

Professor I-wen Wang: better life supported through mechanical circulatory devices-a dream within reach

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Professor I-wen Wang (*Figure 1*) received his medical degree from Case Western Reserve University School of Medicine, after that he has 17 years of experience and practices in thoracic surgery and cardiovascular surgery. With his rich experience, he was elected one of nine doctors at Indiana University Health Methodist Hospital of Indianapolis who specialize in Thoracic & Cardiac Surgery. *Journal of Thoracic Disease (JTD)* had the honor to conduct an in-depth interview with him concerning his studies in left assisted ventricular device (LVAD) and extracorporeal membrane oxygenation (ECMO) at the 2014 Chinese Heart Congress.

JTD: *As you are an expert in the field of mechanical circulatory support, what device do you think is clinically preferable in terms of Impella, LVAD, totally artificial heart?*

Prof. Wang: It depends on the patient because the three devices connote very different types of patient's scenario. The Impella is primarily a short-term device and used for patients in acute cardiogenic shock. It can be implanted without sternotomy and via axillary artery, so patients can be supported sometimes for up to several weeks and the patient can be up and moving. The patient can be bridged to recovery, to transplant or to durable LVAD. It is a first and initial device. Typically we try not to put the durable LVADs into patients who are in acute cardiogenic shock because the data clearly shows that the survival based on Intermacs profile is variable. The one-year survival tend to be worse for Intermacs I patients versus Intermacs II and III patients and so on. So the more stable the patient who is going to have surgery for LVAD, the better the outcome. Sometimes, we do implant durable LVADs into the Intermacs I patients but the majority of patients we put in to LVAD turned out to be Intemacs II or III. The LVADs such as HeartMate-II and HearWare are durable devices so they are intended as bridge to recovery, bridge to



Figure 1 Professor I-wen Wang.

transplant or destination therapy, which means they can be used for periods of months and even years, especially if they are used as destination therapy. The total artificial heart is used for patients who need biventricular support and other specific indications. In the US, it is approved to be only as bridge to transplant. The total artificial heart operation is much more complicated than the LVAD. There is not one single device that's suitable for every patient, but every patient should be assessed individually to see which device will best benefit him.

JTD: *Given the high cost of these devices, it seems that they are somewhat reserved for the wealthy. How does the patient cover the cost in America? How in your opinion can we better balance the high price of these devices and the true need from patients?*

Prof. Wang: In the United States, these devices are

implanted in patients regardless of their income because they have coverage from insurance. Some patients who have limited or no income have government insurance that can cover the costs. So income level is less of a barrier to getting LVADs. In China I think it's a different because the insurance coverage is different. Government provides insurance coverage for everyone, but the extent of coverage is more limited. The initial access for LVADs will likely be very limited number, as part of clinical trials. The cost of the devices in clinical trials is often absorbed by the LVAD companies and hospitals. But this technology, like any other medical technological advances, will be available to those who have the economic ability to pay for it. But as these technologies will become more common and even better technology comes on board, the current generation of LVADs will hopefully become less and less expensive and more and more affordable to everyone. Also advances in manufacturing may allow great efficiency and lower costs in production.

JTD: In America, which type of LVAD is applied more widely?

Prof. Wang: I think the most widely used LVAD in America is Thoratec's HeartMate-II and then the second is the HeartWare HVAD. There are two reasons accounting for this. One is because the HeartMate-II has been in the heart device market longer than the HeartWare device. Another reason is that HeartMate II is approved by United States FDA for bridge to transplantation and for destination therapy. HeartWare, on the other hand, currently has FDA's approval for bridge to transplant but it is still awaiting FDA's approval for destination therapy. Some insurance companies will only cover the FDA approved device. Therefore there are some constraints on what device you can implant for patients.

JTD: What are the features of the common types of LVAD and what is the difference? Based on your experience in China, where do you see the future of LVAD is leading in China?

Prof. Wang: I think the number one is to understand that the LVAD is only the part of the overall care of the end-stage heart failure patients. It's not the ultimate answer, because the device itself is not the final solution. Current devices still have potential risk of complications. The other thing that should be realized is that the successful use of LVAD is not just the surgery to implant a LVAD.

