OUR EXPERIENCE OF LAPAROSCOPIC PANCREATODUODENECTOMY IN TUMORS OF THE PERIAMPULLARY ZONE

Tileuov S.T.[1], Dzhumabekov A.T.[2], Baimakhanov B.B.[1], Doskhanov M.O.[1], Chormanov A.T.[1], Teipov Sh.M.[3], Askeev B.T.[1]

[1]National Scientific Center of Surgery named after A.N. Syzganov, Almaty, Kazakhstan,
[2]"Kazakhstan Medical University "KSPH", Almaty, Kazakhstan,
[3]Kazakh National Medical University named after S.D. Asfendiyarov, Almaty, Kazakhstan

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Tileuov S.T.
orcid.org/0000-0003-1786-0720
Dzhumabekov A.T.
orcid.org/0000-0002-3502-4411
Baimakhanov B.B.
orcid.org/0000-0003-0049-5886
Doskhanov M.O.
orcid.org/0000-0003-0167-9863
Chormanov A.T.
orcid.org/0000-0003-1683-2963
Teipov Sh.M.
orcid.org/0000-0003-2376-0355
Askeev B.T.
orcid.org/0000-0002-3695-7811

Author for correspondence:
Tileuov S.T. *- surgeon, National Scientific Center of Surgery named after A.N. Syzganov, Almaty, Kazakhstan,*
e-mail: surgeonserik1985@mail.ru

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The authors declare that they have no conflicts of interest

Keywords:
pancreatoduodenectomy, laparoscopic, pancreaticojejunoanastomosis, consistency of pancreas, diameter of pancreatic duct

Abstract

The purpose of research is to determine the feasibility of laparoscopic pancreatoduodenectomy in tumors of the periampullary zone.

Material and methods*. In the period from 2016 to 2022 at the Syzganov National Scientific Center of Surgery, 193 patients underwent PD with a diagnosis of a tumor of the periampullary zone. Of these, 6 patients were performed laparoscopically. All patients who underwent LPD were female. The age of the patients ranged from 15 to 77 years (average age – 55,7 years).*

Results*. In 4 (66.7%) patients, cancer of Ampulla of Vater was detected, in 2 (33.3%) pancreatic head cancer. According to the final histology data, adenocarcinoma and the degree of differentiation G2 were detected in all cases. Data on the histology and size of the tumor are summarized in Table 1. The average age of patients was 55.7 years. All patients had a clinic of mechanical jaundice before surgery; the average levels of bilirubin in the blood were 121.3 mmol/l. Accordingly, all patients underwent drainage of the biliary tract. Of these, 5 (83.3%) patients underwent percutaneous stenting and 1 (16.7%) endobiliary stenting.*

Conclusion*. Thus, we presented our initial experience of performing laparoscopic PD. Our results shows the feasibility of laparoscopic PD safely and radically for tumors of the periampullary zone in certain cases. The accumulation of experience in such interventions leads to an improvement in immediate results and a reduction in postoperative complications, the operative time.*

Периампулярлық аймақ ісіктерінің лапароскопиялық гастропанкреатодуоденалды резекция жасау тәжірбиеміз

Тілеуов С.Т.[1], Джумабеков А.Т.[2], Баймаханов Б.Б.[1], Досханов М.О.[1], Чорманов А.Т.[1], Теипов Ш.М.[3], Аскеев Б.Т.[1]

[1]А.Н. Сызғанов атындағы Ұлттық ғылыми хирургия орталығы, Алматы қ., Қазақстан,
[2]«ҚДСЖМ» Қазақстан медицина университеті, Алматы қ., Қазақстан,
[3]С.Д. Асфендияров атындағы Қазақ Ұлттық медициналық университеті, Алматы қ., Казақстан.

Хат алысатын автор:
Тілеуов С.Т. *– дәрігер-хирург, А.Н. Сызғанов атындағы Ұлттық ғылыми хирургия орталығы, Алматы қ., Қазақстан,*
e-mail: surgeonserik1985@mail.ru

Мүдделер қақтығысы:
Авторлар мүдделер қақтығысының жоқтығын мәлімдейді

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Тұжырым

Жұмыстың мақсаты. *периампулярлық аймақ ісіктері үшін лапароскопиялық ГПДР орындылығын анықтау.*

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пациентке ГПДР жасалды. Оның ішінде 6 науқасқа лапароскопиялық жолмен жасалды. Лапароскопиялық ГПДР жасалған барлық науқастар әйелдер болды. Науқастардың жасы 15-тен 77 жас аралығында болды (орташа жасы – 55,7 жас).

