First Fully Robotic Whipple's Surgery Using Hugo™ Robot-Assisted Surgery System: A Case Report and Technical Insight

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INTRODUCTION

The Whipple procedure (pancreaticoduodenectomy) remains the gold standard for treating periampullary cancers. Conventionally, the surgery has been associated with high morbidity. Robot-assisted surgery is minimally invasive and offers increased precision, dexterity, and recovery. Here, we report the first fully robotic Whipple's Surgery using the Hugo™ Robot-Assisted Surgery (RAS) system.

CASE REPORT

A 66-year-old male presented with incidentally detected ampullary adenocarcinoma, which was diagnosed during the evaluation of left abdominal flank pain due to left ureteric calculus. Ultrasound revealed a dilated common bile duct (CBD) and bilobar intrahepatic biliary radical (IHBR) dilatation, besides left ureteric calculus. Biopsy from the ampulla suggested it to be High Grade Dysplasia with tiny foci of Well differentiated adenocarcinoma. Tumor markers were normal.

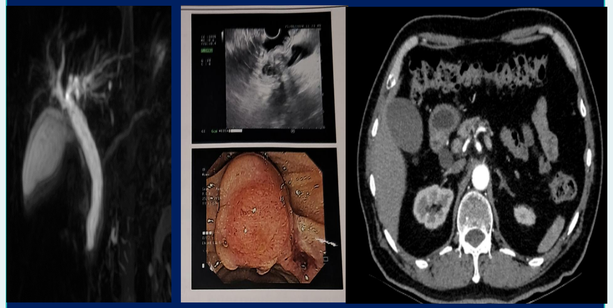


Fig.1: MRCP showing a grossly distended CBD (13mm) with abrupt tapering of its distal end

Fig.2: Endoscopic ultrasound showing GB microliths, dilated CBD (14mm) and bulky ampulla.

Fig. 3: CECT showing mild central intrahepatic biliary radical dilatation, with CBD (15 mm) with an ill marginated enhancing focal lesion measuring 20 x 15 mm in the periampullary region with distal CBD narrowing and proximally dilated CBD. Few sub-centimetric peripancreatic lymph nodes.

METHODS

Position supine with legs split. Port positions and docking :

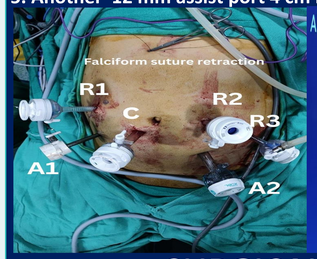
1. 12 mm camera port 2 cm below and slightly to right (arm 2).

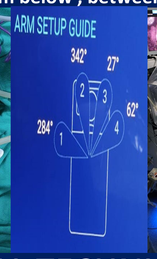
2. 8 mm ports at right (arm 1) and left (arm 3) midclavicular line 4-5 cm cranial to camera port and 2 cm above umbilicus (left and right arm).

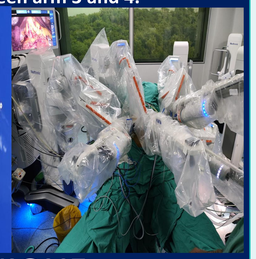
3. 8 mm port for 4th arm in left lumbar region.

4. 5mm assist port 4 cm below, between arm 1 and 2.

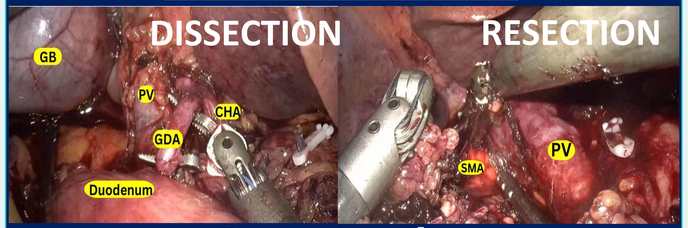
5. Another 12 mm assist port 4 cm below , between arm 3 and 4.



