E-ISSN: 2616-3470
P-ISSN: 2616-3462

www.surgeryscience.com
2022; 6(3): 12-14
Received: 12-04-2022
Accepted: 19-05-2022

Dr. Wenlin Wang
Professor, Department of Chest Wall Surgery, Guangdong Second Provincial General Hospital, Guangzhou, China

Corresponding Author:
Dr. Wenlin Wang
Professor, Department of Chest Wall Surgery, Guangdong Second Provincial General Hospital, Guangzhou, China

Basic theories and concepts of chest wall surgery

Dr. Wenlin Wang

DOI: https://doi.org/10.33545/surgery.2022.v6.i3a.909

Abstract
Traditional thoracic surgery includes the treatment of intrathoracic and extrathoracic diseases, which develop synchronously all the time. In recent years, thoracic surgery has entered the era of minimally invasive surgery, which is completed through thoracoscopic techniques. Because thoracoscopy can only complete intrathoracic surgery, excessive emphasis on the use of thoracoscopy makes chest wall diseases completely ignored. However, in reality, the incidence of this disease is quite high. It can be seen that the treatment of chest wall diseases provides opportunities for specialty development. We proposed the concept of chest wall surgery in 2016 and established the world's first independent chest wall surgery department on May 9, 2018. After several years of clinical practice, we have summarized the theory and practice of this specialty. This article will report our experience and cognition.

Keywords: Chest wall surgery, theory, concept

Introduction
Thoracic surgery is an ancient clinical specialty. The earliest thoracic surgery originated from the treatment of trauma. With the progress of anesthesia technology and other surgical technology, it has gradually developed to the comprehensive treatment of various diseases inside and outside the chest, and finally become a mature clinical surgery specialty.

Early thoracic surgery was mainly open surgery [1]. In this stage, the development of thoracic surgery was relatively balanced, and the surgeries of internal and external thoracic organs develops synchronously, resulting in many achievements. Since the 1990s, surgery has entered minimally invasive era, and thoracic surgery has also ushered in the concept of minimally invasive surgery [2-7]. Early minimally invasive surgery is mainly small incision operation. After thoracoscopy was introduced into the clinic, it was used to assist thoracic surgery in the early stage. When the technology continues to mature, full thoracoscopic surgery has gradually formed. In recent years, with the rapid development of thoracoscopic technology, the scope of clinical use has been further expanded, and the clinical effect has been more ideal. Therefore, thoracic surgery has entered the era of comprehensive minimally invasive surgery finally [2-7]. The main symbol of this era is thoracoscopic surgery, which has greatly changed the traditional thoracic surgical treatment concept and technology, and should be regarded as a revolution in the field of thoracic surgery. However, the use of thoracoscopy has also brought unprecedented drawbacks, which has hindered the development of thoracic surgery from some aspects.

Thoracoscopy is a device used to complete intrathoracic surgery. The vigorous development of thoracoscopic technology will undoubtedly promote the treatment of intrathoracic diseases, but the unrestricted promotion of this technology will inevitably lead to the neglect of chest wall diseases. Such neglect was not too serious in the early days. When most surgeons focus on thoracoscopic surgery, chest wall diseases are completely ignored. Famous medical centers, famous thoracic surgical departments and famous thoracic surgeons almost all focus on thoracoscopic surgery. They occupy various resources and discourse rights. When they no longer perform surgery for chest wall diseases, such diseases will no longer be valued by thoracic surgeons, which will result in a abnormal development. In recent years, with the continuous progress of general thoracoscopic technology, robotic surgery technology has pushed thoracoscopic technology to a higher level [8]. The internal differentiation of thoracic surgery is becoming more and more obvious, and the treatment of chest wall diseases is seriously lagging behind, which has become an important content that must be considered in the development of the specialty.

Thoracic surgery originally included the treatment of both intrathoracic and extrathoracic diseases. As mentioned above, when all medical resources are used for the treatment of intrathoracic diseases, chest wall disease has become the field that needs the most attention. Data show that the incidence rate of chest wall disease is quite high, and the incidence rate of chest wall deformity alone is about 1%. This is an extremely amazing data. In contrast, the total incidence rate of all intrathoracic diseases is not comparable to the incidence rate of this disease. Chest wall diseases not only include deformity, but also include other diseases. If all these diseases are added up, the incidence rate will be much higher. That is to say, there are so many patients with chest wall diseases in clinic, but thoracic surgeons focus on the treatment of intrathoracic diseases, which undoubtedly forms a huge contradiction. If this contradiction is not properly solved, it will definitely affect the development of the whole specialty.

