



E-ISSN: 2616-3470

P-ISSN: 2616-3462

© Surgery Science

www.surgeryscience.com

2022; 6(3): 15-18

Received: 16-04-2022

Accepted: 23-05-2022

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Surgical treatment of pectus excavatum after cardiac surgery: Wung procedure + Wang procedure + Wenlin procedure

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DOI: <https://doi.org/10.33545/surgery.2022.v6.i3a.910>

Abstract

We performed surgery on a patient with pectus excavatum after cardiac surgery recently. The patient was a 11-year-old boy. At the age of 3, he underwent surgery for congenital heart disease. The median sternotomy was employed. The heart surgery was successful, but there was a depression in the anterior chest wall after the operation, which was diagnosed as secondary pectus excavatum. The patient had no discomfort after operation, but was not satisfied with the chest wall appearance. He was admitted to our hospital for surgery. During the operation, three kinds of procedures were used for correction, including Wung procedure, Wang procedure and Wenlin procedure. Three steel bars were used during the operation, and satisfactory results were obtained. Our experience shows that for patients with pectus excavatum after cardiac surgery, Nuss procedure is not only high-risk, but also difficult to achieve success. However, if other procedures are used for correction, satisfactory results can often be obtained.

Keywords: Pectus excavatum, cardiac surgery, Wung procedure, Wang procedure, Wenlin procedure

Introduction

Depression of anterior chest wall often occurs after cardiac surgery, leading to secondary pectus excavatum. Such patients often have severe adhesion behind the sternum. If Nuss procedure is used for correction, due to the existence of adhesion, the operation will be very dangerous and may damage the heart [1]. Therefore, Nuss procedure is not an ideal choice. For this kind of deformity, flexible surgical methods are needed to eliminate the surgical risk and obtain satisfactory results. Here we report the treatment of a case of pectus excavatum after cardiac surgery. During the operation, we used several procedures for correction, and achieved satisfactory results.

Case Report

The patient is an 11-year-old boy. At the age of 3, he received surgery in a local hospital because of congenital heart disease. The median sternotomy was used in the operation, and the operation was successful. His heart disease was thoroughly treated. However, his anterior chest wall showed obvious depression after operation. With the increase of age, the depression was gradually obvious. The patient had no symptoms, but was not satisfied with the chest wall appearance. In order to treat the deformity, the patient was admitted to our hospital for surgical treatment. Preoperative physical examination showed that the anterior chest wall was depressed, and the deepest depression was located in the right chest wall. Several surgical scars could be seen on the anterior and right lateral chest wall [Fig 1]. Imaging examination showed that the anterior chest wall was depressed, and the depressed side was right. The heart is obviously compressed and moves to the left [Fig 2, 3]. The patient was diagnosed as secondary pectus excavatum before operation.

The operation was performed under general anesthesia. The patient was in the supine position. An incision at the median scar of the anterior chest wall was made, which was located near the xiphoid process. The chest wall tissues were dissected along the surface of sternum and costal cartilages. After pulling the tissues outside, the costal cartilages at the bottom of the depression were exposed.

Steel wire guiding lines were placed across the costal cartilages. The adhesions behind the lower sternum was separated from the incision near the xiphoid process. Two incisions on both sides of the chest wall were made to expose the ribs at the most convex part of the depression edge. Steel wire guiding lines were placed across the ribs. The steel bar guiding tube was placed through the chest wall incision on both sides and the dorsal side of the lower sternum with the bar guider, and then an arc-shaped steel bar was placed beneath the lower sternum depression. After turning over the steel bar, the lower part of the depression was supported. A tunnel was made through the lateral chest wall incision to the upper part of the depression, which was located between the chest wall muscles and the bone structures. The second steel bar was placed in the tunnel and the upper part of the depression. Two steel wires were placed by the steel wire guiding lines placed at the bottom of the depression. The chest wall structures of the depression was pulled by the steel wires and fixed on the steel bar to eliminate the depression. After the above operation, the depression of the anterior chest wall basically disappeared, but the lower middle of the anterior chest wall was slightly convex due to the support of the first steel bar, and the ribs beneath both sides of this steel bar were slightly depressed. Another tunnel was made on the plane where the convex existed. The third steel bar was placed to press the central convex at first, and then lift and fix the depressions on both sides of the chest wall [Fig 4, 5]. Drainage tubes were placed in the median surgical field and bilateral thorax respectively, the incisions were closed, and the operation was completed. The operation was smooth without complications, and the postoperative recovery was satisfactory. The thoracic deformity completely disappeared, and Imaging examination showed that the position of the steel bars was normal [Fig 6]. He was discharged 5 days after operation.

