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Modified wang procedure after the failed nuss procedure

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Abstract

Nuss procedure is the most commonly used surgery for pectus excavatum. However, this kind of procedure can not achieve good results sometimes. Once the operation fails, it will bring great trouble to the patient. Because of the adhesion in the mediastinum, Nuss procedure will be very risky and difficult in the reoperation. Wang procedure is a new operation designed for depression deformities. Since the operation is mainly focused on the bone structures, it can significantly reduce the risk and difficulty of the reoperation, and it is the first choice for this type of operation. This paper reports the operation of a 7-year-old pectus excavatum patient. The child underwent Nuss procedure at the age of five. The operation was unsuccessful. We used the modified Wang procedure to perform another operation and achieved satisfactory results.

Keywords: Wang procedure, pectus excavatum, nuss procedure, reoperation

Introduction

There are five basic diseases in chest wall surgery, among which deformity is the most common disease [1-3]. Pectus excavatum is the most common deformity, with the incidence rate of about 0.2-0.8%. The operation of pectus excavatum has a long history. The operation in the early years was open surgery. Nuss procedure was introduced in 1998, and it has many advantages, but it also has clear disadvantages [4-10]. In addition to the challenges of safety, the results of surgery are often worrying [11]. If the surgical details are poorly handled, the operation may fail. Once the pectus excavatum operation fails, it needs to be operated again. In reoperation, if Nuss procedure is used again, because there is serious adhesion in the mediastinum, the operation will be dangerous and complex, therefore, Nuss procedure is no longer a reasonable choice. Wang procedure is a technique designed for depression deformities. This operation is clearly different from Nuss procedure [7-10]. The steel bar is placed before the depressed bone structures, and the main operation is also focused on the surface of the bone structures. Therefore, this operation has obvious advantages for the reoperation of the deformity with mediastinal adhesion [7-10]. In 2020, we received a case of failed Nuss procedure on pectus excavatum. We used the modified Wang procedure to treat it and achieved good results. This article reports the operation.

Case Report

The patient was a 7-year-old boy who was diagnosed as pectus excavatum after birth, and received surgical treatment locally when he was 5-year-old. Nuss procedure was used at that time, but the postoperative effect was not ideal. As time went on, the lesions gradually became worse. Besides the central depression, the lateral chest wall also appeared depression. He was admitted to our hospital for reoperation in 2020. The preoperative physical examination: there were three scars on the chest wall (Fig 1). The anterior chest wall was depressed in the middle, with both sides of the depression being raised. The lateral chest wall outside the raised part was also depressed. The overall appearance of the chest wall presented as complex deformity (Fig 1). The imaging examination: the anterior chest wall was depressed in the middle with bilateral protrusion, bilateral chest walls were also depressed, and there was a steel bar in the chest (Fig 2, 3, 4). The measured value of Wenlin index was 0.45 [12]. The operation was carried out under general anesthesia. Skin incisions were performed at the scar on both laterals of the chest wall respectively. The subcutaneous tissues were freed to expose the ends of the steel bar, and then the steel bar was removed. Another incision was made at the median scar. The back of the sternum was exposed through the incision, and a tunnel was performed before the bone structures.

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A steel bar was put into the tunnel, and the median depression was pulled fixed with the steel bar. Additional steel wires were put at the depression of both sides of the chest wall. After the depression was lifted and fixed on the bar, the ends were fixed on the ribs of the lateral chest wall (Fig 5). The drainage tube was placed in the operation field, the incisions were closed, and the operation was ended. The deformity was corrected completely after operation (Fig 6, 7). The patient was discharged 7 days after operation. After two years of follow-up, the position of the plate was normal, and no deformity occurred.

Discussion

Nuss procedure is a common operation for pectus excavatum [4-6]. Since its report, with lots of advantages, it has been quickly popularized in a large area and has become the standard surgical treatment of pectus excavatum. However, this operation has obvious defects. In addition to the risk of heart damage [11], the results of such operations are often unsatisfactory. This operation is generally regarded as a very simple operation, but its principle is not simple. Few people have studied its principle seriously, which is the basic reason of the failure of the operation [13]. Once the pectus excavatum operation fails, different results may occur. In addition to recurrence of depression, new deformities may also occur. This will pose challenges for reoperation.

After the Nuss procedure failed, the biggest challenge comes from mediastinal adhesion [9, 14, 15]. If Nuss procedure is used for the treatment of reoperation, the risk and difficulty will be very great. Therefore, Nuss procedure is no longer a good choice. Wang procedure is completely different from Nuss procedure [7-10]. Since the main operation is located on the bone structure surface, mediastinal adhesion will not significantly increase the difficulty of operation. Therefore, Wang procedure is a good choice for reoperation.

From the perspective of surgical principle, thoracic deformity surgery can be divided into three types: destructive surgery, mechanical external force plastic surgery and template plastic surgery. Template plastic surgery is the most ideal surgery [1-3]. Wang procedure is a typical template plastic surgery, which can not only correct the depression, but also correct the protrusion around the depression. In addition, if there are other deformities in the part through which the steel bar passes, as long as the deformities can be fixed together with the steel bar, good orthopedic effect can also be obtained. This is the advantage of template plastic surgery.

