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Robotic pancreatic resection. Personal experience with 105 cases

Ressecção pancreática robótica. Experiência pessoal com 105 casos

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ABSTRACT

Objective: the first robotic pancreatic resection in Brazil was performed by our team in 2008. Since March 2018, a new policy prompted us to systematically employ the robot in all minimally invasive pancreatic surgery. The aim of this paper is to review our experience with robotic pancreatic resection. **Methods:** all patients who underwent robotic pancreatic resection from March 2018 through December 2019 were identified. Descriptive data were collected. Preoperative variables included age, sex, and indication for surgery. Intraoperative variables included operative time, bleeding, blood transfusion. **Results:** 105 patients underwent robotic pancreatectomy. Median age was 60.5 years old. Fifty-five patients were female. 51 patients underwent robotic pancreatoduodenectomies, 34 distal pancreatectomy. Morbidity was 23.8%, mainly related to postoperative pancreatic fistula and one death occurred (mortality of 0.9%). Three patients (2.8%) were converted to open surgery. Four patients had delayed gastric emptying and two presented bleeding. Twenty-four patients had pancreatic fistula that was treated conservatively with late removal of the pancreatic drain. No patient required percutaneous drainage, reintervention or hospital readmission. **Conclusions:** the robotic platform is useful for the reconstruction of the alimentary tract after pancreatoduodenectomy or after central pancreatectomy. It may increase the preservation of the spleen during distal pancreatectomies. Pancreas sparing techniques, such as enucleation, resection of uncinate process and central pancreatectomy, should be used to avoid exocrine and/or endocrine insufficiency. Robotic resection of the pancreas is safe and feasible for selected patients. It should be performed in specialized centers by surgeons with experience in both open and minimally invasive pancreatic surgery.

Keywords: Pancreas. Minimally Invasive Surgical Procedures. Robotic Surgical Procedures. Review.

INTRODUCTION

Minimally invasive surgery has been increasingly used in the last three decades. However, minimally pancreatic operations were slowly implemented, due to the anatomic complexity of the organ, its retroperitoneal location, and the high post-operative morbidity due mainly to the digestive enzyme-rich secretions the prancreas produces[1,2].

Our experience with laparoscopic pancreatic resection began in 2001 with benign or low-grade neoplasms, followed by more complex procedures such as central pancreatectomy and pancreatoduodenectomies[3]. The first robotic pancreatic resection in Brazil was performed by our team in 2008[4]. However, the high-cost and the absence of specific instruments for this complex procedure halted its use in our center for 10 years. Since March 2018, with the development of new instruments, acquisition of a new robotic platform (Da Vinci Xi System, Intuitive Surgical, Inc., Sunnycale, CA, USA), and a new hospital policy with marked cost reduction for the use of the robotic system, prompt us to systematically employ the robot in all minimally invasive pancreatic surgery.

The aim of this paper is to review our personal experience with robotic pancreatic resection since the implementation of this new policy.

METHODS

A retrospective review of a prospectively database was performed. All patients who underwent robotic pancreatic resection from March 2018 through December 2019 were identified. Descriptive data were collected. Preoperative variables included age, sex, and indication for surgery. Intraoperative variables encompassed operative time, bleeding and blood transfusion. Diagnosis, tumor size and margin status were determined from final pathology reports. Pancreatic fistula was assessed and graded according to the International Study Group on Pancreatic Fistula recommendations.

Ethics committee approval number is 3.975.324.

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Preoperative assessment

A variety of imaging modalities were used for assessing pancreatic lesions, including ultrasonography (US), computed tomography (CT), magnetic resonance imaging (MR) and endoscopic US. The use of relevant clinical information and key radiologic features were essential for adequate lesion characterization, and differentiation, and therefore for surgical planning. Preoperative workup included MR and endoscopic US for most patients.

Surgical technique

Patient positioning and port placement

The patient is placed in a supine position and 30º reverse Trendelenburg position. Technique for robotic pancreatic resection uses five trocars and their anatomic insertion site is usually the same regardless of the type of procedure (Figure 1). Pneumoperitoneum is created by an open technique and pneumoperitoneum is stablished at 14mmHg. The surgeon is seated at the robotic console and the assistant surgeon stands at the bedside. The assistant surgeon performs retraction, suction, clipping, stapling and change of the robotic instruments. The robotic system is placed by the patient's left flank.

