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Wenlin triad of pectus excavatum

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Abstract

Pectus excavatum is the most common thoracic deformity. There have been a lot of studies on this deformity in the past. However, the previous research is not comprehensive. With the deepening of cognition, some new clinical features of pectus excavatum were gradually discovered. After years of research, we found that patients with pectus excavatum have three special clinical features, namely scoliosis, hunchback and side lying sleeping position. We found that these three characteristics have a clear causal relationship with pectus excavatum, which has not been found in the past. In order to better understand these features, we named them Wenlin triad. The proposal of the triad is not only helpful to further understand the mechanism of the harm of pectus excavatum, but also helpful to the treatment of pectus excavatum.

Keywords: Pectus excavatum, wenlin triad, wung procedure

Introduction

Pectus excavatum is an ancient disease, which was recognized hundreds of years ago. The treatment of this disease has a history of more than 100 years^[1]. Understanding of this disease can be said to be quite comprehensive^[1, 2]. However, with the deepening of understanding, some previously undiscovered features gradually emerged. In the past work, we have treated a large number of patients with pectus excavatum^[2, 3]. In addition to the well-known clinical features, we have found three additional clinical features. Because most patients have these features, and they are unique to the pectus excavatum, we made a special name for them, namely the Wenlin triad. Here we describe these features in a patient with pectus excavatum.

Case Report

The patient, a 14-year-old male, was diagnosed as pectus excavatum after finding a depression in the anterior chest wall at an early age. Early depression is not serious, without any discomfort. However, his family found that he was always hunchbacked. Although they hoped that he would straighten his chest through various methods, it had little effect. Asked the reason, the patient said that he would feel uncomfortable if he held out his chest. His family also introduced his sleeping habit. He never slept flat, and always slept on his side. He said that he would feel uncomfortable if he lay flat. From the age of 12, the patient grew tall, the depression of the anterior chest wall gradually deepened, and the hunchback also aggravated. In addition, his family found that his spine began to bend. After X-ray examination, obvious scoliosis was found. Because of dissatisfaction with the appearance of the anterior chest wall, the patient was admitted to our hospital for surgical treatment. Before the operation, we performed physical and imaging examinations for him. The examinations showed that there were obvious depressions in his anterior chest wall, which were symmetrical [Fig 1], and he has obvious humpback [Fig 2] and scoliosis [Fig 3, 4]. His heart was obviously compressed and shifted to the left thoracic cavity [Fig 4]. The operation was performed under general anesthesia. We used Wung procedure + Wenlin procedure^[4,5] to treat the patient. The Wung procedure was completed with two steel bars, and the Wenlin procedure was completed with the third steel bar. The deformity of anterior chest wall disappeared completely [Fig 5]. The patient was discharged 7 days after operation. After 1 year follow-up, the patient's humpback disappeared, he could lie flat, but there was no significant change in scoliosis.

Discussion

Pectus excavatum is the most common thoracic deformity^[1]. Because it is common, it is also the most studied deformity. However, with the deepening of understanding, some clinical

features that have not been noticed in the past have gradually emerged. Understanding of these features will be beneficial to the treatment of this deformity.

Scoliosis is a common complication of pectus excavatum [6]. This complication is often mentioned, but the relationship with pectus excavatum has not been clarified. We find that scoliosis can be an inevitable result of pectus excavatum. When the heart is compressed by the chest wall depression, it will move to the left. As the mediastinal structure is pulled to the left at the same time, the stress on both sides of the spine will change, which will lead to spinal curvature and eventually form scoliosis [Fig 4]. Obviously, scoliosis is a pathological change caused by pectus excavatum. Thus, scoliosis is a distinct feature of patients with pectus excavatum.

