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# Long-sleeve-working-port assisted laparoscopic pancreaticoduodenectomy—A new technique in laparoscopic surgery

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## ABSTRACT

**INTRODUCTION:** Advances in technology and instruments have made laparoscopic pancreaticoduodenectomy (LPD) feasible. Unfortunately, this operation is technically very challenging and it is not widely accepted by laparoscopic surgeons.

**PRESENTATION OF CASE:** A 59-year-old woman underwent LPD using a newly invented long-sleeve-working-port (LSWP) for a mucinous cystadenoma of the head of pancreas. This case report describes this port and its use on this patient.

**DISCUSSION:** LSWP is a new invention to facilitate difficult laparoscopic operations. Through this LSWP, ordinary instruments used in open surgery can be used to overcome the limitation encountered in conventional laparoscopic surgery.

**CONCLUSION:** LSWP made complex laparoscopic surgery less complex.

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## 1. Introduction

Since the first description of the minimally invasive approach to the abdominal cavity by Bernheim in 1911 [1], laparoscopic surgery has now advanced to represent the gold standard in many surgical procedures such as cholecystectomy and colorectal surgery. The complex anatomy and the high technical skills required in hepatopancreatobiliary (HPB) surgery remain a hurdle to popularize laparoscopic surgery in this surgical field. The main technical limitations are the two dimensional view and loss of tactile sensation using long laparoscopic instruments. As a consequence, difficulties exist in laparoscopic surgery to provide adequate 3-dimensional visualization for meticulous manipulation of tissues, good haemostasis and safe anastomoses, especially pancreatic-enteric anastomoses in a patient with a non-dilated pancreatic duct [2,3].

In September 2014, we came up with an idea of using a long-sleeve-working port (LSWP) in laparoscopic surgery to facilitate a difficult operation. Through this LWSP, ordinary instruments used in open surgery can be inserted to carry out dissection, transection, suturing and anastomosis. This is a case report on using this LSWP to facilitate laparoscopic pancreaticoduodenectomy (LPD).

## 2. Case report

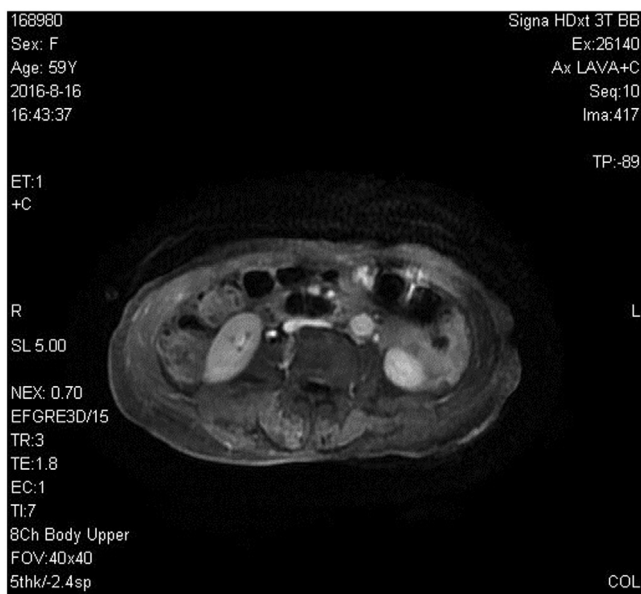
A 59-year-old woman presented to us with vague upper abdominal discomfort for one month. Her blood tests were normal. Magnetic resonance imaging showed a  $3.4 \times 4 \times 4$  cm mass with mixed solid and cystic components in the head of pancreas. The pancreatic duct was 3 mm in diameter. There was no evidence of lymphadenopathy and vascular involvement (Fig. 1).

Under general anaesthesia with muscle relaxation and endotracheal intubation, the patient was put in a supine position with her legs spread apart. Pneumoperitoneum was created using a Veress needle. The ports were inserted as shown in Fig. 2. A 10 mm port at the periumbilical region was for the camera assistant. A 12 mm port on the right midclavicular line and a 5 mm port on the right subcostal region were for the first assistant. A 10 mm port on the left midclavicular line and a 10 mm port on the left subcostal region were for the operating surgeon. When the LSWP was required, the latter port was replaced by the LSWP after extension of the wound so that the operating surgeon could insert an ordinary instrument used in open surgery through it to assist in the operation using his dominant right hand. The operating surgeon stood on the left side of the patient with the first assistant on the right and the second assistant in between the legs of the patient.