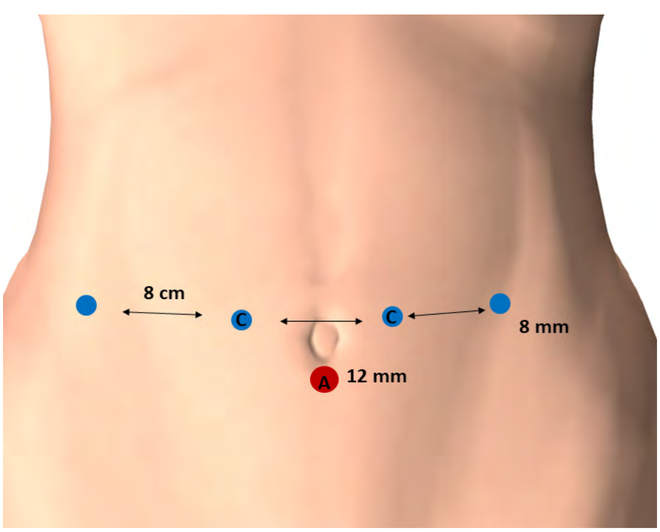

Figure 1. *Trocar placements for robotic pancreatic resections. Blue dots represent 8mm trocars used for robotic arms. Space between robotic arms should be at least 8cm to avoid robotic arms collision. C – camera position may vary depending on the type of surgery and timing of operation. A – 12mm auxiliary port used by the bedside surgeon for retraction, suction, clipping and stapling.*

Pancreatoduodenectomy

The operation begins with the division of the omentum along the greater curvature of the stomach for exposure of the anterior face of the pancreas. Gastroepliploic vessels are controlled and divided. The right colon is lowered down and the duodenum is mobilized until complete exposure of the inferior vena cava is achieved. The ligament of Treitz is mobilized and the jejunum is passed behind the mesenteric vessels. A stapler with a tan cartridge is used to transect the proximal jejunum (Signia™ Stapling System, Medtronic Inc. Minneapolis, MN, USA). The next step is to perform the dissection of the lymph nodes along the hepatic artery and the celiac trunk. The gastroduodenal artery is dissected and encircled. It is then divided between hem-o-lok clips (Teleflex Inc., Morrisville, NC, USA) after a clamping test is performed. The duodenum is then divided with a stapler, two centimeters below the pylorus, and it is retracted to the left flank to improve hilar exposure. The common bile duct is subsequently dissected and divided. If an endoprosthesis is present, it is removed and sent for bacterial identification and culture. In patients suspected to have a distal bile duct cancer, a frozen section biopsy of the proximal bile duct is done to check for a negative surgical margin. Hilar lymphadenectomy is completed, and further dissection is carried out along the portal vein. An umbilical tape is passed around the pancreatic neck through the portal tunnel. The pancreas is divided with harmonic shears using the active blade until identification of the pancreatic duct. When a pancreatic cancer is suspected, a frozen section biopsy of the pancreatic margin is done to check for a negative surgical margin. The pancreatic head is then lifted and the uncinate process is dissected from the portal vein and superior mesenteric artery. The superior mesenteric vein is carefully detached from the uncinate process, and small venous branches are controlled with hem-o-lok clips or the bipolar cautery.

The uncinate process of the pancreas is mobilized until the inferior pancreatic artery is identified and divided between hem-o-lok clips. The portal vein and the superior mesenteric artery are completely skeletonized to ensure a negative posterior margin. The pancreaticoduodenectomy is completed (Figure 2A).