With the improvement of scientific and technological level, traditional clinical specialty are developing towards sub specialty. For example, the traditional orthopedic specialty has been completely differentiated into spinal surgery, hand surgery, joint orthopedics, trauma orthopedics and other sub specialties. After a period of efforts, these sub specialties have developed into independent clinical specialties, which makes the ancient orthopedic specialty get new and full development. Similar to orthopedics, thoracic surgery is also a traditional clinical specialty. However, until now, the development of its sub specialty is not ideal. This is obviously not conducive to specialty development. The essence of the clinical center's emphasis on intrathoracic diseases is actually to complete sub specialty work. After the objective existence of this subspecialty, the embryonic form of another subspecialty soon emerged, which is specialized in the treatment of extrathoracic diseases. Because these diseases are all concentrated in the chest wall, we call them chest wall surgery. We first proposed this new concept in 2016, and established the world's first independent chest wall surgery department on May 9, 2018 [9]. From that time, the voyage of chest wall surgery was officially launched.

Chest wall surgery is a new specialty to carry out clinical work for chest wall diseases. It can be regarded as a subspecialty of traditional thoracic surgery, and if it is looked from a higher level, it should be a new clinical specialty.

Chest wall diseases include five types: trauma, tumor, defect, infection and deformity. These five diseases are roughly equivalent to the disease types of other clinical surgery specialty. Because almost all chest wall diseases involve the diseases of chest wall bones, chest wall surgery has the nature of chest wall orthopedics. In addition, because it involves the appearance of chest wall, it also has the nature of plastic surgery. Chest wall diseases are closely related to intrathoracic diseases. Intrathoracic diseases may invade the chest wall and form chest wall diseases. Chest wall diseases can also invade intrathoracic structures and form intrathoracic diseases. In terms of surgical treatment, chest wall diseases are more closely related to intrathoracic diseases. However, there are essential differences between the two treatments. The nature of the treatment of intrathoracic diseases is more curative. The treatment of chest wall disease not only consider the complete removal of the nidus, but also consider the appearance of chest wall. Therefore, chest wall surgery has two basic natures, namely, curative and plastic. The curative nature is to remove the nidus, while the plastic nature has two basic contents: shaping and reconstruction. Shaping is mainly for deformities, but reconstruction is mainly for various primary and secondary defects. The primary goal of plastic surgery is to restore the integrity of the structures and make the structures have ideal functions, and its ultimate goal is to obtain normal appearance [10]. The treatment methods of the five diseases in chest wall surgery have their own characteristics, but the general principles are the same. Because of this, these diseases may be included in one specialty.

Among the five diseases, the treatment of chest wall trauma is relatively common. The important content is the trauma of various bone structures. At present, there have been many advances in the treatment of fractures, among which the fixation of rib fractures under thoracoscopy is the most concerned technology.

The incidence of chest wall tumor is relatively low. The main operation is to remove the tumor and reconstruct the chest wall structures. The progress in this area mainly focuses on materials, among which 3D printing materials are the most advanced materials.

Chest wall defects can exist independently, but most of them exist in other diseases, or after the resection of chest wall lesions. The main purpose of surgery is the reconstruction. The nature of this operation is basically the same as the reconstruction after resection of chest wall tumors.

Chest wall infection is a infectious diseases of chest wall structures caused by many reasons. It can exist independently, in other chest wall diseases, or secondary to various chest surgery. The disease itself is often stubborn, difficult to deal with, and requires special technology to succeed.

Chest wall deformity is the most common disease in chest wall surgery. In a broad sense, it includes abnormal appearance of chest wall caused by bone structure and soft tissue lesions, but in a narrow sense, it actually only refers to the abnormal appearance of the bony structures of the chest wall, that is, the deformity of the chest. This is the key content in clinical work.

The most common deformity of chest wall is pectus excavatum, followed by pectus carinatum, in addition to flat chest and barrel chest. These four kinds of deformities are often mentioned in general textbooks. In addition to these deformities, there are many other deformities in clinical practice, such as groove chest, saddle chest, lateral chest wall depression deformity, flat chicken chest, Wenlin chest [11], Poland syndrome, asphyxiating thoracic dysplasia (Jeune syndrome), thoracic insufficiency syndrome and other deformities. These deformities have different shapes, and there seems to be no obvious common features on the surface. However, if they are carefully analyzed, they can be divided into two categories: one is protrusion, the other is depression. Such classification is of decisive significance for the treatment of deformities.

