Review Article

Gastroenterology, Hepatology & Digestive Disorders

A Current Status between Laparoscopic and Robotic Resection of Pancreatic Malignant: A Systematic Review

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ABSTRACT

Background: *Laparoscopic and Robotic approaches have become increasingly used for pancreatic surgery. The aim of this study is to evaluate compile and evaluate existing literature on the comparison of laparoscopic pancreatic surgery and robotic pancreatic surgery in the resection of Pancreatic neoplasms. The outcomes of each technique were quantified using meta-analysis.*

Study Design: *A systematic review of articles in both PubMed and Embase comparing laparoscopic and robotic colorectal procedures was performed. Approaches were evaluated in terms of operative time, length of stay, estimated blood loss, conversion, number of lymph nodes harvested, and mobidity and mortality and pancreatic fistula. Mean net differences and effect of each group.*

Results: *232 were full-text articles were identified, and 47 met the inclusion criteria, representing 2753 patients: 690 patients who underwent robotic pancreatic surgery procedures and 2063 patients who underwent laparoscopic pancreatic surgery procedure. Operative time for the robotic approach was 20-45 minutes longer. The robotic group had lower estimated blood loss (57 ml), and patients were 1.85 times more likely to be converted procedure and average length of stay in hospital (14,395 vs 11.85) laparoscopic group was longer then robotic. But there was no real difference between the 2 groups in terms of number of day. There was no much real difference between groups with respect to number of lymph nodes harvested, mortality, or morbidity rate.*

Conclusions: *The laparoscopic and robotic approach to pancreatic surgery is as safe and similar outcomes for both procedures. Further the robotic approach tended to have longer operating times, less blood loss, and a higher rate of conversion to an open procedure compared with laparoscopic procedure. On the basis of the findings of this meta-analysis, there does not appear to be any clear advantage of a robotic approach over a laparoscopic one for pancreatic surgery.*

Keywords
Pancreatic cancer, Laparoscopic-robotic surgery, Lower blood loss, pancreaticoduonectomy, Infections.

Introduction
The discovery pancreatic malignant and diagnosis of pancreatic cancer are fast on the rise and its poor prognosis is reflected in its high proportion of cancer deaths to prevalence, pancreatic neoplasms are now one of the leading causes of mortality worldwide [1,2]. Yet, pancreatic neoplasms still present a challenging operation for surgeons around the world because the organ is delicate, serves numerous vital functions and is closely surrounded by major blood vessels. The race is on to find the least traumatic way to safely remove all the neoplastic cells.

In the past, cancers of the pancreas were removed through large incisions [3]. Since the advent of laparoscopic surgery, it has become clear that patients benefit from a minimally invasive approach in a variety of ways [4,5]. The first laparoscopic pancreatectomy was reported in 1994 [6]. Due to the development of minimally invasive techniques, the majority of pancreatic procedures can be performed using a laparoscopic approach [7-11] or robotic procedure nowadays [10,12,13], hence the indications for laparoscopic surgery and laproscopic-robotic surgery have gradually expanded [9,14].

A number of random trials and meta-analyses for pancreatic cancer surgery [14-23] have reported that laparoscopic surgery exhibited improved post-operative results, including less pain, a smaller incision, a faster recovery to normal action, a shorter post-operative hospital stay and similar long-term survival, compared with those of open pancreatic surgery [5,17,18,24-28]. Therefore, laparoscopic and robotic surgery has been widely accepted as an alternative to conventional open surgery for pancreatic cancer.

Because of the potential advantages, such as less invasiveness and postoperative pain, earlier recovery, better cosmetic results, milder morbidity, earlier time to walking, flatus, and quicker recovery with a shorter hospital stay, laparoscopic-robotic surgery for pancreatic cancer was introduced into clinical practice in 1994, and is now commonplace in China, Japan and America. There has been booming interest in laparoscopic surgery for pancreatic cancer since it was first described in 1994. The last decade has witnessed international growth in the application of laparoscopic surgery for pancreatic cancer yielding a significant amount of scientific data to support its clinical merits and advantages.