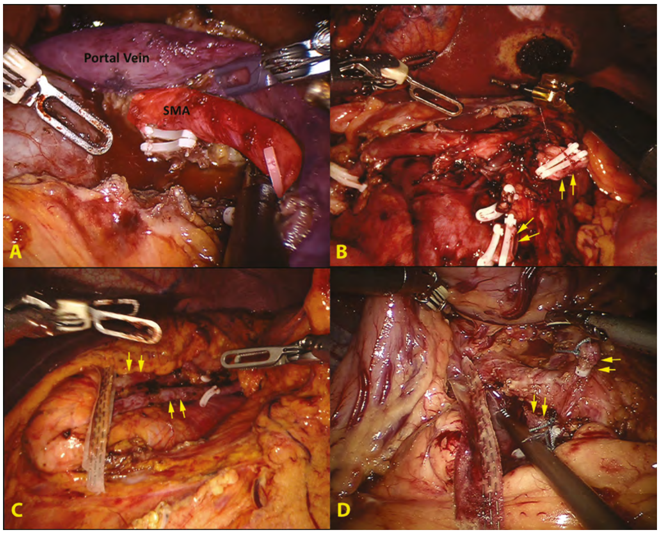

Figure 2. *Robotic pancreatic resections after removal of the specimen.*
A. Intraoperative view after pancreatoduodenectomy with lymphadenectomy and adequate exposure of the superior mesenteric artery (SMA).
B. Intraoperative view after total pancreatectomy. Arrows shows the ligature of the splenic artery and vein.
C. Overview after distal pancreatectomy with preservation of the splenic vessels and spleen.
D. Overview after distal pancreatectomy with splenectomy for malignant disease. Arrows shows the ligature of the splenic artery and vein.

The next step is to perform the reconstruction of the alimentary tract with a pancreatojejunostomy followed by a hepaticojejunostomy and a duodeno-jejunostomy, respectively. The pancreaticojejunostomy is performed using the duct to mucosa technique (Figure 3). A posterior everting layer is done including the pancreatic posterior parenchyma and the jejunal seromuscular, using interrupted 4-0 Prolene® sutures (Figure 3A). A duct to mucosa anastomosis is performed with 5-0 PDS running suture without an internal stent (Figures 3B-C). The anastomosis is completed with an anterior 4-0 Prolene® interrupted suture (Figure 3D). An end-to-side hepatico-jejunostomy is performed using 4-0 or 5-0 PDS continuous sutures depending on the thickness and dilation of the bile duct (Figures 4A-B). An antecolic duodenojejunostomy is then carried out with double layer. The posterior layer is performed with 3-0 running suture. The stomach and jejunum are opened. Full-thickness anastomosis is done with running 3-0 absorbable suture (Figure 4C). Anterior layer is performed with interrupted suture 4-0 Prolene® suture (Figure 4D).

The surgical specimen is retrieved inside a plastic bag through the infraumbilical port, after incision enlargement. Two drains are placed near the pancreatic and biliary anastomosis.

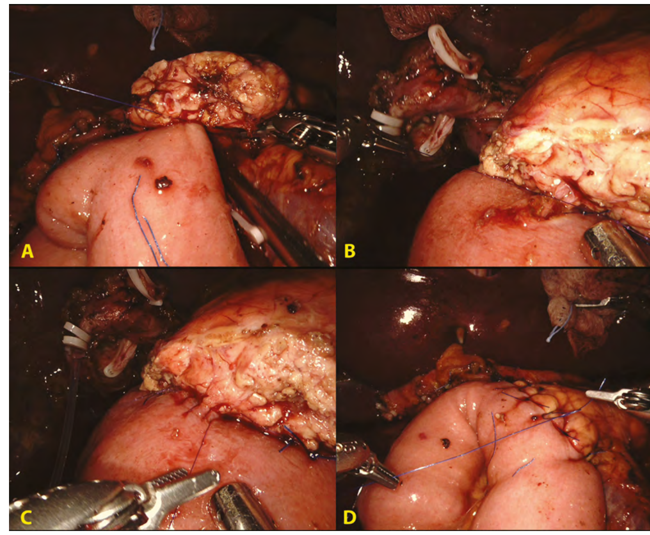

Figure 3. *Robotic duct-to-mucosa pancreatojejunostomy.*
A. Posterior everting layer is done including pancreatic posterior parenchyma and jejunal seromuscular using interrupted 4-0 Prolene® suture.
B. Duct-to-mucosa anastomosis is performed with 5-0 PDS running suture without internal stent.
C. Intraoperative view after completion of the duct-to-mucosa anastomosis.
D. Anastomosis is completed with anterior 4-0 Prolene® interrupted suture.

