

Professor Bing Peng: there is no shortcut to anywhere you want to go

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Laparoscopic pancreaticoduodenectomy (LPD) is regarded as the Mt. Everest of general surgery. After nearly 20 years of endeavor, Bing Peng (*Figure 1*) has mounted the top and claimed the brightest jewel on the apex.

In the past 7 years, Bing Peng (*Figure 2*), as the director of the Minimally Invasive Hepato-bilio-pancreatic Surgery Center of West China Hospital at Sichuan University, has led his team and performed more than 380 cases of LPD and 45 cases of LPD combined with revascularization reconstruction. These achievements are impressive both in China and throughout the world.

Professor Makhmud Timerbulatov of the Bashkir State Medical University in Russia was very surprised, “It’s unbelievable. Bing Peng has just transformed an incredibly difficult surgery into a routine one!”

“Perseverance does not always guarantee success, but giving up surely leads to failure.” Adhering to this belief, Bing Peng never gives up and keeps moving forward, innovating and surpassing. “I am the stubborn type and want to accomplish the task that I have engaged in, except when there is indeed no way to go. Unless I hit a brick wall, I will not be turning back.” Holding a coffee cup in hand, Bing Peng raises his head, pupils sparkling.

Marching toward “Mt. Everest”

Pancreatoduodenectomy has been considered the most difficult operation in general surgery. On the one hand, exposing the pancreas, surrounded by an abundance of large blood vessels, is extremely complicated, and when bleeding occurs, it is very difficult to control and is prone to causing serious consequences. On the other hand, the surgical procedure is complex, not only requiring the removal of various organs including the pancreatic head, duodenum, bile duct, gallbladder and part of the stomach but also involving the reconstruction of three parts of the digestive tract.

With such a difficult operation, even open surgery is not easy to perform, not to mention operating laparoscopically. However, Bing Peng accomplished the task and became a pioneer and advocate to the formation of the second wave

of LPD in China. He simply believes that what he has done is nothing but riding the tide.

“*The tide of the world is mighty, and going with it, we will prosper, but going against it, we will suffer. Minimal invasiveness is the direction and future of general surgery, and every surgeon should go for it. This is the trend, with a huge and unstoppable momentum,*” said Bing Peng.

Bing Peng was born in Chongqing and grew up in Sichuan. He attended Suzhou University and later received a doctoral degree from West China School of Medicine, Sichuan University. In 1998, he began to learn endoscopic techniques from Professor Zongguang Zhou, a renowned endoscopic surgical expert at West China Hospital, and embarked on the journey to minimally invasive surgery.

“*When I learned laparoscopic techniques at the very beginning, I spent half a year focusing on perfecting one thing: operating the laparoscope properly.*” The laparoscope is the eyes of the doctor who performs a laparoscopic surgery, and its proper handling is the prerequisite of a smooth operation. This is also an important lesson taught to him by Professor Zhou—a lesson from which he learned rigorousness and dedication, desiring to have each of his steps solid prior to advancing.

At that time, 4 years had already passed since the world’s first case of LPD. At the beginning of the 21st century, LPD was sporadically performed in China, but due to various reasons such as equipment and operation technique, the surgery often took a long time to complete, with a high incidence of complications. By 2008, LPD operations in China were essentially stalled.

However, Bing Peng was still steadily advancing towards “Mt. Everest.” Also, in 2008, after being a chief surgeon for more than a year, Bing Peng began to focus on tackling LPD surgery, and starting from laparoscopic cholecystectomy, laparoscopic biliary tract surgery, and laparoscopic splenectomy, he gradually advanced to laparoscopic distal pancreatectomy and laparoscopic middle pancreatectomy. During this process, Bing Peng and his surgery team became increasingly well-coordinated.

“*Compared with laparotomy, LPD is like a football game and emphasizes the tacit cooperation between players. By reading the cue of the chief surgeon, such as by making eye contact,*



Figure 1 Professor Bing Peng.



Figure 2 Professor Bing Peng.



Figure 3 Professor Bing Peng conducts routine inspection rounds while at the hospital.

the assistant knows how to take position and then catches the ball.” Bing Peng explained, “a stable team with a mutual understanding of each other’s thoughts helps the team have

an edge on operation duration and incidence of postoperative complications.”

“When we thought that our endoscopic techniques in all aspects had matured, we decided to assume the challenge of LPD.”

In October 2010, Bing Peng performed the first LPD in Sichuan Province (also the first case in the entirety of China’s Western region), prompting the formation of the second wave of LPD in the country.