Нәтижелер. *Науқастардың 4-де (66,7%) үлкен емізікшесінің қатерлі ісігі, 2-де (33,3%) ұйқы безі басының қатерлі ісігі анықталды. Гистологияның соңғы деректеріне сәйкес, барлық жағдайларда аденокарцинома және G2 дифференциация дәрежесі анықталды. Ісіктің гистологиясы мен мөлшері туралы мәліметтер 1-кестеде келтірілген. Пациенттердің орташа жасы 55,7 жасты құрады. Операцияға дейін барлық науқастарда механикалық сарғаю клиникасы байқалды; қандағы билирубиннің орташа деңгейі 121,3 мкмоль/л құрады. Бүкіл науқастарға өт жолдарын дренаждау операциялары жасалды. Оның ішінде 5 (83,3%) науқаска тері-бауыр арқылы холангиостомия және 1 (16,7%) науқасқа эндобилиарлы стенттеу жүргізілді.*

Қорытынды. *Осылайша, біз лапароскопиялық ГПДР бойынша алғашқы тәжірибемізді ұсындық. Біздің нәтижелеріміз белгілі бір жағдайларда периампулярлық аймақ ісіктерінде лапароскопиялық ГПДР-дің қауіпсіз және түбегейлі орындылығын көрсетеді. Мұндай оталарды жасауда тәжірибеніарттыру, нәтижелердің жақсаруына және операциядан кейінгі асқынулардың, операцияның ұзақтығының төмендеуіне әкеледі.*

Наш опыт лапароскопической гастропанкреатодуоденальной резекции при опухолях периампулярной зоны

Автор для корреспонденции:
Тилеуов С.Т. – *врач-хирург, ННЦХ имени А.Н. Сызганова, г. Алматы, Казахстан, e-mail: surgeonserik1985@mail.ru*

Тилеуов С.Т.[1], Джумабеков А.Т.[2], Баймаханов Б.Б.[1], Досханов М.О.[1], Чорманов А.Т.[1], Теипов Ш.М.[3], Аскеев Б.Т.[1]

[1]Национальный научный центр хирургии им. А.Н. Сызганова, г. Алматы, Казахстан,
[2]Казахстанский медицинский университет “ВШОЗ”, г. Алматы, Казахстан,
[3]Казахский Национальный медицинский университет имени С. Д. Асфендиярова, г. Алматы, Казахстан

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Аннотация

Цель работы: *определить целесообразность лапароскопической ГПДР при опухолях периампулярной зоны.*

Материалы и методы. *В период с 2016 по 2022 г. в Национальном научном центре хирургии им. А.Н. Сызганова 193 пациентам была выполнена ГПДР с диагнозом – опухоль периампулярной зоны. Из них 6 пациентам операция была выполнена лапароскопическим путем. Все пациенты, перенесшие ЛГПДР были женского пола. Возраст больных варьировал от 15 до 77 лет (средний возраст – 55,7 лет).*

Результаты. *У 4 (66,7%) пациентов был выявлен рак БДС, у 2 (33,3%) - рак головки поджелудочной железы. Согласно окончательным данным гистологии, во всех случаях была выявлена аденокарцинома со степенью дифференцировки G2. Данные о гистологии и размере опухоли сведены в таблицу 1. Средний возраст пациентов составил 55,7 лет. У всех пациентов до операции наблюдалась клиника механической желтухи; средние уровни билирубина в крови составляли 121,3 мкмоль/л. Соответственно всем пациентам было выполнено дренирование желчных путей. Из них 5 (83,3%) пациентам дренирование было выполнено чрескожным путем и 1 (16,7%) - эндобилиарное стентирование.*

Заключение. *Таким образом, мы представили наш первичный опыт выполнения лапароскопической ГПДР. Наши результаты подтверждают тезис об осуществимости лапароскопической ГПДР безопасно и радикально при опухолях периампулярной зоны при определенных случаях. Накопление опыта таких вмешательств приводит к улучшению непосредственных результатов и уменьшению послеоперационных осложнений, длительности операции.*

Ключевые слова:
гастропанкреатодуоденальная резекция, лапароскопическая, панкреатикоеюноанастомоз, консистенция поджелудочной железы, диаметр панкреатического протока

Introduction

Pancreatic cancer (PC) is one of the most aggressive cancers, with about 9% of an overall 5-year survival rate. In 2020, more than 57,000 new cases are expected in the United States, which is estimated to lead to more than 47,000 deaths [1]. In recent years, the incidence of PC has increased, and it is expected that by 2030, PC will be one of the leading causes of cancer mortality [2, 3]. Unfortunately, due to the late manifestation, only 15-20% of patients are candidates for surgery [1]. Approximately 60-70% of pancreatic adenocarcinomas occur in the head of the pancreas, and the rest is found in the body (15%) and tail (15%) [4].