Discussion

Secondary pectus excavatum after cardiac surgery is a common complication. From the point of appearance, this deformity is not clearly different from the general primary pectus excavatum, but the operation is very challenging. Due to the serious adhesion between sternum and heart, if the general Nuss procedure is used for correction, the operation will be very dangerous and difficult. Therefore, Nuss procedure is not an ideal choice [1].

In the past work, we tried to use Wang procedure for the treatment of this deformity. Because the operation of this deformity is mainly located outside the bony structures, there is no need to separate the posterior sternal adhesion, which can successfully resolve the operation risk and reduce the difficulty [2, 3].

Our patient is a typical secondary pectus excavatum after cardiac surgery, so Wang procedure is suitable choice. Due to the large area of the depression, at least two steel bars are needed to complete the correction of the depression. However, considering the scar in the middle of the anterior chest wall, if the two bars are placed on the surface of the bone structures, they will possibly affect the healing of the incision after operation. Therefore, we only use one bar to perform Wang procedure. The target position of correction is the upper half of the depression. For the lower half of the depression, because a certain range of adhesion behind the sternum can be dissociated through incision near the xiphoid process, we use Wung procedure to complete the correction of the lower half of the depression [4]. After the correction of depression with two bars, we completed the correction of secondary convex and depressions with the third bar. At this time, Wenlin procedure was used [5, 6]. After three procedures with three steel bars were completed, the deformity of the anterior chest wall completely disappeared and the appearance returned to normal.



Fig 1: The appearance of chest wall before operation. Obvious depression and scars can be seen on the anterior chest wall.



Fig 2: Preoperative CT scanning images. A. The heart is compressed by the depression of the anterior chest wall, leaning to the left; B. The lowest part of the anterior chest wall depression is located in the right chest wall; C. The anterior chest wall is obviously sunken, and the heart is severely compressed.

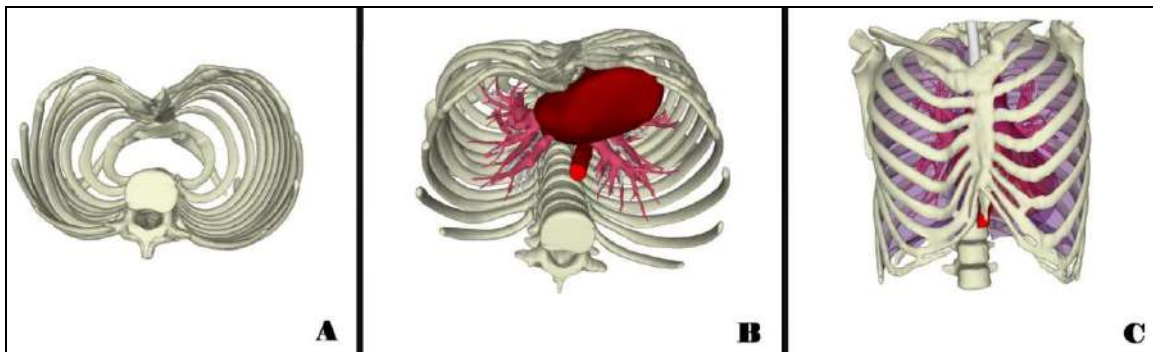


Fig 3: Preoperative three-dimensional reconstruction image. A. The anterior chest wall is obviously sunken; B. Obvious compression on the heart; C. Asymmetric depression of anterior chest wall.