The main physiological harm of pectus excavatum is the compression of the anterior chest wall on the heart, which is the source of discomfort for patients. In order to minimize this compression, the patient will take self-protection measures. When the patient is in an upright or sitting position, the position of the anterior chest wall can be moved forward by bending, which will effectively relieve the pressure of the anterior chest wall on the heart. On the contrary, if the patient holds out his chest, the anterior chest wall will move backward, and the pressure on the heart will increase. This will make the patient very uncomfortable, so the patient will use the posture of bending rather than holding out the chest. This is the root cause of the patient's appearance of hunchback.

When the patient lies flat, because the front chest wall is straightened, its position must move back, which will lead to increased pressure on the heart, and the patient will feel very uncomfortable. In order to avoid this discomfort, the patient will adopt a lateral position, which can move the anterior chest wall forward to reduce the pressure on the heart, and the patient will be relatively comfortable. This is the fundamental reason why patients like to lie on their sides.

The reason for hunchback and side lying is very clear, that is, the compression of the anterior chest wall on the heart. Therefore, both are definite clinical features of patients with pectus excavatum. The relationship between these features and pectus excavatum has never been noticed before. Combining the two features with scoliosis can be regarded as three inevitable clinical features of patients with pectus excavatum. In order to be better known, we named it Wenlin triad. The understanding of this triad can not only further clarify the mechanism of pectus excavatum damage, but also can help the treatment of this deformity. So, it has important clinical significance.



Fig 2: The patient has obvious hunchback

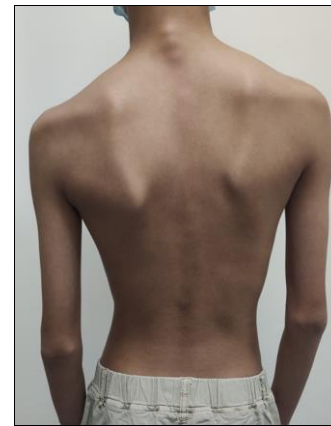


Fig 3: The patient has obvious scoliosis



Fig 4: X-ray showed obvious scoliosis. When the heart is pressed to the left by the depression of the anterior chest wall, all the mediastinal structures are pulled to the left, which may lead to uneven stress on both sides of the spine and eventually form scoliosis

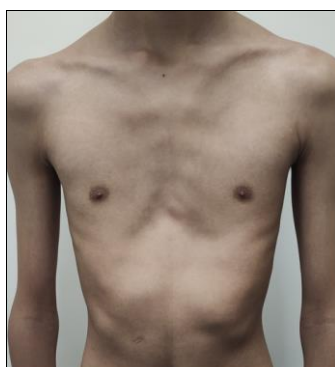


Fig 1: Chest wall appearance. The anterior chest wall has obvious depression

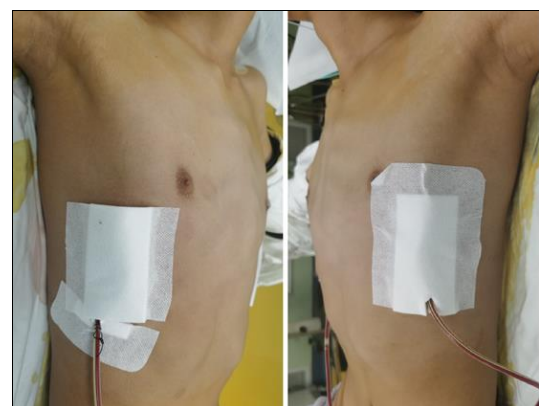


Fig 5: Appearance of chest wall after operation

Conclusion

Although pectus excavatum has been extensively studied, some features have not been deeply recognized. Scoliosis, hunchback and lateral lying are three inevitable clinical features of patients with pectus excavatum. In the past, they were mostly regarded as accidental clinical manifestations. No one paid attention to the internal relationship between these features and pectus excavatum. Our research shows that the three clinical features are the inevitable characteristics of patients with pectus excavatum, and there is a certain causal relationship with pectus excavatum. Therefore, we summarize it as Wenlin triad. We hope that this nomenclature will contribute to the understanding of the damage mechanism of pectus excavatum, and ultimately contribute to the treatment of pectus excavatum.

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