Pancreatoduodenectomy (PD) is a classical surgical procedure for the treatment of benign and malignant tumors in the pancreatic head, terminal part of the common bile duct, duodenum and the ampulla of Vater [5, 6]. For the first time, successful PD was reported by Whipple in 1935 for the treatment of a periampullary tumors [7], however, this procedure became widely used only since 1990 due to previously high mortality. Despite the ongoing development of treatment, PC remains one of the most difficult tumors for treatment and the five-year survival rate reveals less than 10% [8].

The minimally invasive method, after two decades of its introduction into clinical practice, is becoming increasingly popular in pancreatic surgery, mainly due to increased experience in this field and the availability of new technologies [9-12]. Minimally invasive surgery is used more often than conventional surgical operations due to the achievement of comparative satisfactory oncological results, reduction of postoperative pain, decrease usage of narcotic analgesics and decrease hospital stay [13].

The world's first laparoscopic PD (LPD) experience was described in 1994 by Gagner M, Pomp A. [14]. LPD has become increasingly popular among surgeons in the last decade [15-18]. Despite the breakthrough in this field and the positive aspects of laparoscopic surgery, most centers and surgeons try not to apply this method of surgical treatment, due to possible complications, technical difficulties, the need for experienced surgeons in laparoscopic interventions [19]. Several studies have been published, including three randomized controlled trials (RCTs) with inconclusive results of the relative advantage of LPD over open PD (OPD) [20-22].

A long operation time is one of the disadvantages of the laparoscopic method, which was revealed in a number of comparative analyses of OPD and LPD [23]. In general, the increased experience in LPD, standardization of operational procedures and mutual understanding between the surgical team, contributes to reducing the operation time after 10 cases of LPD [24]. Wang et al. reported that the duration of the operation before 50th case was 8.1 hours, after 50th case was 5.4 hours and after 250th case was 4.7 hours [25]. Kenrick et al. in their observations reported that the operation time decreased on average from 7.7 hours in the first 10 patients to 5.3 hours in the last 10 [26].

The use of a full laparoscopic approach to PD has recently become widespread all over the world, and it is beginning to be considered largely applicable [27,28]. It has been shown that a total LPD is feasible and safe and provides a number of potential benefits, including lesser blood loss, need for blood transfusion, stay in the intensive care unit and hospital stay compared to OPD [29].

In Kazakhstan, the first PD was performed in 1980 in the Syzganov National Scientific Center of Surgery by Professor Aliyev M.A. and Seisembaev M.A. Over the past 5 years (2016-2022), 193 PD have been performed at the Syzganov's National Scientific Center of Surgery. The first LPD was performed in 2019 at the Syzganov's National Scientific Center of Surgery (Professor Baimakhanov B.B.).

The main purpose of this article is to determine the feasibility of laparoscopic PD in tumors of the periampullary zone.

Materials and methods

In the period from 2016 to 2022 at the Syzganov National scientific center of surgery, 193 patients underwent PD with a diagnosis of a tumor of the periampullary zone. LPD was performed in 6 patients. All patients who underwent LPD were female. The age of the patients ranged from 15 to 77 years (mean age – 55.7 years).

We analyzed the clinical characteristics of patients (age, gender, tumor localization, CA 19-9, pancreatic consistency, pancreatic duct diameter and histopathological diagnosis), intraoperative data (operation time, number of removed lymph nodes and intraoperative blood loss) and postoperative data (postoperative pancreatic fistula, bleeding and relaparotomy, hospital stay).

Preoperatively, all patients underwent a laboratory, instrumental methods of examination and abdominal contrast enhanced computed tomography.

Indications for LPD were the following: tumor size less than 2.5 cm without metastasis and invasion into superior mesenteric and portal vein. Patients with hard gland and a dilated pancreatic duct were also included to indications for LPD, which are considered as good conditions for reconstruction. Exclusion for LPD were: severe pancreatitis of the body and tail, the presence of a concomitant disease in the patient (cardio-respiratory), age above 70 years, the history of open abdominal surgery, a soft gland and a small diameter of the pancreatic duct, which complicate reconstruction. Preoperatively, all patients had undergone drainage of the bileduct.

