



## XIAO-PING CHEN

### A leader of reform and innovation

**During three decades of research and clinical work, Xiao-Ping Chen has made life-saving contributions to the treatment of liver, biliary and pancreatic diseases**

**X**iao-Ping Chen, president of the Asian-Pacific Hepato-Pancreato-Biliary Association (A-HPBA), is a leading innovator in surgery of the liver, pancreas and biliary system.

Born in Funan County of China's eastern Anhui Province in 1953, Chen graduated from Bengbu Medical College in 1973 and obtained a Master's degree in Surgery from Wuhan Medical College (now Tongji Medical College of Huazhong University of Science and Technology) in 1982 under the instruction of two renowned mentors — Fazu Qiu, a pioneering surgeon from China and member of the Chinese Academy of Sciences (Fig. 1), and Zaide Wu. In 1985, Chen received his Doctor of Medicine in Surgery — one of the first three scholars to receive the qualification after the introduction of a series of economic reforms by the Chinese government in the late 1970s.

Two of Qiu's teachings left an enduring mark on Chen's professional growth and have continued to guide his research and clinical work: "Be a good person, do good deeds and conduct good research" and "To be a good surgeon, one must operate well, speak well and write well." These teachings led Chen to realize that a good surgeon must perform flawless operations and provide good patient care in addition to being able to give lectures to students, deliver academic presentations, conduct research and write papers. Inspired by the words of his mentor, Chen has led an exceptional career developing techniques in the field of hepato-pancreato-biliary surgery that have helped to save the lives of many patients.

Chen completed his postdoctoral training in 1986–1987 at Heidelberg University's Department of Surgery, under the supervision of Christian Herfarth. He later accepted an offer by surgeon Josef Fischer to join the Department of Surgery at the University of Cincinnati as a visiting scholar, during which time he contributed to research on the pathophysiology of acute liver diseases.



**Figure 1.** Xiao-Ping Chen (far left) next to his supervisor and pioneering surgeon Fazu Qiu. From right: surgeon Mengchao Wu and surgeon Josef Lau with his wife.

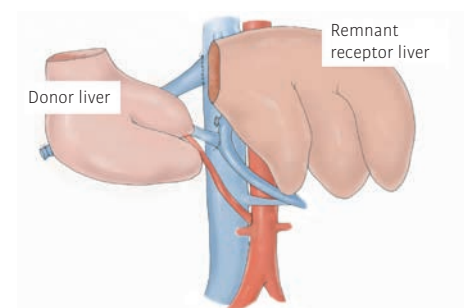
#### Liver transplants

According to a 2011 estimate, about 300,000 people in China develop end-stage liver disease each year. The only treatment available to these patients used to be whole-liver transplantation. However, many patients died due to a severe shortage of organ donors (for example, only 1,897 cases of liver transplantation were reported in China in 2011).

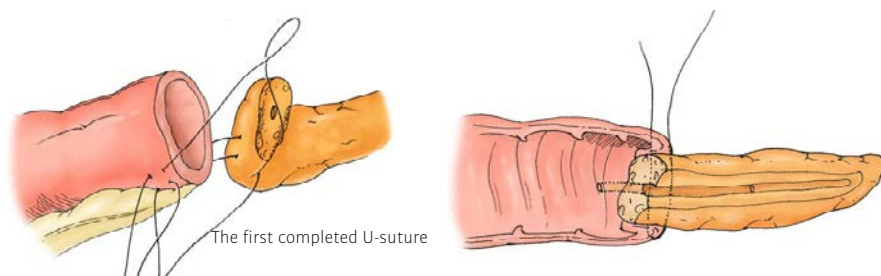
To address the shortage, Chen began to develop living-donor liver transplantation, which involves surgically removing a portion of the liver from a living donor. As this technique does not require replacing the entire liver, one donor liver can be shared between two patients, thus mitigating the shortage in donor organs.

Auxiliary liver transplantation can be used to treat some liver diseases but the success rate of these operations remained low — about 10 per cent — in the early 1980s. The primary reason for failure was that the limited space in the patient's abdomen for the donor liver required the donor liver to be placed in an abnormal position, which was detrimental to the reconstruction of blood circulation. To address this problem, in 1983 Chen developed

the first animal model for studying auxiliary partial orthotopic liver transplantation (Fig. 2). The procedure involved cutting out 40 per cent of the right liver of the canine model and transplanting a partial liver graft (37 per cent of the total donor liver) onto the recipient liver. The procedure solved the problem of space and enabled blood circulation to be reconstructed effectively. Several successful experiments and clinical applications demonstrated that the procedure was safe, effective and feasible.



**Figure 2.** In 1983, Chen developed the first canine model of auxiliary partial orthotopic liver transplantation.



**Figure 4.** Illustration of the invaginated pancreaticojejunostomy with transpancreatic U-sutures technique.

### Liver cancer

Chen has also made significant contributions in the area of liver cancer. With around 740,000 new cases diagnosed each year, China has the highest incidence of hepatocellular carcinoma, generally referred to as liver cancer. About 70 per cent of the tumours in patients diagnosed with hepatocellular carcinoma are categorized as either large (5 to 10 centimetres in diameter) or huge (larger than 10 centimetres in diameter). A prevalent belief in the medical community is that large and huge tumours cannot be removed.