In this patient, in addition to the central depression, there was a raised edge around the depression, and there were other depressions outside the depression, which led the deformity to be a complex type. During the operation, the steel bar was put on the surface of these deformities. While the median depression and lateral chest wall depression were lifted, the raised edge of the median depression was flattened by the steel bar simultaneously, so a variety of orthopedic effects were obtained. This operation is obviously different from the classic Wang procedure, but it can show the advantages of template plastic surgery.

In our past work, we used Wang procedure on many occasions. Sometimes this procedure is used alone [7-10, 16], and sometimes it is used in combination with other operations [17]. Our experience shows that this kind of

procedure is an orthopedic operation with a wide range of uses. Especially for the failed reoperation of pectus excavatum, this procedure should be considered first [9, 14, 15].



Fig 1: Appearance of chest wall before operation. A. Right side view; B. Left side view

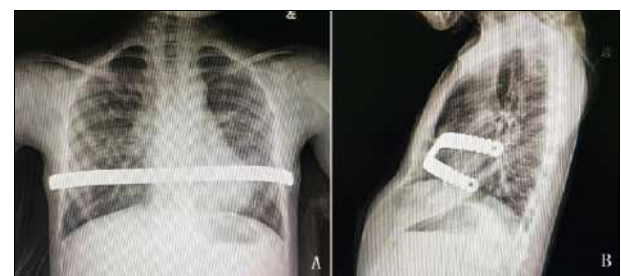


Fig 2: Preoperative X-ray examination. A. Positive view; B. Side view

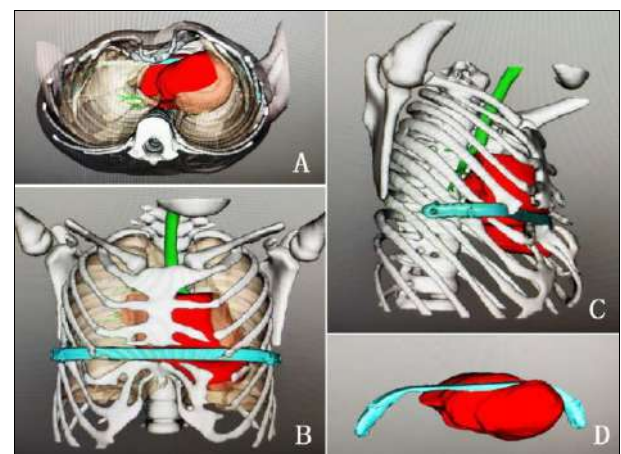


Fig 3: Preoperative three-dimensional images. A. Bottom view; B. Front view; C. Right side view; D. The relationship between steel bar and heart



Fig 4: Preoperative CT examination. A, B. Sectional view; C. Sagittal view

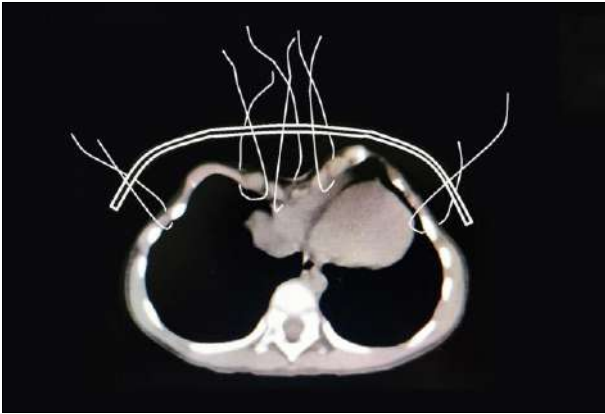


Fig 5: Schematic diagram of modified Wang procedure

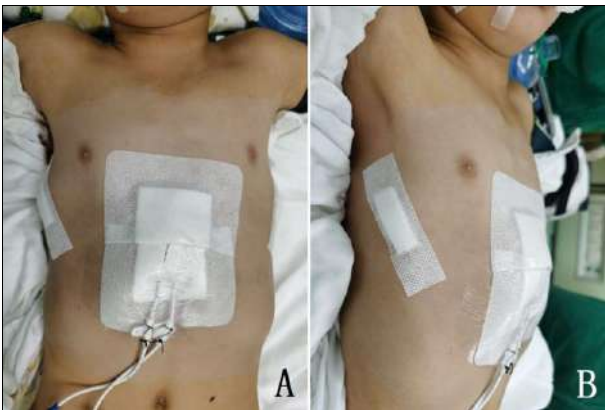


Fig 6: Postoperative appearance of chest wall. A. Front view; B. Side view



Fig 7: Postoperative X-ray examination

Conclusion

After the Nuss procedure of pectus excavatum fails, it will be very risky and difficult to use this procedure to complete the reoperation. For such patients, Wang procedure is an ideal choice. It can not only effectively resolve the risk and reduce the difficulty, but also completely correct the new deformity.

Conflict of Interest

Not available

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Reference

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