Table 1.
Preoperative characteristics, intraoperative and histopathological data of patients who underwent LPD

Preoperative characteristics	Number of patients n=6
Gender	
Male	-
Female	6 (100%)
Age	55,7 (15-77)
Localization of tumors	
Head of pancreas	2 (33,3%)
Ampulla of Vater	4 (66,7%)
Preoperative drainage of the biliary tract	
PTBD	5 (83,3%)
Endobiliary stenting	1 (16,7%)
CA 19-9, U/ml	198±987
Texture of pancreas	
Hard	5 (83,3%)
Soft	1 (16,7%)
Tumor size, cm	1,9 (1,4 – 2,7)
Diameter of pancreatic duct, mm	
≤5	2 (33,3%)
>5	4 (66,7%)
Number of removed lymph nodes	19 (16-21)
Type of tumor	
Adenocarcinoma	6 (100%)
Others	-

Surgical technique and postoperative management

The position of the patient on the operating table on his back with legs spread by 40 degrees with the head end lifted. The position of the operator is between the legs, assistants are on the sides. First of all, under the umbilicus, a Veress needle is used to insufflate CO2 into the abdominal cavity.The location and number of trocars are the key principles of the operation (Figure 1). An optical trocar (C) with a diameter of 10 mm is inserted along the middle line, 2 cm below the umbilicus. 2 trocars (B, D) are placed in the mesogastric region at the umbilicus level along the mid-clavicular line, one 12-millimeter trocar in the left side and the second 10-millimeter trocar in the right side, which are used by the operating surgeon. The remaining 2 trocars (A, E) are installed in the mesogastric region 2 cm above the umbilicus level along the anterior-axillary line, 5 mm trocars in the right and left sides, which are used by assistants. A 30-degree tilt was used for the optical system.The changing positions of the trocars varied depending on the stage of the operation. During the mobilization, ports A, B, D are mainly used by the surgeon. When mobilizing the duodenum by Kocher maneuver, the surgeon use ports A, B. When performing pancreaticojejunoanastomosis, the optical port is C, the surgeon use ports B, D. During hepaticojejunoanastomosis, the optics is changed to port D, and the surgeon use ports E, C, as shown in Figure. 1.

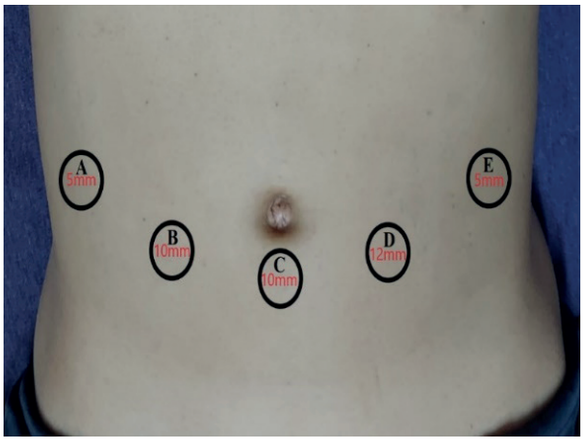

Figure 1.
Placement of trocars for laparoscopic PD

After the introduction of the first port, an examination of the abdominal cavity and liver is carried out to exclude any metastases. The lesser sac is opened with excision of the gastrocolic ligament using ultrasonic scissors. The left gastro-omentum vessels are preserved, while the right ones are intersected. Then the common hepatic artery (CHA) is mobilized by removing the lymph nodes that are located around the artery (8a and 8p group lymph nodes). The gastroduodenal artery (GDA) is isolated, which is also cleared from lymphatic tissues, then clipped (usually 2 clips are left on the stump of the GDA) and intersected. At this stage of the procedure, the anterior surface of the portal vein (PV) is mobilized and exposed, just above the neck of the pancreas. Next, lymph dissection is performed in the area of the hepatoduodenal ligament (group 12) and along its proper hepatic artery (group 12a).