With the development of laparoscopic techniques and the invention of new surgical equipment's, scar less surgery is becoming increasingly popular, which is driving the evolution of minimally-invasive surgery. Robotic surgery is an emerging technology that makes use of and provides 3-dimensional imaging and tremor filtration. With these advantages, it is possible that robotic assisted pancreatic cancer resection may overcome the limitations of conventional laparoscopic surgery.

Finally surgeons experience show that both techniques Laparoscopic and Robotic pancreas surgery becoming more attractive option for pancreas disease. However there will be more reports on this effectiveness on MIPs & RPs on the malignancy in the future possibility.

Amid this review
The purpose of this study is to evaluate compile and evaluate existing literature on the comparison of LPS and RPS in the resection of pancreatic neoplasms. The outcomes of each technique were quantified using meta-analysis.

Methods & Materials
Search Methodology
Our work was performed in PubMed and Embase comparing robotic and laparoscopic pancreatic surgery procedures. Databases were searched irrespective of publication date using the Medical Subject "laparoscopic robotic pancreatectomy" and "laparoscopic pancreatectomy resection".

Publications were included in the study if they met the following criteria: (1) comparative studies examining laparoscopic versus laproscopic-robotic pancreatic resection procedures, regardless of type (eg, total pancreatic resection, distal pancreatic resection); (2) randomized controlled trials, controlled clinical trials, or observational studies, nature comparisons, (3) original articles and studies, reported various outcomes of interest, including limiting of total operating time, LOS, conversions , postoperative outcomes.

Literature Search Results
The literature search yielded 9333 results from the 2 databases (PubMed and Embase). Of these, 232 were full-text articles, which were then analyses to see if they met our criteria. The Preferred Reporting Items original articles Systematic Reviews and Meta-Analyses were used as a model for mapping out the number of records identified and scanning and eligibility (Figure 1). 47 Of the 232 original full text articles identified, 177 were performed by laparoscopic pancreatic surgery and 55 by robotic pancreatic surgery, there are no case reports, systemic reviews or meta analyses, and all articles were in English. In the end, 47 articles were deemed to meet our criteria and included in final quantitative data analysis.

Literature of laparoscopic and laproscopic-robotic surgery for pancreatic cancer in China, USA, Europe, Japan, Korea and India
Current literature was reviewed by searching PubMed/Embase 2016. Around 232 full-text articles were selected to be relevant to LapRob surgery for pancreatic cancer, (Figure 2) per year publications were in English. However, the current status of LapRob surgery for pancreatic cancer in the world to the wider surgical based on the scientific data both in English and in other languages. There was a pronounced rise in a number of articles dedicated to laparoscopic-robotic (LapRob) surgery for pancreatic cancer is observed to 2016, our study show publications in (Figure 3) per country.

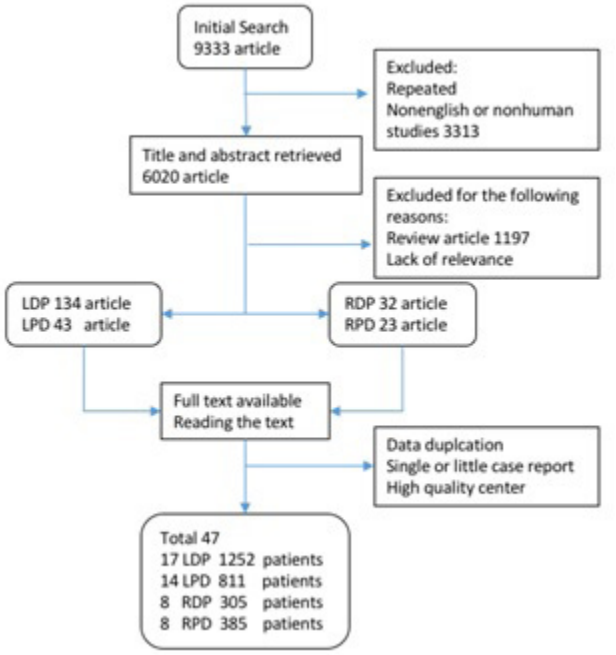

Figure 1: Preferred reporting items original articles and systemic reviews and meta-analysis flowchart of literature review.