By continuously studying and performing LPD, Bing Peng gradually realized that compared with traditional open surgery, LPD has irreplaceable advantages: it reduces postoperative inflammation and thus exerts lower immunosuppression in patients; the technique’s magnified view is conducive to exposure of the operative field, while the laparoscope helps clearly bare blood vessels and explore the upper edge of the pancreas and retroperitoneal tissues. Therefore, LPD is superior to open surgery in dissecting lymph nodes and their surrounding connective tissues and in reducing intraoperative blood loss.

Since then, Bing Peng has continued to promote the surgery and normalization of LPD, held training workshops, and participated in writing textbooks, book chapters, guidelines, etc., as well as live-broadcasting surgery demonstrations several times throughout the country. *“In 2014, I performed a demonstration of LPD in Yunnan. The operation lasted more than 5 hours. After completion of the operation, my colleagues, while feeling refreshed, expressed the length and effect of the operation as acceptable.”*

To better develop LPD, in early 2014, Bing Peng (*Figure 3*) made a major decision to establish the Minimally Invasive Hepatopancreatobiliary Surgery Center, being transferred from the main campus of West China Hospital to the Shangjin Campus, a branch of West China Hospital. This move was strongly supported by Professor Weimin Li, President of West China Hospital.

In early 2017, an article in the *Chinese Journal of Practical Surgery* stated that for pancreatoduodenectomy, most hepatopancreatobiliary surgery centers in China mainly perform the open surgery, and very few of the centers had performed more than 100 operations via LPD, with the Minimally Invasive Hepatopancreatobiliary Surgery Center of West China Hospital as one of the “*very few*”. To date, the center has performed more than 380 LPD surgeries, being one of the top centers in terms of surgical cases as well as its handling of technical difficulties.

Bing Peng is frank about this and says, on the one hand, *“Through our own efforts, we have made some achievements and are recognized by our colleagues, which is to our greatest*

happiness.” On the other hand, it also reflects the importance of keeping with the trend of the times: *“We are just sea spray. Initially, nobody knows us, but now the tide of minimal invasiveness pushes us to the shore, making us well known.”*

“Working on innovations that have not been done by others”

If LPD is regarded as the Mt. Everest of general surgery, then LPD combined with vascular resection and reconstruction is the brightest jewel on the top of Mt. Everest.

As the director of the Minimally Invasive Hepatopancreatobiliary Surgery Center, Bing Peng performed China’s first LPD combined with a partial resection of the superior mesenteric vein + portal vein and reconstruction, and the first LPD combined with the resection and reconstruction of the superior mesenteric vein + portal vein with a prosthetic vessel replacement as well as the world’s first LPD combined with vessel resection and reconstruction using the expanded round hepatic ligament as an autologous vessel.

“It’s tough indeed, but for doctors, this is a challenge we must face.” West China Hospital, as the Medical Center of difficult and severe diseases in western China, has concentrated on patients with difficult pancreatic cancer from across the country. The tumors in these patients have often already invaded the superior mesenteric vein or portal vein, and to eradicate the tumor, a portion of the vessels must be dissected since this is the only way to ensure the long-term survival of these patients.

Successful cases in foreign countries and the capability of a solid team have given Bing Peng the confidence to take on the challenge of this difficult operation. In December 2015, Bing Peng successfully performed China’s first LPD combined with a partial resection of the superior mesenteric vein + portal vein and reconstruction on a patient with pancreatic cancer infiltrating the superior mesenteric vein and portal vein.

However, with the development of vascular resection and reconstruction surgery, new problems have emerged. For patients with a large range of tumor invasions and long blood vessel resections, it is impossible to perform end-to-end blood vessel anastomosis. *“It is like the case in which the sleeves are cut too short and cannot be joined, so a prosthetic vessel must be used to establish the connection.”* However, unlike the natural vessel in a human body, prosthetic vessels are rigid in texture, which greatly increases the difficulty of suturing.

Because of a lack of experience in laparoscopic suturing on prosthetic vessels, when performing his first case of prosthetic vessel reconstruction, Bing Peng had to switch to open surgery.

“Pick yourself up from where you’ve fallen.” After that surgery, Bing Peng immediately called in the doctors of his team to discuss why the surgery had not succeeded. It was agreed that it might be due to a problem of suturing sequence. If the suturing sequence of “hard to easy” (i.e., the end that is under and more difficult is sutured first, proceeding with the end that is above and easier to suture) is adopted, the procedure might succeed; in addition, each suture must be tightened. Building upon this lesson and discussion, in April 2016, just 1 month later, Bing Peng succeeded in performing an LPD combined with vessel resection and reconstruction with prosthetic vessels on a second patient.

