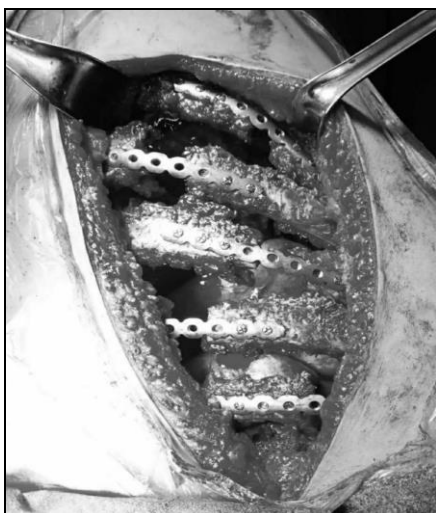
The ribs were cut crosswise to completely remove the lesions in the chest cavity, and then the MatrixRIB was placed between the broken ends of the ribs for chest wall reconstruction, extending each rib to eliminate the chest wall depression (Fig 3). After the chest cavity and the surgical field were cleaned thoroughly, drainage tubes were placed, the incision was closed, and the operation was completed. Both sides of chest wall were basically symmetrical after operation, and the deformity was corrected. The operation was smooth without complications, and he was discharged 7 days after operation.



**Fig 1:** Chest CT images. The right chest wall is depressed, with obvious lesions in the thoracic cavity



**Fig 2:** Surgical pictures. The diseased rib is exposed



**Fig 3:** Surgical pictures. The chest wall was reconstructed with MatrixRIB

## Discussion

Empyema is an ancient and serious infectious disease in the thoracic cavity [6-8, 12, 13]. Since antibiotic effect was not good in early years, empyema was common. With the emergence of a large number of highly effective antibiotics, this disease has been rarely seen. However, many such cases can still be seen in some remote areas. Early empyema can be acute, if not treated in time, it may become chronic and a series of complications may occur. Secondary thoracic depression is one of the most serious complications, which can not only increase the abnormality of lung function, but also lead to more serious complications such as scoliosis [6]. Therefore, it is necessary to treat this deformity. However, in previous empyema operations, the focus of treatment was often only the lesions in the chest, and the deformity of the chest wall was not treated [6-8]. This is undoubtedly a serious defect. Theoretically, actively correcting this secondary deformity will be beneficial to the postoperative rehabilitation of patients. Under the guidance of this theory, we routinely performed corrective surgery on the secondary chest wall deformity of such patients.

Chest wall deformity secondary to empyema is a large area of depression. Because there are many ribs involved, the use of ordinary minimally invasive surgery for depressed deformity cannot obtain satisfactory results [14-18]. Therefore, open surgery must be carried out and the chest wall must be reconstructed comprehensively. The reason of chest wall depression mainly comes from shortening of ribs, so the reasonable reconstruction method is to lengthen the shortened ribs. In order to complete this operation, proper materials must be available.

MatrixRIB is a special material designed for rib fracture [1]. Since the shape of this material is the same as the physiological shape of the rib, and its physical properties can meet the needs of fixation, it is also reasonable to meet the needs of chest wall reconstruction [1-5]. During the operation, we cut off the shortened rib in a crosswise way at first, stretch the two broken ends apart, and then fix them with MatrixRIB. In this way, a plurality of ribs can be extended simultaneously, thereby obtaining a satisfactory reconstruction effect.

Considering that empyema is an infectious lesion, one of the concerns of using MatrixRIB is to affect the healing of incision after surgery. Our experience is that as long as the surgical field and thoracic cavity are thoroughly cleaned and proper drainage is placed, such complications will not generally occur.

## Conclusion

In summary, it is a reasonable choice to implement simultaneous correction for secondary thoracic deformity caused by empyema. Because MatrixRIB has many advantages, it is an ideal material for reconstruction of the chest wall.

## Conflict of Interest

Not available

## Financial Support

Not available

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