

MESTRADO INTEGRADO EM MEDICINA

Robotic-Assisted Pancreatic Surgery: Advancements and Outcomes

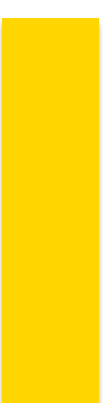
Beatriz Silva Pinto de Oliveira

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Robotic-Assisted Pancreatic Surgery: Advancements and Outcomes

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É AUTORIZADA A REPRODUÇÃO INTEGRAL DESTES TRABALHOS APENAS PARA EFEITOS DE INVESTIGAÇÃO, MEDIANTE DECLARAÇÃO ESCRITA DO INTERESSADO, QUE A TAL SE COMPROMETE.	☒
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Eu, Beatriz Silva Pinto de Oliveira, abaixo assinado,
nº mecanográfico 201905037, estudante do 6º ano do Ciclo de Estudos Integrado em
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Faculdade de Medicina da Universidade do Porto, 14/01/2025

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Dedicatória

Ao meu orientador, Professor Doutor João Araújo Teixeira, por me ajudar a chegar a bom porto.

À minha mãe, por me dar sempre a mão e ser a minha grande inspiração e exemplo.

Ao meu pai, por me dar um apoio incondicional, mesmo sem saber bem o que isto implica.

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Robotic-Assisted Pancreatic Surgery: Advancements and Outcomes

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ABSTRACT

Robotic surgery has been a huge breakthrough in all fields of surgery, due to the three-dimensional view of the operating field, elimination of hand tremor, better dexterity from the instruments and a huge improvement of the capacity to do sutures, knots and complex dissection. Therefore, pancreatic surgery has also benefited from this new approach, especially in procedures such as pancreaticoduodenectomies and distal pancreatectomies, which are the most performed.

Pancreatic robotic surgery has shown many advantages, such as less blood loss and shorter hospital stay, but some concerns still need to be addressed, especially the cost-effectiveness and the clinical outcomes of this approach. The learning curve is also an important factor to take into consideration, since literature is not consensual, and it influences the outcomes of this procedure.

Although literature seems to agree on the potential benefits of pancreatic robotic surgery, more studies, such as randomized-controlled trials, are necessary to fully understand its impact. Besides, more literature is also needed to determine in what conditions this approach is indicated, by comparing the benefits and the downsides.

Keywords: pancreas; robotic surgery; pancreaticoduodenectomy; distal pancreatectomy.

INTRODUCTION

Pancreatic surgery is still one of the most challenging areas of surgery and pancreatic cancer is known as one of the most aggressive solid tumors, related to a very poor prognosis [1, 2]. In these patients, the only option to be cured is through surgery, by removing the lesion [3], therefore, a search for the best technique to approach the lesions of the pancreas has led to an evolution of this surgical field. The first open pancreatic surgery was performed in the beginning of the 20th century and, following the rising concerns with safety, laparoscopy surgery appeared in the 1980s and was quickly adopted [1]. However, due to the complexity of this anatomical region, many surgeons remained reluctant to adopt this technique [4].

Robotic surgery came right after, since the DaVinci system was developed and approved in 2000, giving the surgeon three-dimensional stereoscopic views of the operating field, elimination of hand tremor, better dexterity from endo-wristed instruments and a huge improvement of the capacity to do sutures, knots and complex dissection [1, 4]. So, it comes as no surprise that robotic surgery has brought such excitement, considering the potential it brings to pancreatic surgery. This led to an increase on minimally invasive pancreatic surgery [4].

So far, robotic pancreatic surgery seems to be safe and feasible, as an alternative to open and laparoscopic interventions, however, some concerns need to be addressed, such as cost-effectiveness, efficacy and surgical outcomes [3, 5, 6]. This is also applicable to robotic pancreatic surgery in elderly patients (>85 years old), since it has been proven that there is no increase in mortality, morbidity or length of hospital stay in this part of the population [7].

Considering that there are a limited number of randomized-controlled trials and of comparative studies on this matter, there are still some controversies and there is an urgent need to investigate in depth the outcomes of robotic pancreatic surgery. This review aims to clarify and synthesize the most recent evidence on the robotic pancreatic surgery field, contemplating the advantages, controversies, outcomes and limitations of this practice, as well as the comparison between the robotic and the laparoscopic and open approaches, with emphasis on the pancreaticoduodenectomy and the distal pancreatectomy.