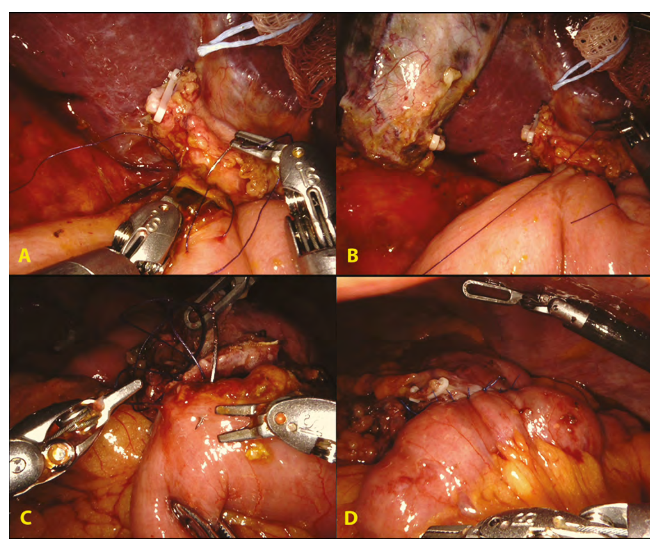

Figure 4. *Robotic hepaticojejunostomy and duodenojejunostomy.*
A. An end-to-side hepaticojejunostomy is performed using continuous absorbable suture.
B. Intraoperative view after completion of the hepaticojejunostomy.
C. Intraoperative view of the duodenojejunostomy. Full-thickness anastomosis is shown.
D. Intraoperative view after completion of the duodenojejunostomy.

Total pancreatectomy

It is similarly carried out as the pancreatectoduodenectomy described above. The main difference is that the pancreas is not divided and the head and the uncinate process are detached from the superior mesenteric artery and the portal vein using the artery-first approach. Once this maneuver is accomplished, the head and the uncinate process of the pancreas are lifted to the left, and the dissection of the distal pancreas is similarly performed as the distal pancreatectomy, described below (Figure 2B). This operation can be done with the preservation of the spleen or with a splenectomy, depending on the diagnosis. The reconstruction of the alimentary tract only includes the hepaticojejunostomy and the duodenojejunostomy as already described (Figure 4).

Distal pancreatectomy without splenectomy

The operation begins with division of the omentum along the greater curvature of the stomach for the exposure of the anterior face of the pancreas. An intraoperative ultrasonography is used to locate the tumor and guarantee the best site for the pancreatic division, allowing for negative margins while preserving the pancreatic parenchyma. The splenic artery is dissected along the superior border of the pancreas and hooked up with a vessel loop. A tunnel is created behind the pancreas in front of the splenic vein. The pancreas is then encircled with an umbilical tape. The pancreas is divided with a stapler using a bioabsorble staple line reinforcement (Seamguard®, W. L. Gore & Associates, Inc., Newark, DE, USA). The splenic artery is retracted during the stapler firing to avoid inadvertently division of this artery. The distal pancreas is lifted and the small splenic artery and vein branches to the pancreas are controlled with the bipolar cautery. Larger branches are ligated with hem-o-lok clips. Once the pancreas is free from these vessels (Figure 2C), it is retrieved inside a plastic bag through the infraumbilical port, usually with minimal or without incision enlargement. One drain is placed near the pancreatic stump.

Distal pancreatectomy with splenectomy

The operation begins with the division of the omentum along the greater curvature of the stomach for exposure of the anterior face of the pancreas. An intraoperative ultrasonography is used to locate the tumor and guarantee the best site for pancreas division, while allowing for negative margins. The next step is to perform the dissection of the lymph nodes along the hepatic artery and the celiac trunk. The splenic artery is identified and divided between hem-o-lok clips. A tunnel is usually created behind the pancreas neck. The pancreas is then encircled with an umbilical tape. The pancreas is divided with a stapler using a bioabsorble staple line reinforcement. The splenic vein is dissected and divided near its junction to the superior mesenteric vein. Usually, the splenic vein can be safely divided with hem-o-lok clips but when it is large it can be divided with a stapler. The distal pancreas is lifted and the plane of resection includes the retroperitoneal space. The short gastric veins are divided, and the distal pancreas is removed en-bloc with the spleen (Figure 2D). The surgical specimen is retrieved inside a plastic bag through the infraumbilical port, with an incision enlargement. Two drains are placed near the pancreatic stump and in the left subphrenic area as previously reported[5].