In the 1980s, Chen hypothesized that while the resection of large liver tumours had proved difficult in clinical practice, the procedure was safe in theory. He noticed that in anatomic resections of equal size, which involve removing liver tissue along functional lines, less tumour-free tissue was resected for larger tumours and more tumour-free tissue was resected for smaller tumours. During that time, intraoperative blood loss from liver resection was reported to be around 2,000 millilitres and the mortality rate caused by intraoperative massive haemorrhage was about 10 per cent. Chen developed three techniques to control bleeding during liver resection: tying up of inflow and outflow vessels without dissecting the hilus of the liver; occlusion of the liver's portal triad and infrahepatic inferior vena cava; and implementation of the liver

double-hanging manoeuvre through the retrohepatic avascular tunnel on the right side of the inferior vena cava. Employing these techniques reduced intraoperative blood loss during liver resection for large and huge tumours to around 250 millilitres and caused the mortality rate to drop below 0.7 per cent.

### Biliary and pancreatic surgery

The most common form of cancer to affect the biliary tract — a system of tube-like structures that transport bile produced by the liver to the intestines — is known as hilar cholangiocarcinoma. Common strategies for surgically treating hilar cholangiocarcinoma are hemihepatectomy with caudate lobectomy or extended hemihepatectomy, a procedure that involves 60 to 80 per cent resection of the liver. However, extensive resection of the liver inevitably results in high rates of postoperative complications and mortality.

Chen noticed that 90 per cent of the resected liver tissue was normal tissue, unaffected by the malignant tumour. He hypothesized that it would be possible to reduce the amount of resected liver cells, while ensuring the removal of the entire area affected by the tumour. Through pathological studies, he identified that hilar cholangiocarcinoma are typically 1–3 centimetres in diameter, often arising at the confluence of the left and right hepatic ducts and spreading only 5–8 millimetres along the bile duct wall. The finding indicated that resection of only about 20 per cent of the liver would be necessary to treat the disease. Through clinical studies, Chen discovered that small-volume liver resection significantly lowered postoperative rates of complication and mortality and obtained similar long-term treatment outcomes compared to more extensive liver resection.

Another common challenge in hepatobiliary surgery is related to the surgical procedure known as biliary-enteric anastomosis performed on small bile ducts. This type of procedure has quite a low success rate, especially when several small bile duct openings need to be connected, or anastomosed. Following numerous experiments, Chen established an inserting biliary-enteric anastomosis technique (Fig. 3) and applied

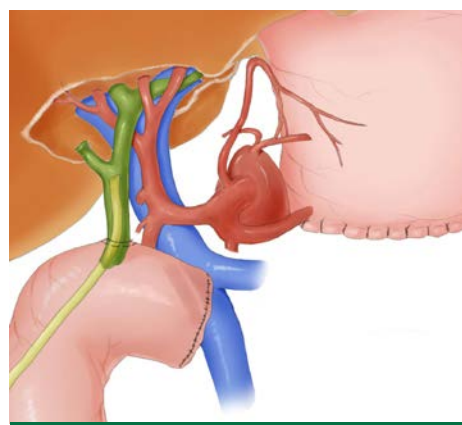
it to auxiliary partial orthotopic liver transplantation and the reconstruction of the biliary tract when bile ducts are accidentally injured during a prior biliary surgery. He later improved this technique by performing biliary-enteric anastomosis without stitching the anterior wall of the bile ducts — a useful modification for complex biliary operations, especially for the reconstruction of the biliary tract after central hepatectomy during hilar cholangiocarcinoma treatment.

Chen's achievements extend beyond the liver to the pancreas as well. Pancreatoduodenectomy is the most effective therapy for treating malignant tumours at the head of the pancreas, the lower common bile duct and the duodenum of the small intestine. A critical procedure in this operation is known as pancreaticojejunostomy, which currently involves time-consuming and complex stitching. The procedure is associated with a high incidence of pancreatic fistula (up to 16 per cent of cases report the complication), which usually leads to postoperative mortality. In this regard, Chen established a procedure described as invaginated pancreaticojejunostomy with transpancreatic U-sutures (Fig. 4), which requires only two to four stitches and saves significant time with reliable effects. The real magic of the technique comes from the 'automatic' insertion of the pancreatic stump into the intestinal lumen simply by pulling the U-suture stitches — a process that cannot be achieved using any other pancreaticojejunostomy technique. The innovation has proved to be a breakthrough for pancreatoduodenectomy and pancreaticojejunostomy.

The work of a surgeon has never been easy, but in his over 30 years of involvement in the field, Chen has established himself as a great surgeon. Motivated by the belief that reform and innovation are crucial to the development of hepato-pancreato-biliary surgery, he has gained great respect and honour among communities of surgeons around the world. An honorary fellow of the American Surgical Association since 2011 and an honorary professor of the University of Insubria in Italy since 2013, Chen has twice been appointed as an executive council member of the International Hepato-Pancreato-Biliary Association (IHPBA), and has been holding the positions of president of the Chinese Chapter of the IHPBA for ten continuous years and president of A-PHPBA since 2013. Chen is without a doubt a leading international figure in surgery of the liver, pancreas and biliary system. ♦

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**Figure 3.** Illustration of the inserting biliary-enteric anastomosis technique that Chen developed to improve the success rate of the procedure.