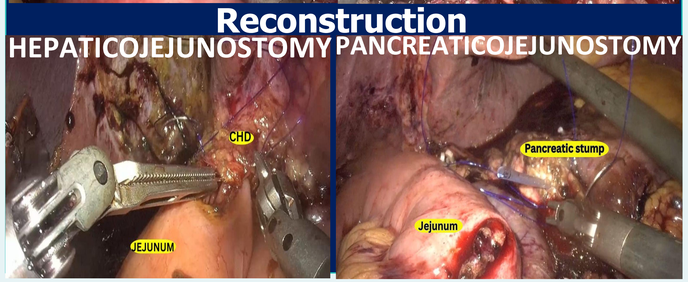




SURGICAL TECHNIQUE



Reconstruction



OUTCOMES

Operative

- Duration of Surgery: 12 hours
- Blood loss: 400 ml
- Recovery uneventful. Extubated on the same day. Jejunal feeding was initiated on POD1, with per oral liquids on POD2 and soft diet on POD4 and Discharged on POD7, without any complications of pancreatic fistula, haemorrhage, gasric emptying.
- Because of high Fistula risk score, Octreotide was continued for 7 days (7/10 High Risk. Pathology 1+, Parenchyma 2+, PD 2 mm 3+, Blood loss 1+).

Pathological

Histopathological report showed a stage pT2N0/14, (size1x1x0.6 cm) polypoidal tumor WD Adenocarcinoma pancreaticobiliary type in the periampullary region (invades into muscularis propria, limited to duodenum), LN 14 free, Margins free (Proximal: 3.5 cm, Distal : 2 cm, CBD : 6.5 cm, Pancreatic : 6 cm, SMA (uncinate): 4 cm, Anterior pancreas: 1 cm, Posterior pancreas: 2 cm, SMV (vascular bed/groove): 6 cm. LVI, PNI-ve. Positive CK7 and MUC-1 and negative CDX2, CK20 and MUC2.

Oncological

Adjuvant Gemcitabine- Cisplatin chemotherapy for two cycles was given. However, at short term follow up CECT abdomen at 6 months showed no evidence of disease.

DISCUSSION

- Open Whipples procedure, while effective and standard, comes with significant patient morbidity, including delayed recovery, extended hospital stays, and increased risk of wound infections. The laparoscopic approach is even more technically demanding and has a long learning curve. Robotic surgery, however, holds promise due to superior optics, dexterity, and safety.
- Till date, Intuitive's Da Vinci Si and Xi systems only have been employed for Whipples procedure worldwide, and has been proven oncologically equivalent to open and laparoscopic approaches with superior short term outcomes. Korean Revo I is the other system used.
- The Hugo™ RAS system is an advanced open robotic platform that incorporates enhanced ergonomics, visualization, and control. The fully robotic approach to Whipple's Surgery offers greater dexterity, especially during the SMA dissection and the crucial pancreaticojejunal anastomosis, which are the two Achilles heels.
- This is the first report of the Robotic Whipple's procedure using the Hugo™ RAS system in the world and provides evidence of its safety and feasibility. The ability to perform such a complex surgery with minimal blood loss and no major complications highlights the potential benefits of this robotic system in complex oncological procedures.

REFERENCES

1. Kornaropoulos M et al. Total robotic pancreaticoduodenectomy: a systematic review of the literature. Surg Endosc. 2017 Nov;31(11):4382-4392. doi: 10.1007/s00464-017-5523-z. Epub 2017 Apr 7. PMID: 28389798.
2. Liu R et al. International consensus guidelines on robotic pancreatic surgery in 2023. Hepatobiliary Surg Nutr. 2024 Feb 1;13(1):89-104. doi: 10.21037/hbsn-23-132.
3. Peters BS, Armijo PR, Krause C, Choudhury SA, Oleynikov D: Review of emerging surgical robotic technology. Surg Endosc 2018; 32: pp. 1636-1655.
4. Kim JS, Choi M, Hwang HS, Lee WJ, Kang CM. The Revo-i Robotic Surgical System in Advanced Pancreatic Surgery: A Second Non-Randomized Clinical Trial and Comparative Analysis to the da Vinci™ System. Yonsei Med J. 2024 Mar;65(3):148-155.