Central pancreatectomy with Roux-en-Y pancreato-jejunostomy

The operation begins with the opening of the retrocavity and the exposure of the pancreas. This can be accomplished with a combination of harmonic scalpel, bipolar forceps and cautery. An ultrasonography is performed to locate the tumor and to define the correct planes where to transect the pancreas with adequate margins. The inferior border of the pancreas is carefully dissected until the superior mesenteric vein is identified. The superior border of the pancreas is dissected. The hepatic artery lymph nodes are removed to help expose the hepatic artery. The portal vein is identified and a retropancreatic tunnel is created with blunt dissection. An umbilical tape is inserted around the pancreas neck. The pancreas is then transected with a stapler using a bioabsorbable staple line reinforcement. The distal pancreas is carefully dissected. The small venous and arterial branches are divided, and the dissection progresses until the distal margin of the pancreatic resection is reached. An umbilical tape is inserted around the pancreas at this point. The ultrasonography is again performed to guarantee a negative margin. The pancreas is divided with the harmonic scalpel for the identification of the main pancreatic duct.

The surgical specimen is removed. The next step is to perform the Roux-en-Y limb. The jejunum is divided with a stapler, 30 cm from the Treitz angle. The Roux-en-Y loop is constructed with a latero-lateral jejunojejunostomy, using the stapler. The opening is closed in a two-layer running suture and the Jejunal loop is brought through an opening in the transverse mesentery. The reconstruction is done with duct-to mucosa pancreatojejunostomy as previously described (Figure 3). The mesenteric breach is closed with interrupted sutures and the cavity is drained.

Enucleation

The operation begins with the opening of the retrocavity and the exposure of the pancreas. An ultrasonography is performed to locate the tumor and to evaluate its distance from the main pancreatic duct that if too close may hinder the operation (Figures 5A-B). The enucleation is usually performed with the Maryland robotic instrument using low bipolar energy (Figures 5C-D). The hemostasis is achieved by compression rather than suture to avoid a lesion to the main pancreatic duct. Once accomplished, the surgical specimen is retrieved, and the pancreatic area is drained.

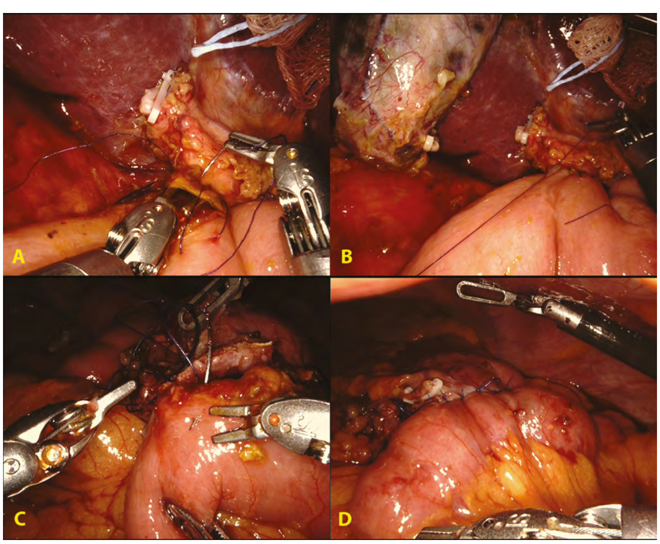

Figure 5. *Robotic enucleation of a low-grade pancreatic tumor.*
A. Intraoperative ultrasonography is performed to locate the tumor and to evaluate its distance from the main pancreatic duct and adjacent vascular structures.
B. Intraoperative view of a pancreatic neuroendocrine tumor amenable to enucleation.
C. Intraoperative view of an enucleation. The enucleation is usually performed with low bipolar energy and hemostasis achieved with compression
D. Overview after robotic enucleation of a pancreatic NET.