“Keep thinking and keep innovating; do not always be imitating.” These are the words of Professor Hauser, Bing Peng’s mentor at the Goethe University Frankfurt School of Medicine, and the words continue to remind him. *“For me, the experience of studying abroad has been a great opening of my vision, which is to pursue a higher purpose; the ultimate goal is to strive to generate a better therapeutic outcome for patients.”*

In fact, the artificial blood vessel is not without its inherent flaws. After all, it is not natural one, so patients require long-term use of anticoagulant drugs; in addition, it is expensive: one artificial blood vessel can cost 20,000-30,000 yuan, resulting in a significant economic burden on patients.

“We have thought hard about how we can do better and are on the road to an autologous vessel.” At that point, no one in the world had succeeded in LPD using autologous tissue to reconstruct the vessel. Learning from the experience of performing open surgery in other countries and a liver transplant in West China Hospital, Bing Peng began to investigate the method using the round ligament of the liver to laparoscopically reconstruct the vessel.

“At that time, after others had performed liver surgery, we collected the separated round hepatic ligament and filled it with water, observing its expansion to see whether it was in line with what had been reported. Then, we began to prepare the surgical plan.” By the end of 2017, Bing Peng’s team successfully performed the world’s first LPD combined with portal vein and superior mesenteric vein resection and reconstruction using an autologous vessel of a hepatic round ligament on a 62-year-old patient with pancreatic head cancer invading the portal vein and superior mesenteric vein. The operation



Figure 4 Professor Bing Peng (middle) and others with the patient (second from the left).



Figure 5 Professor Bing Peng was awarded fellow of the “American College of Surgeons”.



Figure 6 Professor Bing Peng (second from the right) took a group photo with the doctors of the Bashkir State Medical University on the day of the live broadcast.

went smoothly and had only 200 mL of intraoperative blood loss (*Figure 4*).

Currently, there are only three centers capable of reconstructing vessels using artificial vessels and autologous vessels, of which the Minimally Invasive Hepatopancreatobiliary Surgery Center of West China Hospital is one. To date, the center has conducted 45 cases of LPD combined with vascular resection and reconstruction, with a postoperative 3-month mortality of zero.

Some well-known experts once said: “*Professor Bing Peng’s team has become the business card of the Department of Hepatopancreatobiliary Surgery at West China Hospital.*”

At the 2017 Clinical Congress of the American College of Surgeons, Professor Bing Peng was awarded fellow of the “American College of Surgeons” in recognition of his outstanding achievements and contributions in the field of minimally invasive hepatopancreatobiliary surgery, especially in the field of minimally invasive pancreatic surgery (*Figure 5*).

Claiming the territory for China in the field of LPD

In April 2017, Professor Makhmud Timerbulatov from the Bashkir State Medical University of Russia, who has worked for nearly 20 years in the field of general surgery and is the kind of doctor that “*patients wait in queues to see*”, visited West China Hospital. During this visit, he specifically wanted to be an assistant to Bing Peng. Why?

It turns out that in October 2016, Professor Bing Peng’s team was invited by the Bashkir State Medical University to perform two surgical demonstration sessions on LPD. Prior to the team’s arrival, the president of Bashkir State Medical University diplomatically told Bing Peng that the invitation of Bing Peng’s team to perform the surgery had placed him under tremendous pressure, and he was very worried, should serious complications occur.

On the day of surgery, a local television station live-broadcasted the operation, and the surgery went very smoothly (*Figure 6*). After surgery, the two patients recovered well and without complications, being discharged on days 7 and 8 after the surgery. The president of Bashkir State Medical University presented Bing Peng’s team with souvenirs from Bashkir State in person and highly regarded their work with a heartfelt acknowledgment.

Prof. Makhmud, who watched the entire live broadcast, was caught in complete awe. “*I have visited Johns Hopkins*



Figure 7 Professor Bing Peng speaks at the 16th World Congress of Endoscopic Surgery.

School of Medicine in the United States, which is the number one hospital in the world in the specialty of pancreatic surgery, and the surgery of LPD there often takes six to 7 hours. However, Professor Bing Peng only needs 4 hours!" This was the reason for Professor Makhmud's visit to China.

Talking about the 2-week experience of observing and assisting in LPD surgeries, Professor Makhmud admitted that the undertaking was by no means easy, as it is a very demanding task to be Bing Peng's assistant. In traditional laparoscopic surgery, an assistant stands on the left side of the patient to assume the task of operating the laparoscope and exposing the operative field, while the chief surgeon stands on the right side of the patient to perform surgical resection and suturing. For the case where the operative site is on the left, the chief surgeon has to switch positions with the assistant to complete the operation. However, in Bing Peng's opinion, this approach affects the fluency of surgery.

