

Prof. Shijiang Zhang: the development of hybrid surgery in China

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The People's Hospital of Jiangsu Province is the largest tertiary general hospital in the province and has been shouldering the pivotal tasks of providing medical services to province-wide patients, mentoring medical practitioners, and advancing medical research. As the hospital's new clinic building is going to be put into use, a batch of advanced medical instruments will be introduced to provide better care and treatment to the patients.

Prof. Shijiang Zhang, Director of the hospital's cardiothoracic surgery department, is a well-known expert of cardiothoracic surgery and has carried out many ingenious surgeries and some complicated heart and lung transplantations over the past 30 years. He is well versed in complicated surgery for congenital cardiac disease like Tetralogy of Fallot (TOF), Modified Fontan operation, operation for Ebstein's anomaly on adult (Figure 1) etc.

He is also a member of several charity foundations, and frequently flies to Xinjiang Province, more than 2,000 kilometers away, to perform free operations for local kids with heart problems, establishing him as a role model for his extraordinary professional skills and occupational ethics.

Recently JTD has invited Prof. Zhang for an interview to talk about several topics related to transcatheter aortic valve implantation (TAVI) surgery, hybrid surgery, and postoperative care.

JTD: *You have made extraordinary achievements in cardiothoracic diseases and devoted almost half of your life into the healthcare service. How did you decide to be a cardiothoracic surgeon from the very beginning?*

Prof. Zhang: Actually, I had not even thought about being a doctor in my early years, as my favorite subject at that time was literature. After graduation from middle school, I was about 15 years old and went to Lianshui county and work as a farmer in the countryside. I joined the army in 1970, first as a medical soldier, and later pursued study of clinical medicine at the Nanjing Medical University. I was assigned to work at the radiology department after graduation from the university in 1975, and was transferred to the cardiothoracic surgery department the next year because my health conditions did not allow me to work at the radiology department. Since then I gradually develop a love for cardiothoracic surgery and

finally became who I am today.

JTD: *We understand that you had once studied at the School of Medicine, University of Massachusetts, and Harvard Medical School's Brigham and Women's Hospital to learn how to perform cardiovascular surgeries and lung transplantation. Would you like to share with us your experiences during these trips?*

Prof. Zhang: The overseas study period started in 1999. Originally, I was offered an opportunity to study abroad back in 1990, but I had to give up because of family reasons. I went to Boston in 1999 and first worked as a visiting doctor at the affiliated hospital of the School of Medicine, University of Massachusetts, and later was trained on cardiovascular surgery at BWH (Figure 2). Doctors at these hospitals were highly qualified, but the most impressive thing to me during my stay at the Harvard Medical School was its underground operation room. An underground operation room is cleaner and more concentrated with less distraction and disruption during the surgery. No underground operation room has been built in China. The Harvard Medical School holds a regular breakfast meeting at 6:00 AM every Friday to discuss complicated cases and share the latest development in medical technology, and all faculty members will attend the meeting.

Note: BWH stands for Brigham and Women's Hospital and is affiliated to the Harvard Medical School. BWH library is shared with the school, and its sixth floor houses the editorial department of *the New England Journal of Medicine*.

JTD: *You have been working at the cardiothoracic surgery department for almost 30 years and have successfully performed several cases of extremely complicated lung transplantation. What is the biggest challenge for lung transplantation? In which direction do you think this area is going?*

Prof. Zhang: Lung transplantation is much more difficult



Figure 1 Operative treatment of Ebstein's anomaly on adult (1).

Available online: <http://www.asvide.com/articles/280>



Figure 2 Prof. Gongliang Wu (left), Prof. Shijiang Zhang (right). Prof. Zhang was learning bronchoscope under the guidance of Prof. Wu.

than transplantation of other organs such as the kidney, because the lung is a hollow organ that is connected to the outside world. That means once transplantation is completed, the new lung must be working immediately at its full capacity. Generally speaking, patients with chronic obstructive pulmonary disease (COPD) and people with middle and terminal pulmonary diseases can undergo lung transplantation, but there is still no consensus whether lung cancer patients should get such an operation. We generally believe that lung transplantation is viable as long as the

patient does not have any lung infection. Patients with lung infection cannot have lung transplantation because immunosuppressive agent must be used during the surgery. A prominent developmental trend in lung transplantation is towards donation after cardiac death (DCD). The survival rate of grafts from DCD has been close to those from heart-beating donors. DCD is expected to be of growing significance in the future because it can address, to some extent, the shortage of grafts.