Then a cholecystectomy is performed and lymph nodes along the common bile duct (group 12b) are removed. The common hepatic duct is dissected with scissors just above the site of the introduction of the cystic duct. After that, lifting the portal vein, lymph node dissection is performed behind the portal vein (group 12p). Then the duodenum is mobilized by Kocher to the level of the horizontal part with the exposure of the inferior vena cava (IVC) and to the beginning of the superior mesenteric artery (SMA). Then the superior mesenteric vein (SMV) is identified along the lower edge of the pancreas and a tunnel is formed between the posterior surface of the pancreas and the PV, SMV. The duodenum is pulled back to release the horizontal part from the Treitz ligament. Then, pulling the duodenum, lymph node dissection is performed behind the head of the pancreas (group 13) and the upper mesenteric vessels (group 14). Then the small intestine is mobilized, the mesentery vessels are coagulated and intersected before the ligament. Further, at a distance of 25 cm from the Treitz ligament, the jejunum is intersected with a laparoscopic stapler (Endo Gia 40, purple cartridge).

Then the stomach is intersected at the level of the antrum with a laparoscopic stapler (Endo Gia 60, purple cartridge). The pancreas in the isthmus is dissected with ultrasound scissors and the main pancreatic duct is dissected with scissors, as shown in Figure 2. The specimen is placed in a container for further removal. Then the specimen is removed through an infraumbilical trocar with an expansion of the incision to 3-4 cm.

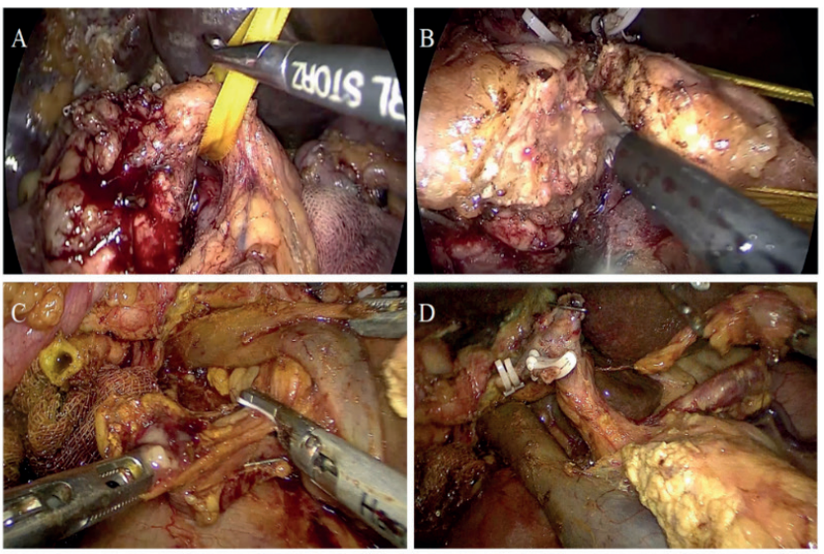

Figure 2.
Stages of the operation: A - The formation of a tunnel between the pancreas and the portal vein; B - The transection of the main pancreatic duct and the pancreatic parenchyma; C - The stage of lymph node dissection; D - The final view after lymph node dissection

Reconstructive phase:

Anastomoses are formed sequentially on one loop of the small intestine: pancreaticoejunoanastomosis (PJA), hepaticojejunoanastomosis (HJA) and gastroenteroanastomosis (GEA). In PJA with a diameter of the main pancreatic duct less than 5.0 mm, stent drainage is left.

In laparoscopic PJA, as in open PJA method, a double-row anastomosis of the "end to side" type between the pancreatic duct and the mucous membrane of the small intestine is formed.

In modified Blumgart PJA, our technique is begun with the imposition of a transpancreatic U-shaped suture. The first suture is located higher in the upper edge of the pancreas. The suture is applied to the entire thickness through the pancreas from the front to the back wall. Then a suture is applied to the small intestine through the serous-muscular layer, followed by transfixation of the pancreas to the entire thickness from the posterior to the anterior in a U-shaped form. Then, nodular sutures are applied separately between the posterior wall of the pancreas and small intestine in the amount of 2-3 sutures. After that, a second transpancreatic U-shaped suture is applied to the lower edge of the pancreas, as indicated above. Then a small enterotomy is performed opposite the pancreatic duct and a stent is inserted into the jejunum through it. Ductal-mucosal PJA is created in the same way as with traditional Blumgart anastomosis (Figure 3).