Li. Better life supported through mechanical circulatory devices

The surgery is actually a very simple operation for most surgeons. What is complicated is how to take care of these very sick patients. Taking care of them before the surgery to make them in the best condition for the surgery; taking care of them during the surgery to make sure they survive the operation and taking care of them after the surgery so that they can live and enjoy their life and avoid complications. So for China the next step is to understand and acquire the teamwork necessary to take care of these patients. Once the technology become available, it will undergo very fast adaptation by the surgical and medical community.

JTD: Would you like to introduce the status quo of heart transplantation (the five- or ten-year survival specifically) in America?

Prof. Wang: The current five-year heart transplantation survival in the US is somewhere near 70%, and the one-year survival is around 85%. Approximately 50% of the heart transplantation patients are still alive eleven years after the surgery. For certain, the current generation of patient data is probably better than earlier cohorts as the process of total patient care is constantly improving. I think it's fairly kind of mature medicine and surgery compared to LVADs as much experience has been gained in heart transplantation.

JTD: Indiana University Health Methodist Hospital is world-famous in the field of heart and lung transplantation. Would you like to share with us your experience?

Prof. Wang: Unfortunately, I am only a relatively recent participant in their success. I joined the Indiana University Health Methodist Hospital in September 2011 so I have only been there for three years. This year was actually the 25th anniversary of the first lung transplant performed at IUH Methodist Hospital. It also has a longstanding history of a heart transplant program. They were actually the first private hospital in the United States to do heart transplantation surgery at the very beginning. So we have a very successful heart and lung transplant program. Each year, we are doing approximately 25 heart transplants per year, 35 to 40 LVADs, and nearly 60 lung transplants. The other component is the ECMO program and again it is a very important part of the successful heart and lung transplant program. We formally started the ECMO program in 2011 and in the past three years we have rapidly increased the number of cases we've performed. In 2013,

we supported 37 patients on ECMO; by this June, we have already done 47 cases. We are expecting over 70 cases this year, which nearly double last year's volume. So the ECMO is a fast growing part of our program-supporting both our heart and lung transplant programs as well as our other critical cardiac and respiratory patients.

JTD: *As one of the emerging trends in recent years, ECMO attracts more and more attention. Could you give us more detailed information about it?*

Prof. Wang: ECMO is a relatively new technology, basically developed by Dr. Robert Bartlett at the University of Michigan. Initially, it is often used in salvage or as the last ditch effort to save a patient. The outcomes were not as good as today. Nowadays we have better timing of using ECMO as well as better critical care. So the survival could almost reach 90% for veno-venous ECMO patients. Our survival for cardiac support is probably close to 60%. It's really a very simple technology to use but it may need to be used earlier in the course for treatment. We need to do very careful patient selection as we don't want to put it into patients where it would be futile.

JTD: *In terms of the criteria of selecting patients, will the age be included?*

Prof. Wang: The answer is no. We do not have an absolute cut-off for patients who need heart and lung transplant, LVAD or ECMO. Doctor Dong from Wuhan

Union Hospital present today their oldest heart transplant patient is 76. Actually we do the same thing. We transplant patients in seventies for both heart and lung. We have put an implant device in a woman in 72 and conducted the transplant a year later in 73. I think age is a part of patient selection but other characteristics must be assessed. There are some patients who are over seventy years of age, but are in a very good cardiac surgery condition; but there are patients in thirties who are not a good heart surgical candidate. So we don't have an absolute cut-off, we take a look at the patients individually. It's reasonable to think that patients who are seventies are probably frailer than some who are 35. But that's not always true. It's the same thing with ECMO. We do not have age as the definitive selection criteria. We take into consideration that whether the patient is suitable for ECMO, whether they have other limiting diseases that prevent them from surviving and recovering from whatever the current status is. That's important what matter is often more than the age. And I should say it's not the chronological age but the physiologic age that's important.

JTD: *Thank you very much for sharing you insights!*

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