# Evaluation of the differences between the surgical robot made in China and the da Vinci surgical robot based on the three-dimensional printed models of pancreaticojejunostomy

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## Objective

The study aimed to compare the results of the existing surgical robot made in China (MicroPort surgical robot) and da Vinci surgical robot based on 3D printed models of pancreaticojejunostomy(PJ) to evaluate the differences between the two types of surgical robots, and to eliminate the anatomical differences and ethical issues caused by in vivo experiments.

## Methods

A training protocol and a series of 3D printed models for PJ of surgical robots were designed, including the training box, the pancreas, the jejunum with mesenteric, the stomach and the surrounding organs which were all made with 3D printing technique. The pancreas was designed with the empty pancreas duct to inject the water simulating pancreatic fluid, so as to evaluate whether there was anastomotic fistula after completing PJ and calculate the anastomosis rate. The failure of the anastomosis would be founded, if the water failed to enter jejunum through the anastomosis when it was injected into the pancreatic duct. By cutting jejunum, the tearing of pancreatic duct, suture location and anastomosis between the pancreas and jejunum could be further evaluated.

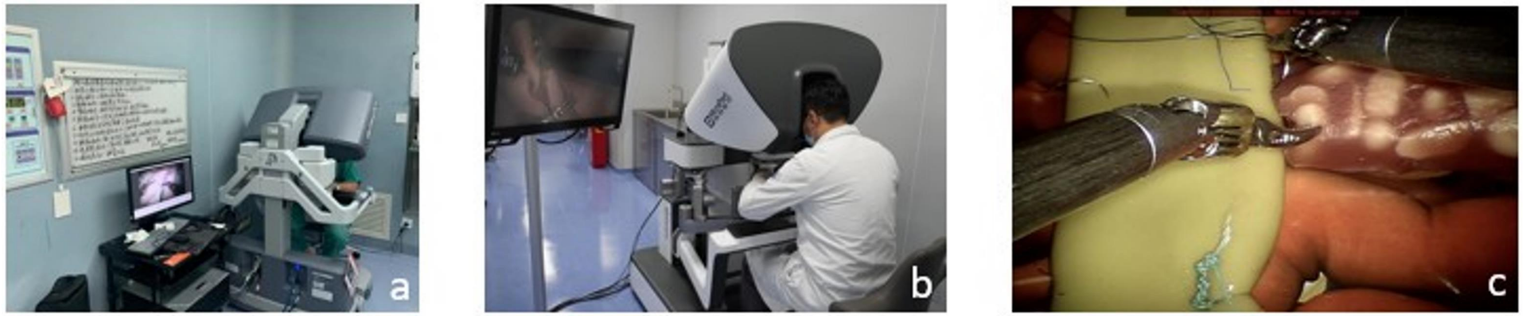



Fig 1.Surgical robot system and operation simulation
a. The da Vinci surgical robot. b. The MicroPort surgical robot. c. operation simulation based on 3D printed models of pancreaticojejunostomy

Several surgeons with same specialty and levels of expertise in surgery were enrolled in the training. They completed PJ by using Blumgart technique on the surgical robot made in China and da Vinci surgical robot respectively. Record their performance and total operation time, evaluate the anastomosis and review their views on the two types of surgical robots, e.g. sense of operation, convention, etc. Evaluate the differences between the two surgical robots by analyzing these data comprehensively.

## Future Directions

Evaluate the differences between the surgical robot made in China (MicroPort surgical robot) and da Vinci robot in different robot-assisted surgeries by designing kinds of series of 3D printed models to simulate various surgical operations, such as bilioenterostomy, hiatal hernia repair, Nissen fundoplication, and so on; Reduce the trial-and-error cost, shorten the learning curve and improve the surgical skills by using 3D printed models to train on surgical robots.

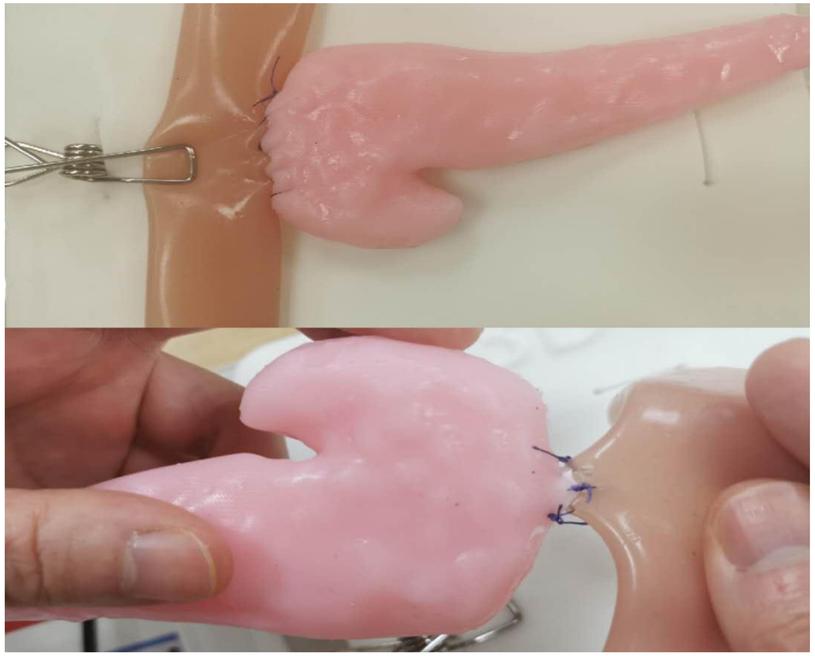


Fig 2. 3D printed models of pancreaticojejunostomy