JTD: *We understand that a team under your leadership has also made enormous progress in hybrid operation, and the hybrid operation room is under construction. What is the status quo of hybrid operation in China? What are its advantages and disadvantages?*

Prof. Zhang: We will have our own hybrid operation room when the hospital's new clinic building is completed. The People's Hospital of Guangdong Province has already built digital subtraction angiography (DSA) hybrid operation room. The hybrid operation room is a product of multi-disciplinary integration, and it can mitigate risks during the operation and reduce peri-operative mortality. The introduction of hybrid operation room places higher demand on doctors because they must be knowledgeable about some technologies used in other medical departments. That seems like a versatile drama performer who can play different roles in a show. Hybrid operation room brings obvious advantages of one-stop service. Take the coronary artery bypass grafting (CABG) as an example: before the operation, coronary arteriography must be carried out in the related department to determine the location and characteristic of the artery stenosis, after which a surgical plan can be finalized, and the surgery is then performed back at the surgical department. Within the hybrid operation room, coronary arteriography and CABG surgery can be done in the same room if the doctor deems surgery is needed based on the result of arteriography. All the procedures are completed in the same room without having to transfer the patient. It is not a medical model where doctors from different departments work together, but one where a single or several doctors perform the surgery based on their extensive knowledge base. This revolutionary model can help many patients. Another example is a dissecting aneurysm, which normally has very high mortality rate. For DeBakey I type dissecting aneurysm, the mortality rate will increase one percentage point each hour within the first 72 hours. That is to say, a patient

would have 50% chance to die if he or she does not receive surgery within the first 48 hours. Based on the conventional surgical methods, the patient is likely to have died before the surgery can begin, particularly due to the time delay in ascertaining imaging results. In a hybrid operation room, however, the patient is much more likely to survive. Hybrid operation is an apparent trend for the future development of cardi thoracic surgery, and more and more hospitals in China will have their own hybrid operation rooms.

JTD: *In TAVI, the impaired cardiac valves should be replaced by the artificial ones. We understand you are launching the project of potential artificial valves in China. Would you like to introduce the progress of the project?*

Prof. Zhang: TAVI is a procedure where an artificial cardiac valve attached to a wire frame is guided by catheter to the heart via femoral artery; once in the proper position in the heart, the wire frame expands, allowing the new valve to open and begin to pump blood. The procedure involves only minor trauma and patients can make a quick recovery. At present, the domestically-made artificial cardiac valves are developed by a team led by Prof. Runlin Gao (who later became the Academician of the Chinese Academy of Engineering in 1999) from the Fuwai Hospital CAMS&PUMC. We began animal tests of the products since 2005, and we can only spare the time to do the tests on weekends because we are already occupied on the weekdays. I remember that in a period we had almost no holidays for a couple of months. So far we have done 48 clinical tests and China Food and Drug Administration told us that we can apply for approval of the product's clinic application if we complete 80 tests. All of the 48 cases are retrograde surgeries and anterograde surgeries are still under research and development. At present, a TAVI procedure costs roughly 50,000 Euros, and about 50,000 such procedures have been carried out worldwide. We hope to reduce treatment cost for patients through our effort.

JTD: *What are the pros and cons of full aortic root reconstruction and aortic valve sparing operation?*

Prof. Zhang: There are two procedures for aortic root reconstruction: Bentall procedure and David procedure. Bentall procedure refers to the total aortic root replacement

with a composite valve-graft; in the David procedure however, the patient's own aortic valve is preserved. The David procedure requires higher technical skills and carries greater risk. The two procedures also apply to different indications. David procedure applies to patients whose aortic valve functions well while aortic root aneurysm is damaged. If the patient's aortic valve is diseased, the Bentall procedure is more appropriate.

JTD: *As we know, in addition to a successful operation, postoperative monitoring and care is also very important for the patient's recovery and further treatment. Would you please share your experience in this regard?*

Prof. Zhang: Postoperative care is indeed very important, because after the cardiac surgery the heart must be able to work immediately and at full capacity. This is crucial to the success of the surgery. We have seen some patients who have had their damaged valves replaced and then quickly deteriorated to critical conditions. These emergency cases remind us the importance of doctors keeping a close eye on the patients' vital signs. Therefore, I always ask our fellow colleagues to spend some time in the ICU to learn how to monitor the vital signs of critical patients, because the experience is very helpful for them to monitor their patients' physical conditions after cardiac surgeries.

JTD: *Thank you very much!*

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