

Prof. Yean Leng Lim: evolution of percutaneous coronary intervention over 40 years

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During April 10th-12th, 2015, the 17th South China International Congress of Cardiology was held in Guangzhou Baiyun International Convention Center, China. At the first day of the congress, I was honored to meet Prof. Yean Leng Lim (*Figure 1*) and had an interview with him after his speech on the evolution of percutaneous coronary intervention (PCI) over 40 years.

Prof. Lim has contributed to the development of medicine and cardiology in Australia, Singapore and China. He is now Raffles Heart Centre's Director and a Cardiologist and Honorary Professor of Medicine at Monash University in Australia. After he retired as Professor & Director of the Centre for Cardiovascular Therapeutics at the Western Health, University of Melbourne. Western Health created the "Y.L.Lim Interventional Fellowship" in recognition of his significant contributions to cardiac services in Melbourne. He was honored with membership of the Order of Australia for his contributions in Education and Medicine in 1997. He has also authored books and scientific papers that have been published internationally in peer-reviewed journals. He is also currently involved in many research projects and clinical trials in cardiology.

Why 40 years?

Prof. Lim told me that the first human case of angioplasty was performed in 1977 and in 2017 we will celebrate its 40th anniversary. So he made it 40 years. During his lecture, Prof. Lim constantly brought the name Andreas Gruentzig to our attention—Father of PCI, the first doctor who performed and developed the first successful coronary angioplasty treatment, and demonstrated that doctors could perform cardiac surgery within the coronary arteries in a patient who was completely awake with no pain. Unfortunately, Dr. Andreas Gruentzig died in 1985 in an airplane crash. "If he was still alive today, he would have seen that the technique he developed has saved many lives, especially those who have heart attack and acute myocardial



Figure 1 Prof. Yean Leng Lim.

infarction." Prof. Lim said.

A doctor and patient's view of PCI

As a young medical student, Prof. Lim was interested in heart and circulation. When he went on his postdoctoral research in Harvard, he was asked to use non-invasive nuclear imaging technique on a group of patients before and after they had percutaneous transluminal coronary angioplasty (PTCA), as the balloon angioplasty was called initially. That was how coronary intervention first came about. In 1981, 4 years after the first use of PCI, he squeezed himself into the cardiac catheter laboratory of the Massachusetts General Hospital in Boston to watch and learn PTCA technique. He knew that PTCA would become an important disruptive life-saving technology for patients suffering coronary artery disease. His belief then was proven to be correct very quickly. PCI is now the most common procedure performed in the world today.

After nearly 40 years, he became a patient who benefited from the PCI procedure which he has been studying and

performing, having had four stents himself. “I think I can speak from the perspective of a patient as well as an expert of the PCI technique now. Before PCI, coronary revascularization could only be done by coronary artery bypass graft (CABG) surgery, a big operation performed on the heart by opening the chest under general anesthesia. But now we can perform PCI under local anesthesia and the patient could return to work a few days after the procedure, which is exactly what had happened to me. Four years ago, when I had the second PCI procedure on a Wednesday, I was back at the same cardiac catheter laboratory the following Tuesday performing the same procedure for a patient, to the horror of my catheter laboratory staff!”

For Prof. Lim, PCI is a remarkable breakthrough for the treatment of atherosclerotic coronary artery disease (CAD), a potentially lethal condition. “Diabetes mellitus will become the most important risk factor for coronary atherosclerosis, especially in Asian countries. The number of patients with diabetes mellitus will be very significant in China, with a population of 1.3 billion. Many patients will benefit from this very simple life-saving procedure.” Prof. Lim said.

PCI—both a simple and complex procedure

As an experienced Interventional Cardiologist, Prof. Lim has performed many procedures of PCI. But he constantly reminded people who performed this procedure that PCI is very effective procedure but it carries the same mortality and morbidity risks of the very invasive open-heart CABG operation. “There is 1% of chance that the patient will die from the procedure,” said Prof. Lim. The complexity and risk involved in the initial PTCA procedure are so important that Dr. Andreas Gruentzig decided to teach doctors who intend to perform PTCA and initiated the PTCA live demonstration courses that is unique in medical education today. No other medical discipline in medicine conducts live-demonstration courses, to my knowledge.” Prof. Lim said.

PCI in the East and the West

Prof. Lim has spent the last 30 years training young doctors in Australia, Singapore and China and helped to establish many interventional cardiology units in the East and the West. “China performs the second most PCI in the world after America today, in the short span of 20 years. I was informed that the official figure of PCI procedures performed in China

had exceeded half of a million in 2014.” Prof. Lim said.