Therefore, Bing Peng proposed the concept of "dual operating surgeons", in which the operative tasks initially assumed by the chief surgeon are shared by the chief surgeon and the assistant. *"In theory, whoever is near the operative site and has an easier access should operate, be it resection, suturing, or other operations."*

Speaking of his assistants, Bing Peng said with a smile: *"Don't be fooled by their age; although still in their 30s, they are all capable and competent, each being able to operate independently and serve as the chief LPD surgeon."* Among his assistants, Dr. Yunqiang Cai has won second place in the national final of the 2016 National Meidao Surgery Video Contest of China.

"In fact, China's work in LPD has already been acknowledged as being at the top in the world in terms of quantity and difficulty, but Chinese doctors are absent on the list of the world's leading experts on minimally invasive hepatopancreatobiliary surgery." With some regret, Bing Peng continued, *"Maybe it*

is because Chinese doctors have not been actively participating in international academic exchanges."

In April 2018, the 16th World Congress of Endoscopic Surgery (WCES) was held in Seattle, and Bing Peng, as the only invited speaker from Mainland China in the field of minimally invasive hepatopancreatobiliary surgery, gave a talk entitled "Laparoscopic Pancreaticoduodenectomy with Major Vascular Resection: Anterior Artery First Approach", in which he introduced the surgical approaches and vessel reconstruction techniques of LPD at the Minimally Invasive Hepatopancreatobiliary Surgery Center of West China Hospital (Figure 7).

"The anterior artery first approach under laparoscope is more in line with the characteristics of laparoscopy facilitating the exposure of blood vessels, and thus, the R0 resection." Bing Peng is the first person in the world to propose this approach, and the related paper was published in *Surg Endosc*, the journal with the highest impact factor in the field of laparoscopic surgery.

Among the three cardinal sins of filial piety, "having no successor" is the biggest

Wang Chen, an academican of the Chinese Academy of Engineering, once said, *"As a director of a department, among the three cardinal sins of filial piety, 'having no successor' is the biggest."* In other words, a director's greatest dereliction of duty is not to cultivate reserve talents for the department, inexcusable not only to the hospital but also to the entire specialty and its future development. Bing Peng could not agree more. To him, this reserve includes both people of talent and technologies.

As the "big brother" of the Minimally Invasive Hepatopancreatobiliary Surgery Center, Bing Peng is undoubtedly stern. He does not tolerate "maybe" or "close to something" and wants the exact number when updated on a patient's signs or test results. For example, the numbers in blood tests, i.e., platelets, leukocytes, and the level of total cholesterol, must be precise; among tumor markers that are abnormal, the exact values of abnormal markers must be presented; and in the inspection on pancreatic fistula, a precise number must be given. *"This is very important and avoids or prevents accidents. I hate it when young doctors talk nonsense when they clearly do not know."*

Talking about the reason for this, Bing Peng admitted that when he was young, he was required to do so. *"Professor Zongguang Zhou does not tolerate talking nonsense and reprimands those who do. Over time, I have developed*



Figure 8 Professor Bing Peng being interviewed.

the habit, and after a glance at the examination results of my patients, I learn them by heart." In 2001, Bing Peng went to study in Germany, where he was rigorously trained by his mentors and has since become even more meticulously detail-oriented. *"In German laboratories, costs are not an issue, and each experiment must be done three times and then must be repeated. If the result is not repeatable, it indicates that it is not reliable. So, everybody is instilled with the rigorousness and professionalism subconsciously."*

Bing Peng said, *"I want to teach these same good habits to my students."* He believes that the so-called departmental heritage has been reflected in these casual details.

According to Bing Peng, the hope of a strong team or department relies on young people, and he is the "shoulder" on which the young people can stand. *"Standing on the platform of West China Hospital, as the director of the center, I always want to be doing something; otherwise, I feel that I'm letting these students down."*

"Frankly, the technical development of LPD is near its end. But what is the direction of the next step in development? I think that multicenter research and robotic surgery may be something we need to pay attention to, and what I need to do is to lead the young people to continuously innovate and advance," said Bing Peng.

