Case Report

Modified Transperitoneal Ports Configuration Technique and Docking with the da Vinci Surgical System Xi for Combined Pancreaticoduodenectomy and Right Partial Nephrectomy

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ABSTRACT

A 68-year-old man with ampullary cancer and clear cell renal cell carcinoma of the kidney underwent a combined robot-assisted laparoscopic pancreaticoduodenectomy and right partial nephrectomy. We report a combined robot assisted surgery for both procedures done at the same setting.

Introduction

Previous cases of robotic partial or radical nephrectomy have been performed with other minimal invasive procedure in one single session.

To the best of our knowledge, we present the first case of combined robotic assisted laparoscopic Whipple’s procedure with right partial nephrectomy in the same setting.

History

This is a 68-year-old Chinese male who presented with painless obstructive jaundice. His body mass index is 21. Liver function test showed total bilirubin 103 micromol/L, alkaline phosphatase of 246 unit/litre, alanine transaminase 243 unit/litre and aspartate transaminase of 86 unit/litre. CA 19-9 was within normal range; 25.9 unit/ml. A CT chest, abdomen and pelvis showed dilated pancreatic duct and both intrahepatic and extrahepatic bile duct with thickening of in the periamputillary region. There was also an incidental 2.2 x 1.8 cm exophytic soft tissue lesion over the upper pole of right kidney suspicious of renal cell carcinoma. There were no lung metastases.

Further investigation with a magnetic retrograde cholangiopancreatography (MRCP) showed a calibre transition at the level of the ampulla. He subsequently underwent an endoscopic ultrasound which revealed a hypoechoic mass from ampulla of Vater with invasion of muscularis propria layer. Biopsy of the mass revealed an invasive adenocarcinoma. In this report, we demonstrate the feasibility of performing a combined pancreaticoduodenectomy and renal sparing surgery in the same setting using the da Vinci Xi® (Intuitive Surgical, Sunnyvale, CA, USA).

Methods

This operation was carried out in three main stages; Pancreatectoduodenectomy for resection of ampullary tumour, followed by right partial nephrectomy, and reconstruction of pancreaticoduodenectomy.

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I Pancreaticoduodenectomy: Resection of Tumor

The patient was placed in a 20-degree reverse Trendelenburg position with gentle tilt to the left. Patient’s arms were positioned at his side (Figure 3). The boom of the robot patient-side cart was then rotated to enable docking from the left side of patient.

The 8 mm robotic ports were placed 8cm apart along the horizontal level of umbilical line at right anterior axillary line, right mid-clavicular line, infraumbilicus, and left anterior axillary line. Additional 12mm laparoscopic port was inserted to the left mid-clavicular line to assist the surgery (Figure 4). Pneumoperitoneum was maintained at 12 mmHg. During resection, the robot prograsp was connected to R1, robot fenestrated bipolar to R2, endoscope to R3, and robotic harmonic scalpel to R4.

II Partial Nephrectomy

Following resection pancreaticoduodenectomy, the robot was undocked. No repositioning of patient was required. The operating table was tilted to 70 degrees right side up [1]. Additional three ports were added as shown in (Figure 2) [2, 3]. Infraumbilical port was converted to a 10/12 assistant port. Another 5mm port placed in midline just below xiphoid sternum for liver retraction. Targeting was done at the upper pole of right kidney where the lesion to facilitate rotation of boom over patient’s shoulder towards patient head before the robotic arm were docked.

Partial nephrectomy performed as described below. Right ureter was identified and traced towards hilum and renal artery and vein were isolated. Margins of the tumour were confirmed using a laparoscopic ultrasound. Renal artery was clamped with a laparoscopic bulldog clamp and the tumour was excised with cold scissors. Renorrhaphy was performed in 2 layers with barbed sutures and Vicryl 3/0 using the sliding hemolock technique. Arterial control was released, and suture line inspected prior to closure of perinephric fat around renorrhaphy site.