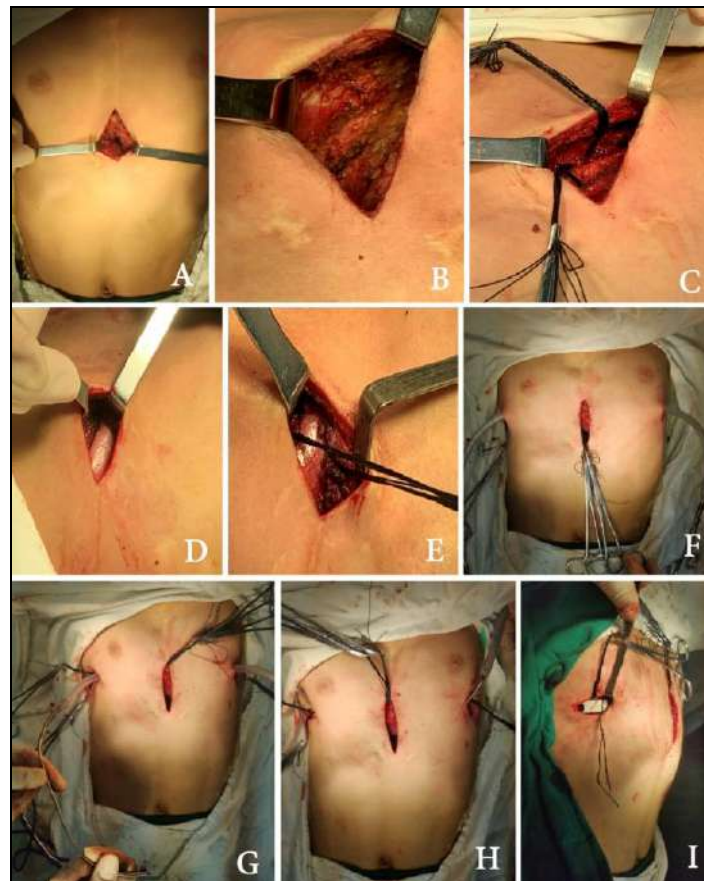


Fig 4: Operation pictures. A. The skin incision is completed at the median scar; B. The costal cartilage S at the bottom of the depression is exposed; C. The steel wire guiding lines are placed around the costal cartilages; D. The lateral chest wall incision was completed to expose the rib at the highest edge of the depression; E. The steel wire guiding line is placed around the rib; F. The steel bar guiding tube is placed into the chest; G. The steel bar guiding tube is connected with the steel bar; H. The steel bar is put into the chest; I. The steel bar is overturned to support the lower half of the depression, and Wung procedure is completed.