METHODS

Search criteria

A review of the literature was performed using PubMed, Scopus and Web of Science databases. The search occurred during November of 2024 and was limited to publications between November 2019 and November 2024 and to the English language. The search was not filtered in respect to design or study type. The search was performed with emphasis on robotic pancreatic surgery, including search terms such as “robot-assisted”, “pancreas”, “pancreas/surgery”, “pancreaticoduodenectomy”, “distal pancreatectomy”, “outcomes” and “cost-effectiveness” and synonyms.

ROBOTIC-ASSISTED PANCREATICODUODENECTOMY

Pancreaticoduodenectomy is one of the most important operations in pancreatic surgery and it is a highly complex and time-consuming procedure, that is usually performed by open approach [8]. It is considered the standard for benign and malignant cancer in the perampullary region and pancreatic head [9]. As laparoscopic surgery appeared, it started to become an alternative to open surgery, as it reduced the surgical wound and therefore the postoperative pain [8]. However, this approach has been limited by its complexity and by the high-level skills required to perform it, as well as other disadvantages such as a limited range of movements and two-dimensional imaging [6, 8]. Therefore, robotic pancreaticoduodenectomy (RPD) came to change the paradigm of this procedure. [8]

Numerous positive results of RPD have been described in studies such as randomized-controlled trials [7,10], for example, a shorter hospital stay after the surgery; wounds as small as 3-4cm (compared to the 30-40cm wounds in open surgery); reduced blood loss; safety to perform this procedure in the elderly patients and low surgical mortality [8, 11-14]. However, the biggest concern on RPD is its elevated cost [8].

In order to understand whether RPD is the best approach, it is necessary to compare it with the open and the laparoscopic techniques.

In comparison to laparoscopic pancreaticoduodenectomy (LPD), RPD has a better range of movements and a three-dimensional optic [9] and literature shows that it presents with less blood loss, lower wound infection rate and shorter hospital stay after surgery [10, 13-17]. When it comes to complications, such as blood transfusion, reoperation, postoperative pancreatic fistula and delayed gastric emptying, there is no significant difference between RPD and LPD [9]. RPD also has less vascular resections, but it has to do

with the selection of patients, since patients who undergo RPD tend to have tumors that do not involve vessels [9].

When it comes to OPD, for malignant tumors, RPD has a higher R0 resection rate and a similar lymph node harvest number [6] RPD is also associated with less blood loss and longer operative time [6, 9, 18]. Many factors may explain this longer operative time: the robot needs to be prepared before the operation and surgeons that haven't surpassed the learning curve take more time operating [18]. However, both blood loss and operation time results show different results in different studies, since both are highly influenced by the proficiency of the surgeon [18]. Another study has also stated that RPD had a shorter operative time (260.77 min versus 453.79 min, $p < 0.001$) [19], showing that findings in this matter are still controversial. RPD has also proven to have comparable perioperative mortality and postoperative complication rate and a shorter length of stay than OPD [6], and some studies even state that RPD has a lower 90-day mortality rate but referring that it is difficult to demonstrate [19]. RPD shows no increase in surgical risk compared to OPD [14, 17, 20-26]. In a study by A. Mantzavinou et al., RPD has shown a greater therapeutic index than OPD, although with no statistical significance (if $p < 0.05$); this index quantified risk (30-day mortality rate) versus benefit (yield of lymph node harvest and curative tumor resection) [2]. In some studies, RPD also shows a larger amount of lymph nodes harvested and a lower resection margin, however, other studies reveal no significant difference in these aspects [16, 18, 27].

The international consensus statement on robotic pancreatic surgery [6] states that RPD can be used for benign or malignant disease in the pancreas head and duodenum that need resection and also for reconstruction of vessels if the surgeons have passed the RPD learning curve [6].

ROBOTIC-ASSISTED DISTAL PANCREATECTOMY

Distal pancreatectomy is considered the standard treatment for tumors of the body and tail of the pancreas [28]. Since this procedure is less complex than the pancreaticoduodenectomy, as it does not involve reconstructions, the laparoscopic distal pancreatectomy (LDP) has been largely adopted by surgeons around the world [1]. Some studies have already confirmed that LDP is superior to open distal pancreatectomy (ODP) when it comes to recovery, hospital stay and blood loss [29]. Therefore, it is important to compare the robotic distal pancreatectomy (RDP) with LDP, in order to understand whether it is indeed a better approach.