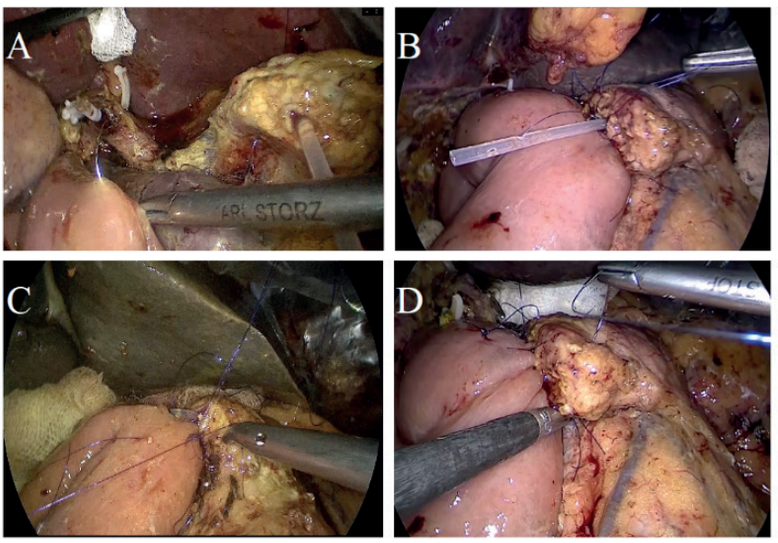

Figure 3. Laparoscopic ductal-mucosal pancreaticojejunoanastomosis "end to side" with the stent drainage: A - The suture of the posterior wall of the anastomosis with U-shaped sutures; B - The formation of the posterior wall of the anastomosis and the installation of a stent into the pancreatic duct; C - The suture of an anastomosis between the pancreatic duct and the mucosa of the small intestine; D - The final type of superposition of PJA

The end-to-side HJA is performed with a continuous running 5-0 PDS suture at a distance of about 15-20 cm from the PJA, as shown in Figure 4. The posterior and anterior walls of the anastomosis are stitched with continuous sutures according to the principle of vascular technique. During the application of a continuous suture on the front wall, the sutures are not stretched. After application, continuous suture are carefully stretched and tied.

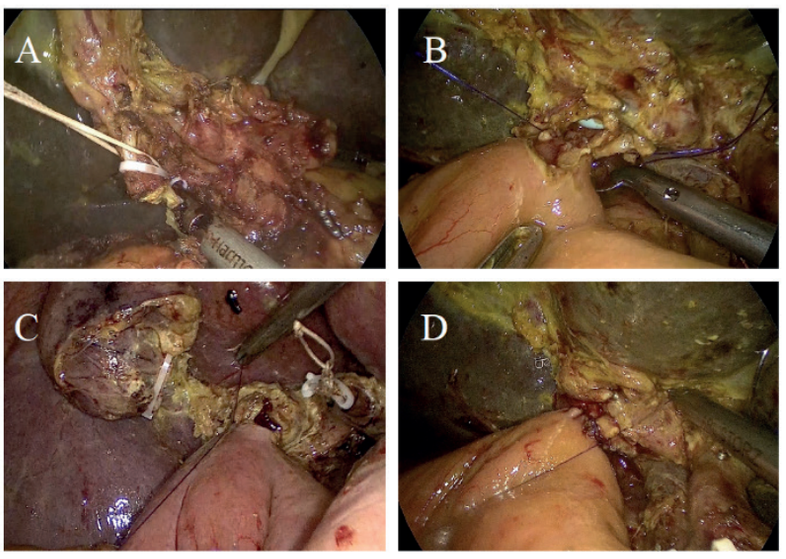

Figure 4. The stage of laparoscopic hepaticojejunoanastomosis "end to side" with a continuous running suture: A - The transection of common hepatic duct; B - The suture of the posterior wall of the anastomosis; C - The suture of the anterior wall of the anastomosis; D - The final type of HJA overlay

At the stage of formation of GEA "side by side" anastomoses, we use two methods: manual method through mini-laparotomy access and intracorporal in total LPD.

1. When performing an anastomosis by manual method, the anastomosis is performed through a mini-laparotomy access. A small incision is made in the epigastric region with a length of 4-5 cm, from where the specimen is removed and anastomosis is applied by the traditional method, as shown in Figure 5.

2. When performing a total LPD, the anastomosis is performed by the intracorporal method. First, holes for a laparoscopic linear stapler are made on the wall of the stomach and small intestine. Then, using a linear stapler with a diameter of 60 mm (Covidien) with a purple cartridge, an anastomosis is performed by the post-rim method, as shown in Figure 5.