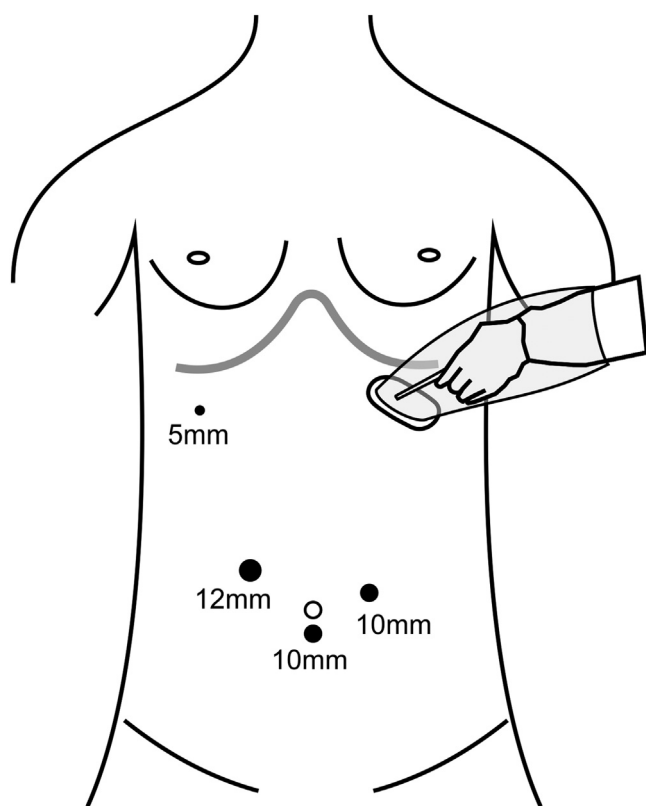
The abdominal cavity was inspected to rule out peritoneal and liver metastases. The gastrocolic ligament was opened to gain access to the lesser sac. The right colic flexure was mobilized and lowered. Kocher's manoeuvre was then carried out to expose the anterior of the inferior vena cava and the abdominal aorta. A tunnel was established between the anterior surface of the portal vein

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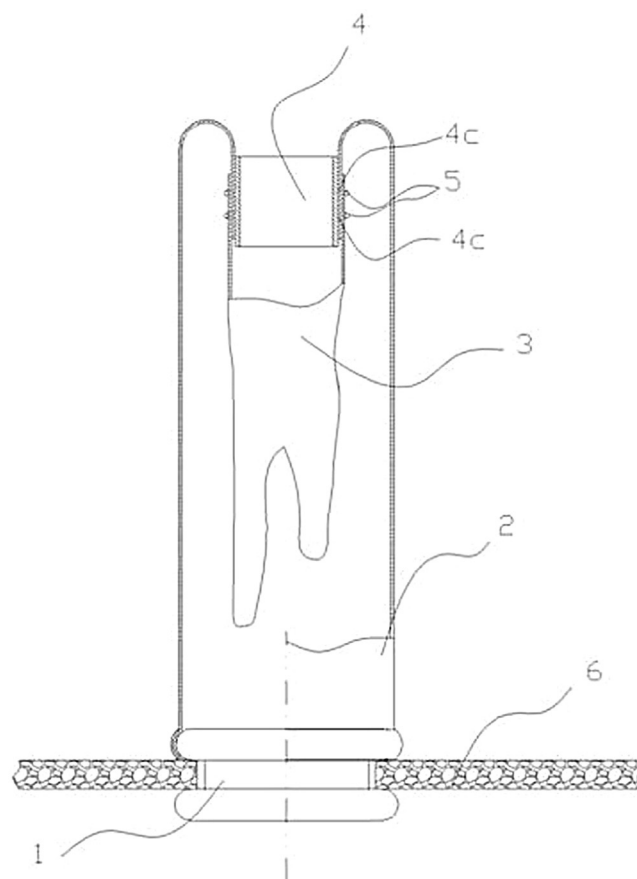


**Fig. 1.** MRI scan showing a mass with solid and cystic components in the head of the pancreas.



**Fig. 2.** Positions of the ports.

and the posterior surface of the pancreatic neck by blunt dissection. Conventional LPD was then carried out. The resected specimen, which contained the head of pancreas, the duodenum, the common bile duct and the gallbladder, was put into a bag and was taken out of the abdominal cavity by extending the port site on the left subcostal region by 5 cm. The LSWP was then put into place in this incision.



**Fig. 3.** The long-sleeve-working-port. 1. retractor, 2. long sleeve, 3. Gloved hand of the surgeon, 4. ring put on the wrist of the surgeon, 4c. the groove of the ring for binding, 5. the terminal of the sleeve being bound on the ring, 6. the abdominal wall.

### 3. Composition of the LSWP

The LSWP consists of a retractor, a long sleeve and a ring. This is now commercially available (manufactured by Suyun Medical Co., Jiang Su, PR China).