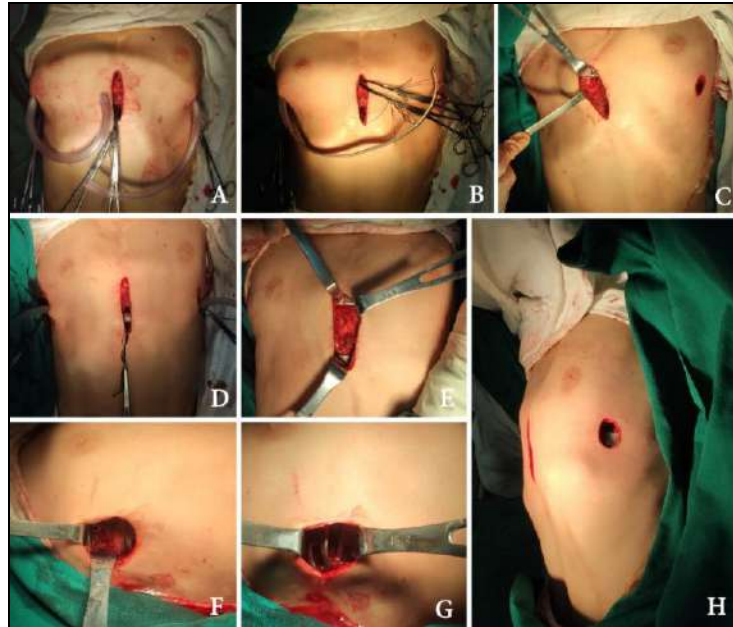


Fig 5: Operation pictures. A, The second steel bar guiding tube is placed; B, The second steel bar is connected; C, Wang procedure is completed; D, The third steel bar guiding tube is placed; E, After Wenlin procedure is completed, two steel bars on the surface of bone structures were exposed; F, G, the ends of three steel bars in the lateral chest wall incision; H, The appearance of chest wall after three procedures.

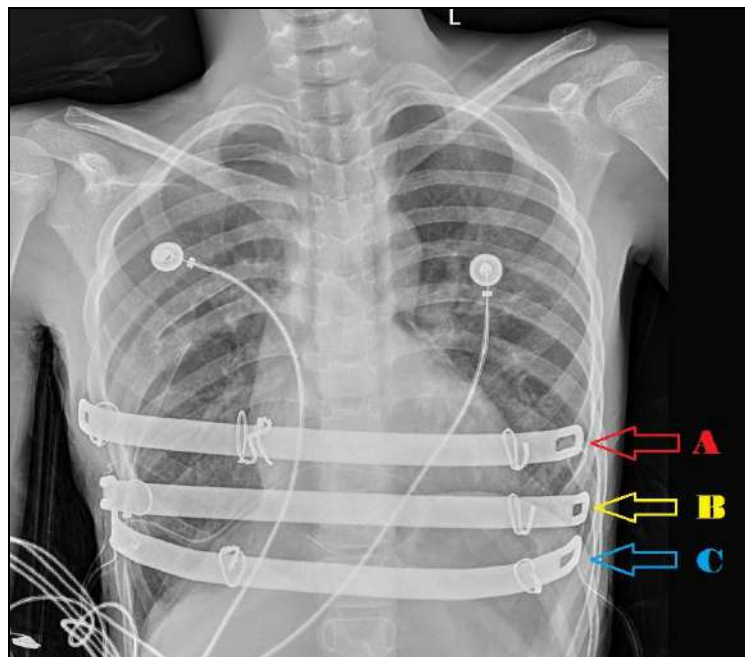


Fig 6: Postoperative X-ray examination. A, Wang procedure steel bar; B, Wung procedure steel bar; C, Wenlin procedure steel bar.

Conclusion

Our experience shows that Nuss procedure is not suitable for pectus excavatum after cardiac surgery. The preferred method should be Wang procedure. On this basis, if other procedures can be combined with Wang procedure, satisfactory results will be obtained. Such operation is not only safe, but also simple and easy, so it is the most ideal choice.

Reference

1. Nuss D, Obermeyer RJ, Kelly RE. Pectus excavatum from a pediatric surgeon's perspective. *Ann Cardiothorac Surg.* 2016;5:493-500.
2. Wang W, Chen C, Long W, Li X, Wang W. Wang procedure for treatment of pectus excavatum. *SL Clin Exp Cardiol.* 2018;2:113.
3. Wang W, Chen C, Long W, Li X, Wang W. Wang

- procedure: novel minimally invasive procedure for pectus excavatum children with low age. *Case Reports and Images in Surgery.* 2018;1:1-2. DOI:10.15761/CRIS.1000104
4. Wang W, Long W, Liu Y, Bin C, Juan L. Wung procedure: a minimally invasive operation for pectus excavatum. *International Journal of Case Reports in Surgery.* (Received)
5. Wang W. Minimally invasive surgical technique for barrel chest. *Surg Case Rep.* 2018;1:1-2. Doi: 10.31487/j.SCR.2018.02.005
6. Wang W, Long W, Liu Y, Bin C, Juan L. Wenlin procedure: a novel surgical technique for pectus carinatum. *International Journal of Case Reports in Surgery.* 2022;4:10-12.