Most of the literature on this topic shows that RDP is safe and feasible [1]. Due to the characteristics of robotic surgery, such as a larger range of movement and a three-dimensional image, RDP has shown a short operative time and a fast recovery after surgery [4]. RDP also reported less blood loss, a higher spleen preservation rate (65% vs. 29% in LDP) and less postoperative fistulas [4].

The international consensus statement on robotic pancreatic surgery [6] states that RDP has a similar lymph nodes harvested rate and margin status to LDP in case of a malignant tumor. It also shows that RDP is as safe and feasible as LDP, as length of hospital stay, postoperative complications, perioperative mortality and rate of fistulas are similar as well. When it comes to spleen preservation, LDP and RDP have no

significant difference, even though RDP has higher preservation of the splenic vessels [6]. On the other hand, some recent literature is showing less blood loss, higher spleen preservation and shorter hospital stay in RDP in comparison to LDP [28, 30, 31], which emphasizes the need for more studies to evaluate these aspects. The oncological outcomes have proven similar between LDP and RDP [4]. In a recent large meta-analysis, RDP has shown lower conversion rate, less unplanned splenectomies, higher splenic vessels preservation and less blood loss but a higher operation time, compared to LDP [28]. The operation time has controversial results in different studies, so more evidence is needed. This aspect seems to vary according to specific approaches, since, in general, when it comes to longer surgeries the duration of RDP is more similar to the duration of LDP [28], so more analyzes of subgroups are required to properly address this matter.

In comparison to ODP, RDP has less blood loss and less length of stay in the hospital but a similar perioperative mortality, complication rate and fistula rate [6]. RDP has shown less need for blood transfusion, lower complications and shorter hospital stay than ODP [32]. In addition, no differences were found in operation time, blood loss, lymph nodes harvested, spleen preservation rate, morbidity rate and postoperative fistula [31-33].

MORBIDITY AND MORTALITY

One of the fundamental aspects that need consideration in robotic surgery is whether it impacts the morbidity of the patients. Many studies have shown a better perioperative pain control and lower morbidity rates (as a result of lower blood loss, less complications and a better resection margin), as well as shorter length of hospital stay in patients who underwent robotic surgery [3, 8]. However, literature is still unclear about its oncological results [3]. The precise dissection around splenic vessels also allows robotic surgery to have a high rate of spleen-preserving procedures, which also leads to a better outcome in the postoperative period [3]. Therefore, robotic pancreatic surgery improves the quality of life of the patient, when compared to open or laparoscopic procedures [3].

Survival outcomes also need to be more addressed in literature, specifically through randomized-controlled trials. However, a study by Shyr YM et al. [8] showed 82,9% of 1-year survival, 45,3% of 3-year survival and 26,8% of 5-year survival in the RPD group, and, in comparison, 63,8%, 26,2% and 17,4% respectively in the OPD group [8]. A systematic review by Serra et al. [3] also states that the robotic procedures are associated with lower mortality.

In addition, all of these advantages have been proved to be only possible with a surgical center specialized in these procedures, necessary for the better postoperative mortality and morbidity [3].

LEARNING CURVES

When it comes to the learning curves, it is important to compare them between the open, laparoscopic and robotic approaches, instead of only looking at one of them. Although this topic is very controversial, it is stated in literature that the time to surpass learning curve for robotic surgery is shorter than the time to surpass the learning curve for laparoscopic surgery [34]. What also seems to be consensual is the fact that

formal training in a specialized center is necessary to successfully surpass this learning curve [34]. In order to compare procedures, it is essential to consider the learning curve, since it is relevant in aspects such as operative time and surgical outcomes.

Literature has shown a huge heterogeneity on this matter, however, in a systematic review by Müller et al. is stated that the learning curve was 30 procedures for OPD, 39 for LPD, 35 for RPD and 16 for LDP and 15 for RDP, with no information to access the learning curve for ODP [35]. The international consensus guidelines on robotic pancreatic surgery in 2023 states that more than 50 consecutive cases are needed to surpass the RPD learning curve [32].

To surpass the RDP learning curve, the international consensus statement on robotic pancreatic surgery states a need to perform 10-20 surgeries [6].

However, this data is highly heterogeneous and more studies need to be made in order to determine a consensual learning curve.

COST-EFFECTIVENESS

In a society ruled by costs, the evaluation of the costs of every medical procedure is essential to understand whether it is worth pursuing. In general, it is well established that robotic surgery is more expensive than the alternatives, literature stating that RDP is significantly more expensive than LDP [28]. In literature, the costs of distal pancreatectomy are the most studied and the ones with more evidence and so the focus of this topic will be on that specific surgical technique.