The treatment of thoracic deformity has experienced two periods. The early years were the era of open surgery, and then entered the era of minimally invasive surgery. Minimally invasive surgery for thoracic deformity is selected according to the characteristics of deformity. For protrusive deformities, Wenlin procedure and Abramson procedure can be used. For depression deformities, Nuss procedure, Wang procedure, Wung procedure and other methods can be used.

In terms of the nature of surgery, deformity plastic surgery can be divided into three categories: destructive plastic surgery, mechanical external force plastic surgery and template plastic surgery. The three surgical techniques are totally different. Destructive plastic surgery is mostly open surgery, which is mainly to expose the diseased structures, then eliminate deformities and restore normal shape. The effect of this

technique is relatively satisfied, but the damage is large, so it is not an ideal operation. Mechanical external force plastic surgery is the shaping of deformities indirectly with the help of mechanical external force, and the representative operation is Nuss procedure. Because of the indirect shaping nature of this operation, it can be completed through a relatively hidden incision. The postoperative scar does not affect the appearance, which is one of the main advantages of this method, but the indirect shaping nature often affects the shaping effect. Template plastic surgery refers to the shaping of deformities with specific materials as templates. Representatives of this kind of operation are Wang procedure [12, 13] and Wenlin procedure [14]. There are two main points of operation, one is the ideal template, and the other is to ensure that all the diseased structures are touched to the template and fixed solidly. In general, each plastic surgical technique has its own advantages, but template plastic surgery is obviously the highest level of plastic surgery.

In short, chest wall surgery is a new clinical specialty. Its theory and concept are completely different from those of traditional thoracic surgery. Therefore, in practical work, surgeons must carry out relevant work with brand-new ideas. This is the premise and basic guarantee for the smooth clinical work of chest wall surgery.

Reference

1. Navarro R, Benavidez R. Nowadays open-chest surgery in the era of fast-track management. J Vis Surg. 2017;3:1.
2. Chen-Yoshikawa TF, Fukui T, Nakamura S, Ito T, Kadomatsu Y, Tsubouchi H, *et al*. Current trends in thoracic surgery. Nagoya J Med Sci. 2020;82:161-74.
3. Pompeo E. Minimally invasive thoracic surgery: new trends in Italy. Ann Transl Med. 2015;3:269.
4. Vinck EE, Ebels T, Hittinger R, Peterson TF. Cardiothoracic Surgery in the Caribbean. Braz J Cardiovasc Surg. 2021;36:599-606.
5. Laisaar T. Thoracic surgery in Estonia. J Thorac Dis. 2022;14:1719-24.
6. Elkhayat H, Elsayed HH, Adel W, Elkhouly AG, Abdellateef A, Amin WAM, *et al*. Thoracic surgery in Egypt. J Thorac Dis. 2022;14:1282-95.
7. Souilamas RM, Uzbeck MH, Bayrak Y, Guenif N, Hamed F, Shafiq I, *et al*. Thoracic surgery in United Arab Emirates. J Thorac Dis. 2022;14:788-93.
8. Terra RM, Leite PHC, Vega AJMD. Global status of the robotic thoracic surgery. J Thorac Dis. 2021;13:6123-8.
9. Jiang R, Liao L. Wenlin Wang: A weird doctor in defiance of the Matthew effect. J Thorac Dis. 2019;11:E90-E95.
10. Liu Y, Wang W, Long W, Cai B, Chen C, Wang W, *et al*. Chest wall reconstruction with digitally designed materials for straight back syndrome with tracheal stenosis: a case report. Ann Transl Med. 2021;9:1357.
11. Wang W, Long W, Liu Y, Cai B, luo J. Wenlin chest: an independent thoracic deformity. International Journal of case reports in surgery. 2022;4:13-5.
12. Wang W, Chen C, Long W, Li X, Wang W. Wang procedure for treatment of pectus excavatum. SL Clin Exp Cardiolog. 2018;2:113.
13. 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.
14. Wang W, Long W, Liu Y, Cai B, luo J. Wenlin procedure: a novel surgical technique for pectus carinatum. International Journal of case reports in surgery. 2022;4:10-12.