Resection of the uncinate process

The operation begins with the identification of the right colon and the duodenum. The right colon is taken down to expose the duodenum which is then fully mobilized using upward traction and division of ligaments. The Kocher maneuver is carefully performed and the uncinate process of the pancreas is identified. The inferior border of the uncinate process is the inferior pancreatoduodenal arterial. On the left margin, its border is the superior mesenteric vein, which receives some venous tributaries from the uncinate process. The right margin is the duodenum and the arterial arcade, while superiorly its limit is the main pancreatic duct. The resection of the uncinate process begins with the division of the small arterial branches from the inferior pancreatic artery followed by control of the venous tributaries to the superior mesenteric vein. These small vessels are controlled by either bipolar forceps or hem-o-lok clips. The dissection progresses along the right margin close to the duodenum arterial arcade. The intraoperative localization of the pancreatic duct can be performed by intraoperative ultrasonography or indocyanine green enhanced fluorescence[6]. The resection is performed by a combination of harmonic shears and bipolar forceps. The pancreas is transected about 5mm below its upper margin, for safety. After the complete resection of the uncinate process, temporary hemostasis is done with compression. The surgical specimen is retrieved through the umbilical port, inside a plastic bag. The pancreatic area is drained.

RESULTS

A hundred and five patients underwent robotic pancreatectomies. The median age was 60.5 years old (range 26-85 years). Fifty-five patients were female and 50 males. The majority of the patients underwent robotic pancreatoduodenectomies, 34 distal pancreatectomies with or without spleen preservation, 10 underwent pancreatic enucleations, 5 pylorus preserving total pancreatectomies. Table 1 shows patients' distribution according to the type of robotic resection. For all the pancreatoduodenectomies, the pylorus-preserving technique was used, except in two patients who had previously undergone bariatric surgery. Three patients underwent laparoscopic resection of the uncinate process and two central pancreatectomies with Roux-en-Y pancreatojejunostomy. Three patients, with malignant tumors with portal vein lateral invasion, a partial resection and reconstruction of the portal vein was performed by robotic approach.

Table 1. *Patient distribution according to the type of robotic pancreatic resection*

Type	n.	%
Pancreatoduodenectomy	51	48.6
Spleen-preserving DP	22	20.9
Distal pancreatectomy (DP)	12	11.4
Enucleation	10	9.5
Total pancreatectomy	5	4.8
Uncinate process resection	3	2.9
Central pancreatectomy	2	1.9
Total	105	100.0

Most patients underwent robotic pancreas resection for malignant disease. Forty-one patients (39%) were operated on for periampullary adenocarcinoma, 29 for neuroendocrine tumors, 24 for intraductal papillary mucinous neoplasm (IPMN), and 5 pancreatic cystadenomas. Among those operated on for malignant disease, two patients presented microscopic positive margins (R1). Table 2 shows patients' distribution according to the indication for robotic pancreatic resection.

Table 2. *Patient distribution according to the indication for robotic pancreatic resection*

Disease	n.	%
Adenocarcinoma	41	39.0
NET	29	27.6
IPMN	24	22.9
Cystadenoma	5	4.8
Chronic pancreatitis	3	2.9
Frantz tumor	2	1.9
IgG4 related disease	1	.9
Total	105	100.0

Three patients operated on due to pancreatic cancer (2.8%) were converted, one for portal vein inadvertent tear during the portal vein tunnel dissection and two for technical difficulties (portal vein invasion). The first conversion was preemptive, the small tear of the portal vein was repaired, and the postoperative period was uneventful. In the second conversion, the extensive portal vein invasion was not seen in any of the preoperative imaging tests, and the portal vein was successfully reconstructed. However, the third patient who had received neoadjuvant chemoradiation, the portal vein wall was extremely thin and adhered to the tumor. After conversion, the reconstruction of the portal vein was not optimal and the venous anastomosis occluded, in the postoperative period leading to liver failure and death (mortality rate of 0.9%). The morbidity was 23.8% mainly related to postoperative pancreatic fistula. Some patients presented more than one complication. Four patients had delayed gastric emptying resulting in longer hospitalization. Two patients presented bleeding from the pancreatic area. One of them had a massive bleeding that prompted blood transfusion and an arteriography. The latter was negative, and the cause of the bleeding was later identified as related to the epigastric artery disruption at one of the trocar sites. The other patient bleeding was minimum, and he was treated with observation and diet interruption with full recovery. Twenty-four patients presented pancreatic fistula treated conservatively with late removal of the pancreatic drain. No patient required percutaneous drainage, reintervention or hospital readmission. One patient needed late reoperation for pancreatic pseudocyst, four months after the initial operation. This reoperation was successfully performed by the robotic approach.