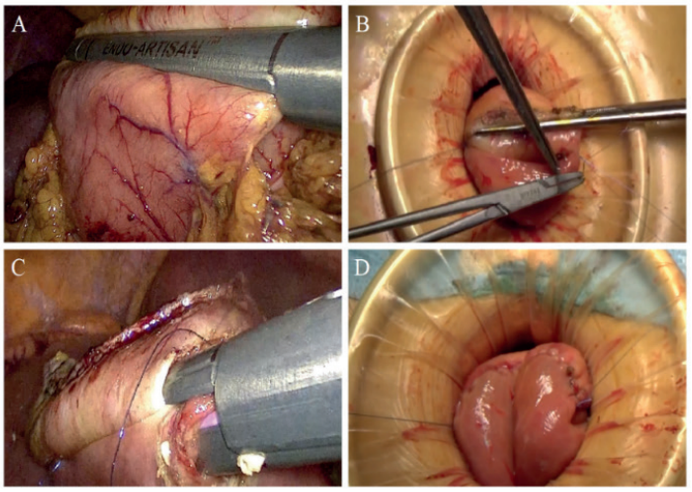

Figure 5.
The stage of applying gastroenteroanastomosis:
A - Dividing the stomach with a stitching device; B - The imposition of GEA by manual method through mini-laparotomy access; C - The imposition of laparoscopic intracorporeal GEA with a linear stapler; D - The final type of GEA by manual method via mini-laparotomy access

In the postoperative period, nasogastric and urinary catheters were removed from all patients on the 2nd postoperative day, unless additional problems arose. Oral alimentation was started on the 3rd day under normal conditions. The level of drainage amylase was measured on the 3rd and 5th postoperative days. Prophylactic octreotide was administered subcutaneously and continued regularly for three days after surgery.

Statistical analysis

Statistical analysis was carried out using the Microsoft Excel 2010 package (Microsoft, USA). Arithmetic mean and standard deviations (M±SD) were calculated to describe quantitative data. Absolute and relative (%) values were calculated for the analysis of qualitative data.

Results

In 4 (66.7%) patients, cancer of Ampulla of Vater was detected, in 2 (33.3%) pancreatic head cancer. According to the final histology data, adenocarcinoma with the degree of differentiation G2 was detected in all cases. Data on the histology and size of the tumor are summarized in Table 1. The mean age of patients was 55.7 years. All patients had a clinic of mechanical jaundice before surgery; the mean levels of bilirubin in the blood were 121.3 mmol/l. Accordingly, all patients underwent drainage of the biliary tract. Of these, 5 (83.3%) patients underwent percutaneous stenting and 1 (16.7%) endobiliary stenting. All LPD were performed using standard surgical techniques. Intraoperative data are shown in Table 2.

Mean operative time was 480 minutes. Depending on the consistency of the pancreas, the hard gland mainly prevailed in 5 (83.3%) patients and soft in 1 (16.7%). In 4 cases GEA was performed by mini-laparotomy access and in 2 cases was completed total laparoscopically. No additional trocars were required to complete the operation. No intraoperative transfusions were performed.

Intraoperative data and complications	OPD (n = 187)	LPD (n = 6)	p-value
Operation time (min.)	380 (260 – 600)	480 (390 – 660)	ns
Hospital stay (days)	17 (11–34)	11 (8–17)	ns
Blood loss (ml)	240 (180 - 1500)	130 (40 - 350)	ns
Pancreatic fistula	6 (3.2%)	1 (16,7%)	ns
Delayed gastric emptying	9 (4.8%)	-	-
Bleeding	8 (4.2%)	1 (16.7%)	ns
Re-operation	6 (3.2%)	1 (16.7%)	ns
Wound infection	11 (5.9%)	-	-
Hospital mortality	5 (2.7%)	-	-

Table 2.
Comparison of intraoperative data and complications of patients who underwent PD, n=193, from 2016 to 2022

Mean blood loss was 130 ml. Mean hospital stay was 11 days. Conversion to open surgery was required for only 1 patient, where there was a significant inflammatory process in the area of the head of the pancreas. In all cases, R0 resection was achieved. Number of removed lymph nodes was 19.

A postoperative complication was observed in 1 (14.3%) patient in the form of intra-abdominal erosive bleeding, which required repeated surgery. Hospital mortality was not observed.

Discussion

Laparoscopic PD is considered one of the most difficult surgical interventions, which is associated with the imposition of multiple and complex anastomoses [23]. A long operative time is one of the disadvantages of the laparoscopic method, which was revealed in a number of comparative analyses of OPD and LPD [23]. Gagner M, Pomp A. described the world's first LPD experience in their work [14]. It has also been shown that LPD has the following problems: long operative time and increased postoperative morbidity compared to open surgery [14]. In general, the increased experience of working in the LPD, standardization of operational procedures and mutual understanding between the surgical team, contributes to reduction in operation time [24]. Wang et al. and Kendrick et al. in their observations reported that, with the accumulation of experience, the operative time was reduced [25, 26].

