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Wenlin procedure: Minimally invasive surgery for barrel chest

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Abstract

Wenlin procedure is a special operation designed by us. In the early stage, it was specially used for the treatment of pectus carinatum. Later, we found that it also had an effect on other protrusion deformities. Barrel chest can be regarded as the overall protrusion of chest wall, so it is also a kind of protrusion deformity. Because there is protrusion, Wenlin procedure should also play a role. We used this kind of operation in the operation of barrel chest and obtained satisfactory results. Our experience shows that Wenlin procedure is an ideal choice for the treatment of barrel chest.

Keywords: Wenlin procedure, barrel chest, minimally invasive surgery

Introduction

Barrel chest is one of the common thoracic deformities. Clinically, it is often seen in patients with chronic lung disease, which is a typical secondary damage. Considering the patient's age and fragile bone structures, this secondary barrel chest does not need surgical treatment^[1]. Our department is independent chest wall surgery department, and thoracic deformity surgery is our main work^[2]. Due to the particularity of our work, we often encounter various rare deformities in clinical practice. These deformities include a special type of barrel chest. These patients have no lung disease, and their barrel chest appeared in childhood, so this is a typical primary barrel chest. Most of these patients are teenagers or adults. The barrel-shaped chest wall makes these patients very miserable. They have a strong desire for surgery and need help. However, there is no record of barrel chest surgery in the previous literature. In order to find a suitable surgical method, we studied the structural characteristics of barrel chest, and finally found an ideal method, Wenlin procedure^[1].

Wenlin procedure is one of the many deformity surgeries we designed, which was originally designed for pectus carinatum [Fig 1A]^[3-8]. The basic principle is to place a relatively flat steel bar in front of the protrusive chest wall, flatten the chest wall, and fix both ends of the steel bar on the ribs. This operation is simple, safe and practical, and is an ideal method for the treatment of pectus carinatum^[6]. We have used this method in large-scale pectus carinatum surgery and gained valuable clinical experience. In the subsequent work, we found that this method can also be used in other protrusive deformities. This discovery is of great help to our later work. We also used this method in the operation of asphyxiating thoracic dysplasia (Jeune syndrome), and achieved good results [Fig 1B]^[7]. The experience of these operations further broadened the scope of application of Wenlin procedure. Our final discovery is that Wenlin procedure can be used for all deformities with chest wall protrusion^[7,8].

Barrel chest is a completely independent deformity. On the surface, this deformity has no connection with pectus carinatum and other protrusive deformities. However, if the relationship between them was observed from a different perspective, the internal relationship can be easily found. If the pectus carinatum is regarded as a local protrusion of the anterior chest wall, the barrel chest can be regarded as a whole protrusion deformity of the anterior chest wall. Since both have protrusion, there may be therapeutic similarities. Wenlin procedure is an effective method for the treatment of protrusion. Since it can be used for the surgery of pectus carinatum^[6] and asphyxiating thoracic dysplasia^[7], it can also be used for the surgery of barrel chest. Based on this consideration, we studied the possibility of using Wenlin procedure in the treatment of barrel chest, and finally found that this possibility is tenable.

We made a reasonable design for the details of the operation, and finally formed a mature minimally invasive operation for the treatment of barrel chest [Fig 1C] ^[1].

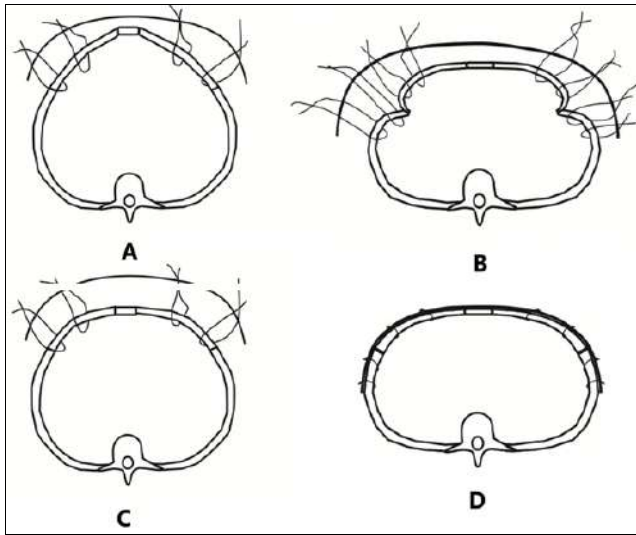


Fig 1: Schematic diagram of Wenlin procedure. A. Wenlin procedure of pectus carinatum; B. Wenlin procedure of asphyxiating thoracic dysplasia; C. Wenlin procedure of barrel chest; D. The appearance of the chest wall after Wenlin procedure

Although Wenlin procedure can be used for barrel chest and pectus carinatum, the specific details of surgery are also very different due to the obvious differences in the structures of deformities. Specifically, Wenlin procedure of barrel chest has the following technical points ^[1]: 1) more steel bars are required. Because the barrel chest is the overall protrusion of the anterior chest wall, the protrusion area is large and the range is wide. If the entire anterior chest wall need to be flattened, one or two steel bars are certainly not enough. Generally, three or even four steel bars are needed to obtain the ideal effect; 2) the steel bar should be placed in a proper position. Due to the large area and wide range of protrusion, the position of the steel bars need to be reasonably arranged. Only in this way can the force be balanced and good shaping effect be obtained; 3) The steel bars must be properly fixed. After the anterior chest wall is flattened with the steel bars, two ends of the bar need to be fixed on the ribs, and at this time, both ends bear huge stress. If the fixation is not appropriate, the ribs or steel wires may be broken due to excessive stress concentration, which will not only affect the surgical effect, but also lead to surgical failure; 4) The operation sequence must be reasonably arranged. Because there will be a large number of steel bars, steel wires and other auxiliary items in the operation field at the same time, If the sequence of operations is not reasonably arranged, the operation site will be very messy, which will seriously affect the operation; 5) Operation should be in strict accordance with the principle of template plastic surgery. This principle is the basic principle of Wenlin procedure, which requires that every part of the bone structure should be closely attached to the steel bars as much as possible. In order to achieve this goal, the fixation position of the steel bar must be reasonably designed during the operation, and only in this way can a satisfactory shaping effect be obtained.

In general, barrel chest is a kind of protrusive deformity, so it can be treated with Wenlin procedure. However, due to the wide area of deformity and many operation contents, it is not easy to master this method skillfully. To treat the deformity perfectly, the details of the operation should be carefully designed before

operation. During the operation, all operation details also need to be handled carefully, which is the basic guarantee for satisfactory completion of barrel chest surgery.

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