DISCUSSION

Robotic pancreatic surgery has been increasingly used, worldwide in the last few years[7-10]. Robotic pancreatic surgery has shown to be safe for benign lesions and for selected patients with malignancies[8]. Robotic pancreaticoduodenectomy is associated with fewer wound complications, shorter hospital stays, and decreased overall complication rates including minimal intraoperative blood loss[9,10]. Oncologic outcomes are similar to the open counterpart[8]. The same results have also been observed in robotic distal pancreatectomy with the additional benefit of increasing the rate of spleen preservation[11,12].

In 2008, we performed the first robotic pancreatectomy in Latin America but at that time, we did not find any advantage over the standard laparoscopic pancreatectomy[4]. We believed that it should be reserved for more complex operations. There was a lack of specialized robotic instruments and the cost was prohibitive for its disseminated use in our country.

Since March 2018, the establishment of a new policy in our hospital with marked cost reduction for the use of the robotic system, prompt us to systematically employ the robotic system in all our minimally invasive pancreatic surgeries. Throughout this period, 105 patients underwent robotic pancreatic resections. Our experience with minimally invasive pancreatic resections began in 2001[3] with laparoscopic distal pancreatectomy and, as occurred with other authors, improvement of our expertise in advanced laparoscopic surgery has allowed us to perform all types of robotic pancreatic operations since day one. This previous experience in both open and laparoscopic pancreatic resection resulted in a less steep learning-curve than usually reported in the literature. As an example, after only 20 cases of robotic pancreatoduodenectomies, the average time for the reconstruction of the alimentary tract decreased and became stable.

Most robotic procedures in our series were pancreatoduodenectomies. In 5 patients, a total pancreatectomy was necessary due to extensive adenocarcinoma in one patient, type 1 IPMN in 3 and multiple NET in another one. Distal pancreatectomies were performed in 34 patients. However, different from our previous report on laparoscopic pancreatectomies experience, our rate of spleen preservation for distal pancreatectomies increased significantly after the introduction of the robotic technique, raising our awareness to the importance of the splenic salvation[14]. The enucleation of benign or low-grade malignancies was performed in about 10% of our cases.

Under special conditions, when the tumor is in the neck of the pancreas, the ideal operation is the central pancreatectomy. Considering the long-term functional results, the central pancreatectomy is an effective technique to preserve the pancreatic function. In a comparative study, the incidences of endocrine and exocrine insufficiency after central pancreatectomy were 4 and 5%, respectively, compared to 38 and 15.6% in patients who underwent extended distal pancreatectomy[14]. The laparoscopic resection of the neck of the pancreas or of any segment in the middle of the pancreas is not difficult. However, the reconstruction of the main pancreatic duct may be difficult and hazardous laparoscopically[15]. The use of a robotic system is essential to increase the number of this important pancreas-sparing operation[16]. We recently published a video of this challenging procedure to help other surgeons learn and use it more frequently[16]. Another important pancreas sparing technique is the resection of the uncinate process of the pancreas. It is a highly anatomic and demanding procedure, with only few authors describing the minimally invasive resection of the uncinate process[6,17,18]. The resection of the uncinate process of the pancreas and the central pancreatectomy with Roux-en-Y pancreatojejunostomy were performed in 3 and 2 patients, respectively[6,16].

Patient selection for minimally invasive pancreatic resection includes the consideration of comorbidities, the tumor size and location, and the presumed disease. As the experience with robotic surgery has increased, the selection criteria have broadened, including patients with more comorbidities. Despite that, similar perioperative outcomes were achieved. Most patients were operated on for periampullary adenocarcinoma. The contra-indication for the robotic approach was related to the portal and superior mesenteric vein invasion and/or the hepatic or superior mesenteric arteries encasement. Those patients were usually treated with neoadjuvant chemotherapy. Our only death, in this series, was a patient with an objective response after neoadjuvant treatment regarding the portal vein invasion. He was converted to open procedure after technical difficulty; the portal vein was resected and reconstructed. However, in the postoperative, there was a portal vein occlusion, which led to liver failure. Other two patients were converted but had uneventful recoveries.