Over the past few years, there has been an opinion that laparoscopic approaches can be safely used for almost all typical operations when they are performed by highly qualified surgeons [30]. A comparison of the results of OPD and LPD showed the advantage of the laparoscopic method associated with a decrease in blood loss; the frequency of wound complications and a shorter hospital stay [31]. Historically, the first LPD was performed in 1994 by Gagner M. et al. [14]. They published a series of 10 cases in which the average work time was 8.5 hours and the conversion rate was 40%, and concluded that the benefits of LPD are questionable [32].

The emergence in recent years of robotic surgery for pancreatectomies has provided a viable alternative to open and laparoscopic methods [33]. It has been shown that robotic PD provides advantages over laparoscopy, such as reduced blood loss and shorter hospital stay in the postoperative period [34], and also provides greater stability and accuracy of handling the instrument [35]. The operation of robotic laparoscopy is less physically stressful, avoids prolonged fixation of the position and provides an ergonomic position [36]. The potential advantages of robotic assistance, such as additional maneuverability and precision of movements, can be offset by the disadvantage of the lack of tactile feedback, especially in patients with a soft, loose pancreas or a thin anastomosis [37]. Buchs et al. studied 44 patients with RPD and 39 patients with OPD and found significantly shorter operative time (444 minutes compared to 559 minutes, $p = 0.0001$) and reduced blood loss (387 ml compared to 827 ml, $p = 0.0001$) in the robotic group compared to the open group [38].

World experience shows that there is no significant effectiveness of LPD, but some indicators are improving, such as: no wound complications, less blood loss, reduced average hospital stay, reduced postoperative pain, improved quality of life. The long operative time decreases with the accumulation of experience and large numbers of performed LPD. In our work, we also did not reveal the effectiveness of LPD, the statistical difference between LPD and OPD. This may be due to a small amount of cases. In the future, with an increase in the number of operations, especially laparoscopic, perhaps then we will determine the data on the effectiveness of LPD.

For the first time, Dokmak et al. [39] showed a high incidence of complications with the laparoscopic approach with poor selection of patients, a significant increase in grade C pancreatic fistulas and postoperative bleeding. For the author, the selection of patients is mandatory, especially for obese patients and for patients with a high risk of developing pancreatic fistula [39].

Based on this, we also believe that a good selection of patients is needed for the laparoscopic approach, adhering to the following factors: the tumor size is less than 2.5 cm without signs of metastases, without invasion in the superior mesenteric vein and portal vein. Also, indications were considered as a hard gland and a wide pancreatic duct, which are considered to be good conditions for reconstruction.

Pancreatic fistulas are the most common complication that leads to high morbidity and mortality after both open and laparoscopic PD [40-42].

Adhering to the clear indications for the implementation of LPD in our work, the hard gland mainly prevailed in 5 (83.3%) patients and soft in 1 (16.7%). One patient who had a soft gland developed a pancreatic fistula of class C in the postoperative period. After that, this patient had postoperative bleeding, which required a relaparotomy. According to literature data, pancreatic fistulas after pancreatoduodenal resection occur in up to 5-30% of cases in world practice [44].

To reduce the frequency and complications of anastomosis, several techniques have been studied, including pancreatogastrostomy, ductal-mucosal anastomosis, invagination pancreatojejunostomy or the use of octreotide. However, none of them showed a clear advantage [45-48].

To date, in world practice, the long operative time for LPD is considered the most discussed issue. In the initial stages, during the LPD, a long operative time is revealed, associated with the complexity of the operation itself and in the imposition of several anastomoses. But world experience shows that with the accumulation of experience and an increase in the number of LPD, the operative time decreases. Wang et al. reported that the operative time before the 50th case was 8.1 hours, after the 50th case 5.4 hours and after the 250th case was 4.7 hours [25]. In our work, the operative time averaged 8 hours. We believe that with an increase in the number of LPD, operative time will be decreased.

Conclusion

We presented our initial experience of performing laparoscopic PD. Our results show the feasibility of LPD for tumors of the periampullary zone in certain cases. The accumulation of experience in such interventions leads to improvement in immediate results and reduction in both postoperative complications and operative time.

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