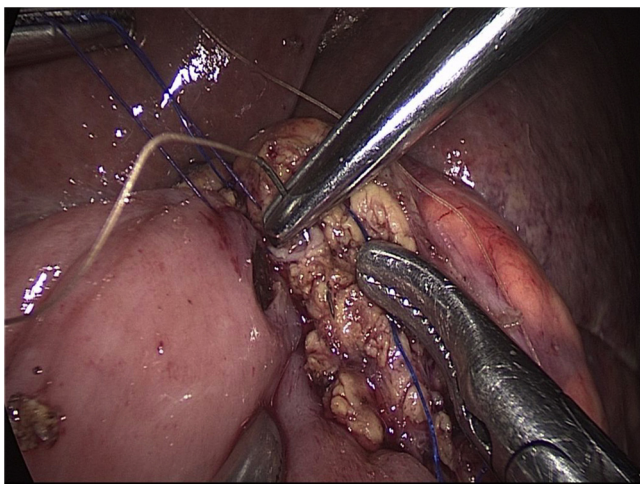
First, the retractor was fixed onto the incision. This retractor is connected to a transparent plastic long sleeve through which the right hand of the operating surgeon carrying an operating instrument used in open surgery was inserted. A ring was then put onto the surgeon's wrist to fix the long sleeve around the wrist (Fig. 3). Thus, the LSWP and the abdominal cavity were sealed off to prevent gas leak. The surgeon can use any ordinary instrument used in open surgery to continue with the operation (Fig. 4).

In this patient, the pancreaticojejunostomy was performed in a side-to-end manner. The posterior wall of the pancreas was sutured to the seromuscular layer of the jejunum using a continuous 4-0 prolene suture. The pancreatic duct was sutured to a small mucosal opening of the jejunum using interrupted 5-0 Vicryl. A transjejunal stent was inserted across the anastomosis (Fig. 5). The anterior wall of the pancreas was sutured to the jejunum using continuous seromuscular 4-0 prolene sutures. Hepaticojejunostomy was carried out using a single layer of interrupted 4-0 Vicryl. The gastrojejunostomy was completed with a stapler. Two drainage tubes were inserted, one at the back of the hepaticojejunostomy and another at the back of the pancreaticojejunostomy. The operative time was 495 min and the intraoperative blood loss was 100 ml. No blood transfusion was required in the perioperative period.

The patient recovered well from the operation. There was no pancreatic fistula. She was discharged home on postoperative day



**Fig. 4.** The surgeon's hand holding an ordinary needle holder of open surgery through the LSWP.



**Fig. 5.** A stent put across the pancreaticojejunostomy.

9. Histopathology showed a mucinous cystadenoma with atypical hyperplasia.

#### 4. Discussion

The first case of LPD was reported by Gagner and Pomp in 1994 [4]. Since then, LPD has been reported from some specialized centers [5,6]. Technical difficulties in LPD have made this operation very challenging, even to experienced laparoscopic surgeons, and this operation cannot be popularized [7–11]. There are many technical hurdles to overcome in carrying out a complex major surgery. The long instruments used in laparoscopic surgery not only lose tactile sensation of the surgeons, but also decrease dexterity and magnify tremor [12,13]. Furthermore, the 2 dimensional image in laparoscopic surgery requires not only good eye-head coordination of a surgeon, but also a mental reconstruction of a 3 dimensional image. As pancreaticojejunostomy is a complex anastomosis which requires precise suturing movements, no wonder why surgeons consider LPD as technically difficult and a significant proportion of surgeons has stopped performing it.

LSWP is a new invention that we introduced into LPD to facilitate this operation. An incision of about 5 cm is required in the left subcostal area through which the resected specimen in a plastic bag can be retrieved from the abdominal cavity. The LSWP is then installed onto this wound. Through the LSWP, any ordinary instruments for open surgery can be used to assist in laparoscopic surgery. The LSWP can be considered as a conical projection from the small incision made in the abdominal wall to retrieve the specimen. The diameter of the inner ring of the retractor is 10 cm. Care must be taken in the initial operation to avoid putting trocars and ports in this area of 10 cm.

In this patient, an ordinary needle holder used in open surgery was used to reconstruct all the anastomosis. The relatively short needle holder made suturing and knot tying easily. With the magnified view of the camera system used in laparoscopic surgery, precise stitching was accomplished easily and quickly even in this patient with a pancreatic duct of 3 mm in diameter.

Although robotic assisted surgery overcomes many of the limitations of conventional laparoscopic surgery by enhancing dexterity of a surgeon, improving on the non-dominant hand performance and allowing delicate tissue dissection and precise intracorporeal suturing [14–18], robotic surgery has the disadvantage of increased costs [19–21] and lack of tactile sensation [22]. This LSWP has the advantages of robotic assisted surgery but without its disadvantages.

#### 5. In conclusion

Although LPD is still considered by most surgeons to be a complex procedure requiring high-level skills, the LSWP made the operation less complex and an ordinary instrument used in open surgery was used to carry out the difficult anastomoses.

#### Conflicts of interest

All authors have no conflicts of interest.

#### Sources of funding

There is no financial support for this study.

#### Ethical approval

Approval has been obtained from the Ethics Committee of The First People's Hospital of Foshan, PR China.

#### Consent

Written consent has been obtained from the patient concerned.

#### Author contribution

Chen Ying Jun: study design, data collections, data analysis, writing.

Lau Wan Yee: writing.

Zhen Zuo Jun: data collections.

He Yin Tao: data collections.

#### Guarantor

Chen Ying Jun, Lau Wan Yee.

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