Laparoscopic pancreatoduodenectomy was first described in 1994[19]. Early results demonstrated the safety and feasibility of this procedure[20]. Some surgeons, as we ourselves[21], have shown the benefits of this approach. However, the technical complexity, combined with the limited range of motion and poor ergonomics allowed by laparoscopy, have resulted in a challenging learning curve that has restricted its wider dissemination. With the introduction of the robotic platform, the interest in the use of this new minimally invasive technique for pancreatoduodenectomy has been renovated. As of today, at least two centers have published series with more than 450 procedures each[9,10]. Other centers have started to describe a rapid increase in the number of robotic pancreatoduodenectomies performed, and so do we.

Pancreatic fistulas from pancreatic anastomosis are the most common factor responsible for the morbidity, after both open and minimally invasive PD. However, the precision conferred by the robotic platform in the confection of the pancreatojejunostomy has reduced the severity of the postoperative pancreatic fistulas in our patients. We no longer use routine stents for the duct-to-mucosa anastomosis and, in most cases, a running suture is possible even for extremely small pancreatic ducts. No patient, in this series, experienced a type B or C postoperative pancreatic fistula. Those with high amylase content in the drain fluid were treated conservatively with the removal of the drain after 3 to 4 weeks. Delayed gastric emptying was present in 4 patients who required longer hospitalization. This complication is usually associated with diabetes and pancreatic fistula. Postoperative bleeding is rare, but hazardous. Extreme caution is required and sometimes arteriography may be helpful to locate the site of bleeding and to treat the source, usually the gastroduodenal artery. These patients should be kept on zero diet once any pancreatic activation may incur in bleeding reactivation.

CONCLUSION

The robotic platform is useful for the reconstruction of the alimentary tract after pancreatoduodenectomy or after central pancreatectomy. It may increase the preservation of the spleen during distal pancreatectomies. Pancreas sparing techniques, such as enucleation, resection of uncinate process and central pancreatectomy, should be used to avoid exocrine and/or endocrine insufficiency. Robotic resection of the pancreas is safe and feasible for selected patients. It should be performed at referral centers by expert surgeons both on open and minimally invasive pancreatic surgery.

DISCLOSURES

Drs. Machado, Lobo Filho, Mattos, Ardengh and Makdissi have no conflicts of interest or financial ties to disclose.

R E S U M O

Objetivo: *a primeira ressecção pancreática robótica no Brasil foi realizada por nossa equipe em 2008. Desde março de 2018, uma nova política nos levou a empregar sistematicamente o robô em todas cirurgias pancreáticas minimamente invasivas. O objetivo deste artigo é revisar nossa experiência com a ressecção pancreática robótica.* **Métodos:** *todos os pacientes submetidos a ressecção pancreática robótica de 2018 a 2019 foram incluídos. Variáveis pré- e intraoperatórias como idade, sexo, indicação, tempo cirúrgico, sangramento, diagnóstico, tamanho do tumor foram analisados.* **Resultados:** *105 pacientes foram submetidos a pancreatectomia robótica. A idade mediana dos pacientes foi de 60,5 anos. 55 pacientes eram do sexo feminino. 51 pacientes foram submetidos a pancreatoduodenectomia, 34 pancreatectomia distal. A morbidade foi de 23,8% e ocorreu um óbito (mortalidade de 0,9%). Três pacientes (2,8%) tiveram a operação convertida para aberta. Quatro pacientes apresentaram retardo no esvaziamento gástrico e dois apresentaram sangramento. Vinte e quatro pacientes apresentaram fístula pancreática tratada de forma conservadora com remoção tardia do dreno pancreático. Nenhum paciente necessitou de drenagem percutânea, reintervenção ou readmissão hospitalar.* **Conclusões:** *a plataforma robótica é útil para a reconstrução do trato alimentar após pancreatoduodenectomia ou após pancreatectomia central. Pode aumentar a preservação do baço durante pancreatectomias distais. Técnicas poupadoras de pâncreas, como enucleação, ressecção de processo uncinado e pancreatectomia central, devem ser usadas para evitar insuficiência exócrina e/ou endócrina. A ressecção robótica do pâncreas é segura e viável para pacientes selecionados. Deve ser realizada em centros especializados por cirurgiões com experiência em cirurgia pancreática aberta e minimamente invasiva.*

Palavras chave: *Pâncreas. Cirurgia Minimamente Invasiva. Procedimentos Cirúrgicos Robóticos. Revisão.*

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