In 2017, Bing Peng took the lead in organizing a multicenter study on LPD that involved 17 hospitals all over China, including the Huadong Hospital of Fudan University, Fudan University Attached Tumor Hospital, and Shanghai Changzheng Hospital. *"Now, we hope to come up with better data through multicenter studies to prove the superiority of LPD. In the future, we will present multinational multicenter data to convince others to trust LPD even more, so patients can benefit more from it."*

According to Bing Peng (Figure 8), a technique cannot always be in the lead position. Just as endoscopic surgeries

have become the mainstream of current surgery, in the future, robots will replace endoscopic surgeries and become mainstream, which is an unstoppable trend. At present, Bing Peng's team is working closely with domestic robot manufacturers to conduct clinical tests on domestically manufactured robots to promote the clinical applications of these robots. *"Performance-wise, domestically manufactured robots are similar to the Da Vinci Robots but are 10 times cheaper. In the future, when clinically applied, they will surely be able to provide Chinese patients with more cost-effective services."* It is told that domestically manufactured robots will be put into clinical applications as soon as 2019.

In addition, the learning curve in the use of robots to carry out LPD is short, which can accelerate the training course on LPD for young doctors. Currently, Bing Peng is also helping formulate the standards for training on the use of domestically manufactured robots, so clinicians can more easily master LPD.

"What do you want to say to young doctors?"

"Again, perseverance does not always guarantee success, but giving up surely leads to failure. I hope they continue the journey on the road of minimally invasive hepatopancreatobiliary surgery and make good use of this platform to seize the opportunity and surpass us."

Expert's introduction

Bing Peng, Professor and Chief Physician, received a doctorate degree in surgery from the West China School of Medicine, Sichuan University in July 1996 and once studied at the Goethe University Frankfurt School of Medicine in Germany. He is currently serving as the director of the Minimally Invasive Hepato-bilio-pancreatic Surgery Center of West China Hospital, Sichuan University and is member of the Laparoscopy and Endoscopy Group of the Chinese Medical Association's Surgery Branch, fellow of the American College of Surgeons (FACS), member of the International Association of Surgeons, Gastroenterologist and Oncologists (IASGO), member of the China Chapter of Minimally Invasive Surgery of IASGO, member of the Committee of the Specialty of Minimally Invasive Surgery of the Surgical Branch of Chinese Medical Doctor Association (CMDA), deputy director of the Minimally Invasive Diagnosis and Treatment Group of the Pancreatic Cancer Committee of the Chinese Anti-cancer Association, deputy director of the Minimally Invasive Diagnosis and Treatment Group on Pancreatic Diseases of the Pancreatic Diseases Branch

of the China International Exchange and Promotion Association for Medical and Healthcare, deputy director of the Committee on Abdominal Tumors of the China Medical Education Association, member of the Standing Committee of Hepatobiliary and Pancreatic Surgery of the China Medical Education Association, member of the Committee of the Endoscopic Doctors Branch of CMDA, member of the Expert Group on Pancreatic Cancer for Cancer Prevention of the Health Exchange and Cooperation across the Taiwan Straits, and member of the Robot and Laparoscopic Surgery Society of the China Research Hospital Association, as well as an editorial board member or reviewer of *World Journal of Hepatology*, *World Journal of Gastroenterology*, *Chinese Journal of Laparoscopic Surgery*, *Chinese Journal of Bases and Clinics in General Surgery*, *Journal of Laparoscopic Surgery* and *Journal of Hepatopancreatobiliary Surgery*.

Professor Bing Peng is among the first doctors in China to perform the difficult LPD and has become a pioneer and advocate in the formation of the second wave of LPD in China. In January 2014, he succeeded in performing LPD on an 89-year-old patient with pancreatic head cancer, the world's oldest, who manifested no postoperative complications and no tumor survival and experienced a high quality of life after 2 years of follow-up. He also performed China's first LPD combined with the resection and reconstruction of the superior mesenteric vein + portal vein with prosthetic vessel replacement, as well as the world's first LPD combined with vessel resection and reconstruction using the expanded round hepatic ligament as an autologous vessel. He has frequently attended large-scale international and domestic academic conferences and given presentations.

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Research achievements

He has won the certificate of surgery broadcasting of "One hundred surgeons, one hundred surgeries" during the 2015 China Surgery Week and two third-place prizes at the Science and Technology Progress Awards of Sichuan Province (of one as the PI) and has hosted or participated in six national and provincial research projects. He has published more than 50 papers in academic journals at home and abroad as the first author or a corresponding author, of which many have been cited in SCI and Medline.

Monographs

As editor and author, Professor Bing Peng has contributed to many book chapters, e.g., "Surgery", Higher Education Press, 2009, Beijing; "Guidelines to abdominal surgeries and their perioperative management", Science Press, 2010, Beijing; and "Laparoscopic Pancreatic Surgery" (Editor-in-Chief), People's Medical Publishing House, 2017, Beijing.

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Footnote

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

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