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Surgical treatment of Wenlin chest after Spinal Orthopedics

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Abstract
Wenlin chest is a rare congenital thoracic deformity, which used to be regarded as a kind of pectus carinatum. After its own particularity was gradually recognized, some new names appeared in clinic. We have received many such patients. To facilitate our work, we named it as Wenlin chest. This deformity may be combined with malformations of other parts of the body, and scoliosis is a possible concomitant deformity. We treated a Wenlin chest patient who had undergone plastic surgery due to scoliosis. We carried out the operation of thoracic deformity for him and obtained satisfactory results.

Keywords: Wenlin chest, wenlin procedure, wung procedure, currarino-silverman syndrome, pouter pigeon chests, pectus acutum, chondromal deformation

Introduction
Wenlin Chest is a rare congenital thoracic deformity named by us [1, 2]. It was not independently named in the early years, but was regarded as a kind of pectus carinatum. Some people called it type 2 pectus carinatum. At that time, since all protrusion deformities were treated with open surgery, this classification had no problem. With the deepening of understanding, some important features of this deformity have been found, so new names have been given by different authors. These names included Currarino-Silverman syndrome, pouter pigeon chests, pectus acutum and chondromal deformation, etc. [3-6]. We also made a new name for it because we have received many patients with such a deformity. Our department is the first and only chest wall surgery department in China, and our main work is to complete various chest wall disease operations [7-9]. Most of these operations are all kinds of deformity operations. Although Wenlin chest is rare, it is not rare in our patients, which provides us with more opportunities to recognize and treat this deformity. We have designed various surgical methods and achieved good results. In this article, we introduce the operation of a Wenlin chest patient. He is a 35-year-old male with scoliosis. He had received scoliosis surgery in the local hospital 2 years before coming to our hospital for treatment. We performed minimally invasive surgery for him and achieved satisfactory results.

Case Report
The patient was a 35-year-old male. No abnormality had been found in his childhood. Protrusion of the anterior chest wall was found after puberty. After that, scoliosis gradually appeared. At the early stage, the anterior chest wall only had simple protrusion, but gradually had central depression, with scoliosis aggravated. At the age of 33, the patient received spinal orthopedic surgery in the local hospital. After the surgery, scoliosis improved, but the deformity of the anterior chest wall became worse. For surgical treatment, the patient was admitted to our hospital two years later. Physical examination before operation revealed that the upper half of the anterior chest wall is protrusive, and the lower chest wall is depressed in the middle (Fig. 1); Surgical scar can be seen on the back. Imaging examination showed slight scoliosis of the spine, and spinal surgical stent was visible; the upper part of the anterior chest wall was protrusive, the lower part was depressed in the middle; the sternum was abnormally thickened, and the side view was "S"-shaped; and the heart was obviously compressed (Fig. 2, 3). The operation was performed under general anesthesia. It mainly includes two procedures, namely Wenlin procedure [10-12] and Wung procedure [13-15]. An incision was made in the middle to expose the sternal angle and body, and the pre-shaping on the sternum was performed [15]. Two other incisions were made on both sides of the chest wall, and the soft tissues and muscle tissues were dissected to expose the ribs of the sides chest wall.

Two tunnels were made from the side chest wall incisions to the center incision. The upper tunnel is located in front of the protrusive bone structures, and the lower tunnel is located beneath the depressed bone structures. Two steel bars were put into two tunnels respectively. The upper steel bar was completed for Wenlin procedure, while the lower steel bar for Wung procedure. The fixations of the steel bars were completed with Wang technique [16]. After these operations were completed, drainage tubes were placed in the bilateral thoracic cavities and surgical field, and the incision was closed. Thoracic deformity disappeared after operation, and the operation was smooth without complications (Fig. 4). The patient was discharged ten days after the operation.

Fig 1: Chest wall appearance before operation

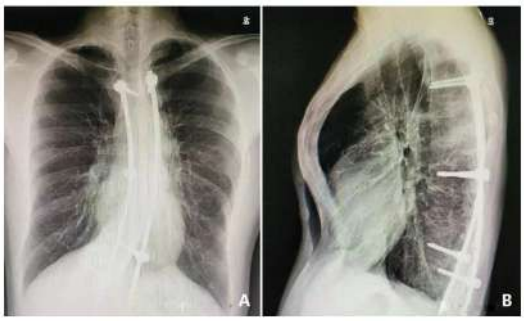

Fig 2: X-ray examination pictures. A, Positive view; B, Side view

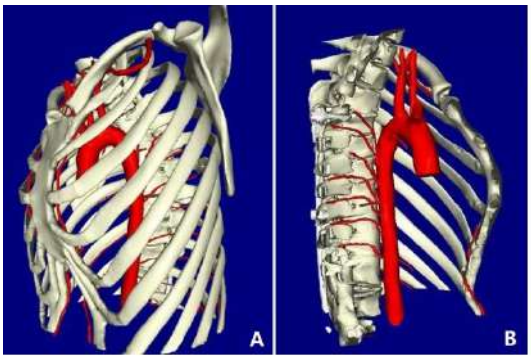

Fig 3: Three dimensional images of the chest. A, Overall image; B. Section image

Fig 4: Chest wall appearance after operation

Discussion

Wenlin chest is a rare congenital thoracic deformity [1 ,2]. As the main manifestation is the abnormal shape of the thoracic bone structure, the spine may also be involved. Scoliosis is not uncommon in common pectus carinatum patients. Wenlin chest was used regared as a kind of pectus carinatum, so it is understandable to combine with scoliosis. If scoliosis is too obvious or severe, surgery is required. The patient received scoliosis surgery before correction of thoracic deformity, but the effect was not perfect, and slight scoliosis still existed after surgery. It is uncertain whether this spinal deformity has an impact on the anterior chest wall deformity.

Wenlin chest surgery has a long history. In the early years, the treatment was mainly completed through open surgery [3]. This method has many defects, so it needs continuous improvement. Considering that the deformity contains both protrusion and depression, sandwich technique may be a choice [17]. However, due to the abnormal thickening and hardness of the sternum, sandwich technique alone cannot complete the treatment. The premise of reasonable correction is to change the sternal elasticity. We use the method of pre-shaping to change the sternum structure first, which makes it possible to treat Wenlin chest with minimally invasive surgery [15].

In our surgery, we used two basic procedures, namely Wenlin procedure and Wung procedure. Wenlin procedure is a minimally invasive operation designed for protrusion, and Wung operation is a minimally invasive operation designed for depression. On the premise that the pre-shaping of sternum has been completed, these two procedures can easily complete the treatment of deformity, thus obtaining satisfactory results.

Conclusion

In the past work, we designed various surgeries for the treatment of Wenlin chest. Our experience shows that the pre-shaping of sternum is the key factor to complete Wenlin chest treatment. Wenlin procedure and Wung procedure are both minimally invasive surgeries. The use of these two procedures can make satisfactory correction of Wenlin chest.

Conflict of Interest
Not available

Financial Support
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