“In China, the development of CABG surgery was relatively late compared to the West. Many hospitals in China still have no CABG surgery. Doctors in such hospitals are forced to treat very complex CAD patients by PCI therapy. Such cases would normally be treated by CABG surgery in the West.” Prof. Lim continued, “Under such circumstances, China and other Asian countries, such as Japan and South Korea, have helped to push the frontiers of PCI by developing many new and wonderful techniques. I believe Asian interventionists have better PCI technique to treat complex atherosclerotic CAD lesions compared to their western counterparts, but complex diseases are better treated by CABG surgery in the West. Recent Asian clinical trial research data from China and South Korea were unable to prove non-inferiority of PCI to CABG surgery in treating left main and severe triple vessel CAD patients after more than 5 years of long-term follow-up. In China and other developing countries in Asia, CABG surgery is not freely available in many hospitals. Doctors have no alternative but to perform PCI on patients with very complex diseases. These complex PCI procedures have risks that are higher than CABG surgery. However, to date, the available randomized clinical trials data still is still unable to show equivalence of PCI to CABG surgery in treating CAD patients with very complex diseases, especially the very important group of left main and triple-vessel disease patients. CABG bypass is still the better coronary revascularization technique in the long term for these patients. Fortunately, for the majority of coronary disease patients with less complex lesions, PCI has been shown to be non-inferior to CABG surgery in the long-term.” Prof. Lim said.

Prof. Lim hoped that in the near future, doctors in China could prove that this eastern approach of using PCI to treat all coronary lesions, including complex lesions of SYNTAX score >33 by PCI, using the best functional approach, the best devices and anti-thrombotic regime, will be shown to be non-inferior to western CABG surgery in long-term clinical outcome. “I think the replacement of the very traumatic CABG surgery by the much less invasive PCI to treat all ischemic CAD patients must be the ultimate challenge of interventional cardiologists in the East and the West.” Prof. Lim added.

Future of CAD therapy: handy-man or medicine-man?

Prof. Lim mentioned the four major milestones of

PCI, starting with percutaneous trans-luminal coronary angioplasty (PTCA) in 1977. Next came bare-metal stent (BMS), the Wall stent and Palmaz-Schatz stents in 1986 and 1987. In 1999, the first drug-eluting stent (DES) was implanted in man. Moving forward from now we have the bio-resorbable stents (BRS), which he believes will be the fourth breakthrough for PCI. Five years after implantation of BRS, there is not only increase in vessel size, but also the return of normal vasomotion of the stented vessel.

“One of the Achilles heel of PCI, in particular coronary stenting, is stent thrombosis, either acute or delayed, in a small number of patients. The worst consequence of stent thrombosis is acute myocardial infarction that could be fatal. To overcome stent thrombosis, many anti-platelet and anti-thrombotic agents have been developed over the past three decades. Unfortunately, serious bleeding with associated increased mortality is the undesirable consequence of all anti-platelet and anti-thrombotic drugs. To maximize the anti-thrombotic efficacy and minimize the risk of bleeding of anti-thrombotic and anti-platelet drugs have been the major challenge for researchers and manufacturers in this field. In fact, Prof. Yaling Han from China has recently published in *JAMA*, the positive results of a very important randomized clinical trial-BRIGHT, regarding the reduction of bleeding with bivalirudin monotherapy for STEMI PCI.” Prof. Lim said.

Prof. Lim believes that significant breakthrough in medical therapy should progress from major traumatic surgery to minor or minimally invasive surgery under general anesthesia, to percutaneous interventions under local anesthesia and finally to preventing and treating all kind of diseases using only drugs. Prof. Lim also recalled a slide used by Andreas Gruentzig entitled “Handy-man or medicine man?” when Andreas Gruentzig tried to prophesize the future of PTCA for the treatment of CAD in his lectures in the early 1980s.

Medical education in the East and the West

Prof. Lim holds numerous professorships in Australian, Singapore and Chinese universities. The latter includes Peking University, PUMC in Beijing, Fudan and Jiaotong Universities in Shanghai, Zhejiang University in Hangzhou and the 4th Military Medical University in Xi’an. He also founded the medical school for Xiamen University and served as its Foundation Dean. When asked about the differences of medical education between the East and the West, he thought China should change from using research

degrees such as Master and PhD as surrogates to train clinicians and focus more on bedside clinical training to create clinicians and specialists.

“In China, the training of clinical specialists still relies heavily on the publication of research papers. The education goal of medical students and postgraduates alike is to obtain Master and PhD degrees. They have to qualify with these postgraduate degrees to become clinical specialists. In the west, 90 percent of clinicians and specialists are trained with very robust and carefully planned and supervised clinical training programs that last 6-8 years. Most clinicians and specialists do not have Master or PhD degrees and their clinical careers can be very successful and fulfilling without these research qualifications.” Prof. Lim said.

However, Prof. Lim believes that research is the key to advancement in medicine and improvement in patient care. “Research, bench or bedside, is left to a minority of doctors in the West who are keen to do research and train the next generation of young doctors. The majority of doctors in the West spend most of their time and energy in getting their patients better in the best possible way. Major breakthroughs in medicine, Nobel Prize winning efforts that will affect a lot of patients is left to a very small group of bright clinician-scientists in the West. That is the difference which I can perceive in medical education and training of clinicians between the East and the West, having the privilege to work in both sides,” said Prof. Lim.

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Footnote

Conflicts of Interest: The author has no conflicts of interest to declare.

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