To access the costs of robotic surgery, it is necessary to consider not only the cost of the robot itself, but also the costs of the postoperative period. In a study by Vicente et al. [36] it was shown that the hospital stay and conversion to open surgery were shorter in RDP than LDP, representing a benefit in cost for the robotic approach. In this same study, RDP is proved to have a higher cost in utility but also higher quality-adjusted life year (QALYs). When considering the shorter hospitalization cost of RDP, in opposition to the higher operative costs, the overall RDP costs are only slightly higher than LDP and they decrease with the experience of the surgeon [36]. RDP patients also have a faster return to work, which translate to a higher economic gain [37].

Since the difference in costs between RDP and LDP is slight and there is a benefit in QALYs, it can be accepted that the robotic approach is cost-effective. In another study, a threshold of 4800 Euros/QALY was described, so RDP could be considered cost-effective if this value is accepted by the institutions [37].

As robotic surgery is adopted by more and more surgeons and institutions, it will become more competitive in the market and its cost will probably decrease, making it even more appealing.

CONCLUSION

Robotic surgery is an emerging field that came to change the paradigm of surgery as we know it. In the pancreatic field, it has allowed major breakthroughs due to its three-dimensional vision, large range of motion and elimination of the surgeon's hand tremor [1, 4]. These characteristics are ideal to perform pancreatic surgery, but many matters need to be addressed in order to understand exactly its indications and limitations. Robotic surgery has been proven safe and feasible [3, 5, 6] and has shown advantages both in pancreaticoduodenectomies and distal pancreatectomies, such as less blood loss and shorter hospital stay.

Furthermore, the costs of robotic surgery are extremely important to be taken into account, since they are highly elevated. However, these costs will probably decrease with the dissemination of these robots and with a more competitive market.

In addition, more studies are necessary to define the specific indications of robotic surgery, as well as to analyze the oncological outcomes and compare them with the laparoscopic and open approaches. More randomized-controlled trials are also needed to address robotic surgery mortality and morbidity. In order to better understand the possible indications for robotic pancreatic surgery, more data on outcomes in specific patients' subgroups who will benefit from a particular approach is needed. Studies to address the optimal learning curve are also necessary.

Even though robotic surgery is a brand-new field and still requires plenty of research for us to fully understand its impact, its advantages on the hands of an experienced team are undeniable, as it increases postoperative quality of life and reduces complications of the surgery [4, 6], especially when it comes to distal pancreatectomies, where surgeons are adopting the robotic approach more and more.

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2

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- No aims or questions are formulated. _____ 0
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2

3) Description of the literature search

- The search strategy is not presented. _____ 0
 The literature search is described briefly. _____ 1
 The literature search is described in detail, including search terms and inclusion criteria. _____ 2

2

4) Referencing

- Key statements are not supported by references. _____ 0
 The referencing of key statements is inconsistent. _____ 1
 Key statements are supported by references. _____ 2

2

5) Scientific reasoning

(e.g., incorporation of appropriate evidence, such as RCTs in clinical medicine)

- The article's point is not based on appropriate arguments. _____ 0
 Appropriate evidence is introduced selectively. _____ 1
 Appropriate evidence is generally present. _____ 2

2

6) Appropriate presentation of data

(e.g., absolute vs relative risk; effect sizes without confidence intervals)

- Data are presented inadequately. _____ 0
 Data are often not presented in the most appropriate way. _____ 1
 Relevant outcome data are generally presented appropriately. _____ 2

2

Sumscore

12

Fig. 1 SANRA - Scale

Nota 1: O ponto 5 diz respeito à contextualização da evidência científica em relação ao tipo de estudo(s) que a produziu (e, idealmente, à qualidade do(s) mesmo(s)). O ponto 6 diz respeito a sustentar as afirmações com os dados quantitativos mais apropriado. A título de exemplo, para cumprir o ponto 5 e o ponto 6, ao invés de afirmar "já foi evidenciado que os testes de alergia às penicilinas apresentam alta especificidade e moderada sensibilidade", dever-se-á indicar "uma revisão sistemática com meta-análise de acuidade diagnóstica evidenciou que os testes de alergia às penicilinas apresentam alta especificidade (valor meta-analítico: 97%; IC95%=94-98%) e moderada sensibilidade (valor meta-analítico: 31%; IC95%=19-46%).

