



ASO Author Reflections: The Role of the Robot in Pancreatoduodenectomy

Marcel Autran C. Machado, MD, FACS, and Fabio F. Makdissi, MD

Department of Surgery, Nove de Julho Hospital, São Paulo, Brazil

PAST

The first pancreatoduodenectomy (PD) was performed in 1935. However, this operation was performed infrequently until 1980s due to high hospital mortality and dismal survival. Since the 1980s, more high-volume centers have developed along with experience of this complex procedure, resulting in a significant drop in mortality. Median operative time and hospital stay also decreased significantly between the 1970s and 2000s.¹

Since the introduction of minimally invasive surgery, pancreatoduodenectomy has remained as a final frontier for this technique. In 1994, Gagner and Pomp reported the first laparoscopic pancreatoduodenectomy,² but the dissemination of laparoscopic PD remained confined to very few high-volume centers with no clear advantages over the open counterpart. The slow progression of this technique may be related to the retroperitoneal location of the pancreas and its close relation to major mesenteric vessels that makes dissection difficult and potentially hazardous.³ Another important issue is the reconstruction of the biliary and pancreatic tract, which is demanding and requires advanced surgical skills and additional time.³ Recently, the robotic platform has been increasingly used for pancreatic resection, including pancreatoduodenectomy.^{4,5} The current report details some advantages offered by this technology for pancreatic surgery.⁶

PRESENT

The robotic platform is a useful tool for treatment of benign and malignant pancreatic diseases. With the advent of new and more efficient chemotherapeutic agents and technical improvements, there has been an increase in indications for PD, as well as the complexity of these operations. Vascular resection and neoadjuvant therapy are becoming more and more common, so the resection stage of PD has become more difficult and attracted more attention. The robotic approach, with the added freedom and stability of the robotic platform, is helpful for complex reconstructions and can overcome some of the limitations of laparoscopic PD.

This report demonstrates a series of videoclips compiled from several robotic pancreatoduodenectomies to demonstrate the superior mesenteric artery (SMA)-first technique in diverse clinical situations.⁶ The main feature of this technique is that the pancreas is dissected from its posterior aspect and the SMA is completely dissected from the head of the pancreas. The SMA-first approach has been used routinely by several authors in open surgery and is believed to allow a better lymphadenectomy and identification of a replaced right hepatic artery, and to facilitate the resection of the portomesenteric venous confluence and reconstruction.⁶ In those situations, the robotic platform may be useful. In our early experience, the SMA-first approach was used selectively in patients with tumor proximity to the portal vein or SMV. We soon observed that this approach was effective to achieve free posterior margins once the posterior limit was easily defined after identification of the SMA and its course. Since then, this approach has been used systematically in all our pancreatoduodenectomies. In some patients, surgical planes may not appear as clear as in the present report but, with greater experience, the feasibility of posterior dissection of the SMA is extremely high.

© Society of Surgical Oncology 2021

First Received: 15 February 2021

Accepted: 15 February 2021

M. A. C. Machado, MD, FACS
e-mail: dr@drmarcel.com.br

Published online: 01 April 2021

FUTURE

Minimally invasive surgery has gained increasing acceptance in recent years, expanding to pancreatoduodenectomy. Laparoscopic pancreatoduodenectomy is already considered a viable, safe, and effective procedure when performed by an experienced surgeon. However, both the applicability and the best results of the minimally invasive technique on a large scale are still restricted to large-volume centers as well.⁷ The improved dexterity of the robotic system provides a good opportunity to perform this challenging procedure in the minimally invasive context and expand its use to a larger number of surgeons. In some centers, the robotic system has been more commonly used in the reconstruction phase alone.

In our point of view, this complex operation can and should be performed using minimally invasive techniques. However, there are still few centers that have managed to successfully perform laparoscopic PD due to the steep learning curve and difficulty in teaching this complex procedure. On the other hand, robotic PD has a more manageable learning curve and is easier to teach.⁸ The decision to use one technique or the other will depend on the availability of the robotic platform and adequate training. In the future, the three techniques (open, laparoscopic, and robotic) certainly will coexist, but with a different proportion than is seen today. In our opinion, the robotic technique will prevail, at least for pancreatoduodenectomies. Independently from the technique used, the treatment of pancreatic tumors will continue to involve a multidisciplinary team.

REFERENCES

1. Cameron JL, Riall TS, Coleman J, Belcher KA. One thousand consecutive pancreaticoduodenectomies. *Ann Surg.* 2006;244(1):10–5.
2. Gagner M, Pomp A. Laparoscopic pylorus-preserving pancreatoduodenectomy. *Surg Endosc.* 1994;8(5):408–10.
3. Coppola A, Stauffer JA, Asbun HJ. Laparoscopic pancreatoduodenectomy: current status and future directions. *Updat Surg.* 2016;68(3):217–24.
4. Machado MA, Filho MML, Mattos BH, et al. Robotic pancreatic resection. Personal experience with 105 cases. *Rev Col Bras Cir.* 2020;47:e20202501.
5. Zureikat AH, Beane JD, Zenati MS, et al. 500 minimally invasive robotic pancreatoduodenectomies: one decade of optimizing performance. *Ann Surg.* 2019. <https://doi.org/10.1097/SLA.0000000000003550>.
6. Machado MA, Mattos BH, Lobo Filho MM, Makdissi FF. Robotic artery-first approach during pancreatoduodenectomy. *Ann Surg Oncol.* 2021. <https://doi.org/10.1245/s10434-021-09776-4>.
7. van Hilst J, de Rooij T, Bosscha K, et al. Laparoscopic versus open pancreatoduodenectomy for pancreatic or periampullary tumours (LEOPARD-2): a multicentre, patient-blinded, randomised controlled phase 2/3 trial. *Lancet Gastroenterol Hepatol.* 2019;4(3):199–207.
8. Zwart MJW, Nota CLM, de Rooij T, et al. Outcomes of a multicenter training program in robotic pancreatoduodenectomy (LAELAPS-3). *Ann Surg.* 2021. <https://doi.org/10.1097/SLA.0000000000004783>.

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.