III Pancreaticoduodenectomy: Reconstruction

The patient was repositioned to the previous position. Pancreateojejunostomy (PJ) was then reconstructed with Blumgurt technique using...
Polydioxanone suture (PDS) 3-O sutures for transpancreatic stitch and Prolene 6-O sutures for duct to mucosa reconstruction. Hepaticojejunostomy (HJ) was reconstructed with PDS 5-O continuously to the posterior wall and interruptedly to the anterior wall. A loop of jejunum was then anchored to the stomach antecolically 50 cm from the HJ, the gastrojejunostomy (GJ) anastomosis was then performed extracorporally via a short midline incision made for removal of specimens. Two abdominal drains were kept over the anastomotic site.

Results

The estimated blood loss was 150mls. The postoperative hemoglobin was 11.0g/dl which remained stable during his recovery and no blood transfusion was required. Post-operatively, his recovery was otherwise uneventful, and he was discharged on post-operative day 9. The final histology of the pancreaticoduodenectomy and the right partial nephrectomy revealed a moderately differentiated ampullary adenocarcinoma, pathologic stage T4 N1 with negative margins and a clear cell renal cell carcinoma Fuhrman grade 2, pathologic stage T1a with negative margins respectively. At 7 weeks post operatively, he was started on adjuvant chemotherapy TS-ONE (Tegafur, Gimeracil, Oteracil) by the medical oncologist. A repeat CT chest abdomen pelvis at 3 months showed no recurrence.

Table 1: Duration of each phase of operation.

| Phase Description                        | Duration              |
|------------------------------------------|-----------------------|
| Total operative time                     | 12 hours 40 minutes   |
| Csole time for Whipple’s resection       | 5 hours               |
| Console time for RAPN                    | 2 hours 30 minutes    |
| Console time for Whipple’s reconstruction (PJ and HJ) | 3 hours          |
| Warm ischaemia time for RAPN             | 17 minutes            |

Discussion

There have been many combined minimally invasive procedures reported in the literature. In 2007, Finley performed a combined robot-assisted laparoscopic nephroureterectomy and radical prostatectomy [4]. In 2009, Manish et al. reported the first case of robot assisted laparoscopic combined partial nephrectomy with radical prostatectomy performed in a single session [5]. In 2010, Lavery et al. performed a combined robotic radical prostatectomy and radical nephrectomy in a single setting [6]. In the following year, Lavery performed robotic radical prostatectomy combined with a right hemicolectomy [7]. Subsequently, there has been more reports of combined robot assisted radical prostatectomy and partial nephrectomy done in a single setting [8-12]. Kim J et al. reported that it is feasible for distal gastrectomy to be done concurrently with partial nephrectomy with good outcomes [13].

In 2014, S Pisipati et al. reported a case series of robotic combined radical cystectomy and nephroureterectomy in 5 cases and a case of robotic combined nephroureterectomy and radical prostatectomy. There were no complications of Clavien Grade 3 and greater in their series and length of stay was reduced from 13 days to 10 days [14]. A large robot-assisted laparoscopic pancreatic surgery by single-surgeon experience was reported by Giulianotti et al. concluded that it is feasible and safe. Complication and mortality rates are comparable to those of open surgery but with the advantages of minimally invasive surgery [15]. To our knowledge, this is the first report on a case of concomitant pancreatic and renal tumour which successful underwent a robot assisted laparoscopic partial nephrectomy and pancreaticoduodenectomy procedure.

With the described procedure as above, we have demonstrated that it is safe, potentially reducing operative costs especially when it comes to robotic surgery as it is done in a single setting without compromising in patient’s outcome. With the adjustment of 3 extra robotic ports, both procedures could be safely performed without the need for patient repositioning. Both hepatobiliary surgeon and urologist involved in this operation were fellowship trained in robotic surgery. In this case, the advantage of using the da Vinci Xi® compared to the older system is the addition of the boom, which allows the robotic arms to extend and rotate, hence facilitate docking from multiple angles.

Conclusion

We report our technique of combined robot-assisted partial nephrectomy and pancreaticoduodenectomy without the need for patient repositioning is safe and feasible.

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