SANRA – explanations and instructions

This scale is intended to help editors assess the quality of a narrative review article based on formal criteria accessible to the reader. It cannot cover other elements of editorial decision making such as degree of originality, topicality, conflicts of interest or the plausibility, correctness or completeness of the content itself. SANRA is an instrument for editors, authors, and reviewers evaluating individual manuscripts. It may also help editors to document average manuscript quality within their journal and researchers to document the manuscript quality, for example in peer review research. Using only three scoring options, 0, 1 and 2, SANRA is intended to provide a swift and pragmatic sum score for quality, for everyday use with real manuscripts, in a field where established quality standards have previously been lacking. It is not designed as an exact measurement of the quality of all theoretically possible manuscripts. For this reason, the extreme values (0 and 2) should be used relatively freely and not reserved only for perfect or hopeless articles.

We recommend that users test-rate a few manuscripts to familiarize themselves with the scale, before using it on the intended group of manuscripts. Ratings should assess the totality of a manuscript, including the abstract. The following comments clarify how each question is designed to be used.

Item 1 – Justification of the article's importance for the readership

Justification of importance for the readership must be seen in the context of each journal's readership.

Consider how well the manuscript outlines the clinical problem and highlights unanswered questions or evidence gaps – thoroughly (2), superficially (1), or not at all (0).

Item 2 – Statement of concrete/specific aims or formulation of questions

A good paper will propose one or more specific aims or questions which will be dealt with or topics which will be reviewed.

Please rate whether this has been done thoroughly and clearly (2), vaguely or unclearly (1), or not at all (0).

Item 3 – Description of the literature search

A convincing narrative review will be transparent about the sources of information on which the text is based. Please rate the degree to which you think this has been achieved. To achieve a rating of 2, it is not necessary to describe the literature search in as much detail as for a systematic review (searching multiple databases, including exact descriptions of search history, flowcharts, etc.), but it is necessary to specify search terms, and the types of literature included. A manuscript which only refers briefly to its literature search would score 1, while one not mentioning its methods would score 0.

Item 4 – Referencing

No manuscript references all statements. However, those that are essential for the arguments of the manuscript – “key statements” – should be backed by references in all or almost all cases. Exceptions could reasonably be made for rating purposes where a key statement has uncontroversial face-validity, such as “Diabetes is among the commonest causes of chronic morbidity worldwide.”

Please rate the completeness of referencing: for most or all relevant key statements (2), inconsistently (1), sporadically (0).

Item 5 – Scientific reasoning

The item describes the quality of the scientific point made. A convincing narrative review presents evidence for key arguments.

It should mention study design (randomized controlled trial, qualitative study, etc), and where available, levels of evidence.

Please rate whether you feel this has been done thoroughly (2), superficially (1), or hardly at all (0). Unlike item 6, which is concerned with the selection and presentation of concrete outcome data, this item relates to the use of evidence and of types of evidence in the manuscript's arguments.

Item 6 – Appropriate presentation of data:

This item describes the correct presentation of data central to the article's argument. Which data are considered relevant varies from field to field. In some areas relevant data would be absolute rather than relative risks or clinical versus surrogate or intermediate endpoints. These outcomes must be presented correctly. For example, it is appropriate that effect sizes are accompanied by confidence intervals. Please rate how far the paper achieves this – thoroughly (2), partially (1), or hardly at all (0). Unlike item 5, which relates to the use of evidence and of types of evidence in the manuscript's arguments, this item is concerned with the selection and presentation of concrete outcome data.

Fig. 2 SANRA—explanations and instructions document

Scale for the Assessment of Narrative Review Articles – SANRA

- 1) **The importance is explicitly justified:** Página 2 (Parágrafo 6): “So far, robotic pancreatic surgery seems to be safe and feasible, as an alternative to open and laparoscopic interventions, however, some concerns need to be addressed, such as cost-effectiveness, efficacy and surgical outcomes [3, 5, 6].”; Página 3 (Parágrafo 1): “Considering that there are a limited number of randomized-controlled trials and of comparative studies on this matter, there are still some controversies and there is an urgent need to investigate in depth the outcomes of robotic pancreatic surgery”
- 2) **One or more concrete aims or questions are formulated:** Página 3 (Parágrafo 1): “This review aims to clarify and synthesize the most recent evidence on the robotic pancreatic surgery field, contemplating the advantages, controversies, outcomes and limitations of this practice, as well as the comparison between the robotic and the laparoscopic and open approaches, with emphasis on the pancreaticoduodenectomy and the distal pancreatectomy.”
- 3) **The literature search is described in detail, including search terms and inclusion criteria:** Página 3 (Parágrafo 2): “A review of the literature was performed using PubMed, Scopus and Web of Science databases. The search occurred during November of 2024 and was limited to publications between November 2019 and November 2024 and to the English language. The search was not filtered in respect to design or study type. The search was performed with emphasis on robotic pancreatic surgery, including search terms such as “robot-assisted”, “pancreas”, “pancreas/surgery”, “pancreaticoduodenectomy”, “distal pancreatectomy”, “outcomes” and “cost-effectiveness” and synonyms.”
- 4) **Key statements are supported by references:** Página 2 (Parágrafo 5): “Robotic surgery came right after, since the DaVinci system was developed and approved in 2000, giving the surgeon three-dimensional stereoscopic views of the operating field, elimination of hand tremor, better dexterity from endo-wristed instruments and a huge improvement of the capacity to do sutures, knots and complex dissection [1, 4].”; Página 2 (Parágrafo 6): “So far, robotic pancreatic surgery seems to be safe and feasible, as an alternative to open and laparoscopic interventions, however, some concerns need to be addressed, such as cost-effectiveness, efficacy and surgical outcomes [3, 5, 6].”; Página 3 (Parágrafo 4): “Numerous positive results of RPD have been described in literature [7,10], such as a shorter hospital stay after the surgery; wounds as small as 3-4cm (compared to the 30-40cm wounds in open surgery); reduced blood loss; safety to perform this procedure in the elderly patients and low surgical mortality [8, 11-14]. However, the biggest concern on RPD is its elevated cost [8].”; Página 4 (Parágrafo 4): “Most of the literature on this topic shows that RDP is safe and feasible [1]. Due to the characteristics of robotic surgery, such as a larger range of movement and a three-dimensional image, RDP has shown a short operative time and a fast recovery after surgery [4]. RDP also reported less blood loss, a higher spleen preservation rate (65% vs. 29% in LDP) and less postoperative fistulas [4].”; Página 5 (Parágrafo 3): “Therefore, robotic pancreatic surgery improves the quality of life of the patient, when compared to open or laparoscopic procedures [3].”; Página 6 (Parágrafo 3): “To surpass the RDP

learning curve, the international consensus statement on robotic pancreatic surgery states a need to perform 10-20 surgeries [6].”.

- 5) **Appropriate evidence is generally present:** Página 3 (Parágrafo 4): “Numerous positive results of RPD have been described in studies such as randomized-controlled trials [7,10], for example, a shorter hospital stay after the surgery; wounds as small as 3-4cm (compared to the 30-40cm wounds in open surgery); reduced blood loss; safety to perform this procedure in the elderly patients and low surgical mortality [8, 11-14]”; Página 4 (Parágrafo 3): “The international consensus statement on robotic pancreatic surgery [6] states that RPD can be used for benign or malignant disease in the pancreas head and duodenum that need resection and also for reconstruction of vessels if the surgeons have passed the RPD learning curve [6].”; Página 6 (Parágrafo 2): “[...] in a systematic review by Müller et al. is stated that the learning curve was 30 procedures for OPD, 39 for LPD, 35 for RPD and 16 for LDP and 15 for RDP, with no information to access the learning curve for ODP [35].”; Página 6 (Parágrafo 2): “The international consensus guidelines on robotic pancreatic surgery in 2023 states that more than 50 consecutive cases are needed to surpass the RPD learning curve [32].”.
- 6) **Relevant outcome data are generally presented appropriately:** Página 3 (Parágrafo 4): “[...] wounds as small as 3-4cm (compared to the 30-40cm wounds in open surgery);” Página 4 (Parágrafo 2): “Another study has also stated that RDP had a shorter operative time (260.77 min versus 453.79 min, $p<0.001$) [19]”; Página 5 (Parágrafo 4): “However, a study by Shyr YM et al. [8] showed 82,9% of 1-year survival, 45,3% of 3-year survival and 26,8% of 5-year survival in the RPD group, and, in comparison, 63,8%, 26,2% and 17,4% respectively in the OPD group [8].”; Página 6 (Parágrafo 2): “[...] in a systematic review by Müller et al. is stated that the learning curve was 30 procedures for OPD, 39 for LPD, 35 for RPD and 16 for LDP and 15 for RDP, with no information to access the learning curve for ODP [35].”.



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