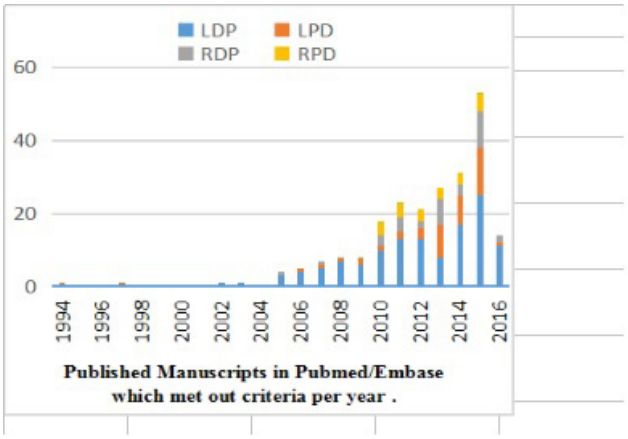

Figure 2: 232 Full-text articles, published in Pubmed/Embase manuscripts which met our criteria per year from 1994 to 2016.

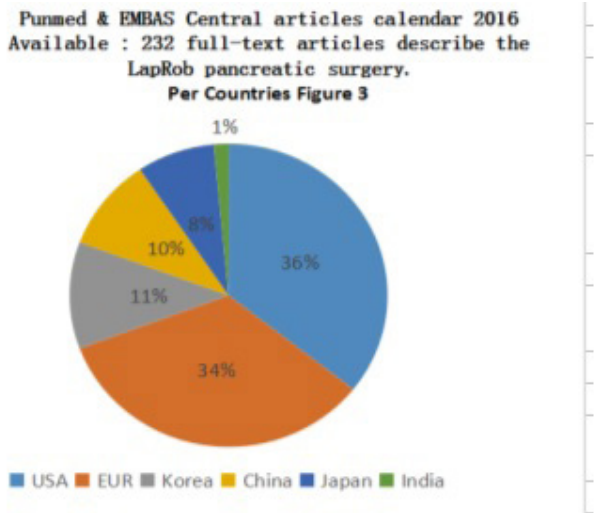

Figure 3: Pubmed/Embase Central articles calender 2016 available: 232 Full text articles describe the laparoscopic-robotic pancreatic surgery per countries.

Indication for Laparoscopic and Robotic Pancreatectomy

The indication for laparoscopic and robotic pancreatectomy at our review was pancreatic neoplasm. The articles reporting on the laparoscopic pancreatic surgery are shown in Table 1 and articles what reporting robotic pancreatic surgery and study design Table 2. Patients who were suitable for laparoscopic resection or robotic resection were referred to GIs. Patients who had a history of pancreatic surgery were excluded from the study. Before surgery, the surgeons explained comprehensively both merits and demerits in the two operations to all patients. The decision for which type of surgical approach was made by the patients. The written informed consent was then provided to all patients.

Outcomes of Interest

Lparoscopic and Robotic pancreatic surgeries were compared both procedures that depend on the basis of several Intra-Post-operative outcomes, these were overall complication rate and postoperative fistula rate as primary outcomes, and secondary outcomes such as operation duration, intraoperative blood loss, hospital LOS and conversion to Robotic surgery. Patients in whom conversion had been performed were retained in the LPS group as the meta-analysis was performed in an intention-to-treat manner. The details of outcome measures are listed in Tables Not all of the studies included had defined the occurrence of pancreatic fistula according to the definition of the International Study Group on Pancreatic Fistula (ISGPF) and therefore rates of pancreatic fistula were calculated on the basis of the definitions used by the respective authors.

Description of Included Trials

In total, the analysis represents 2753 patients across 47 studies, 690 patients who underwent robotic pancreatic surgery procedures and 2063 patients who underwent laparoscopic pancreatic surgery procedure (Figure 1). 47 full-text articles further subdivided patients into 2 groups, first those who underwent laparoscopic pancreatic surgery and those who had LapRob pancreatic surgery, on the basis of the type of pancreatic resection procedure [5,7,11,14,] (31 laparoscopic, 16 robotic) 1252 who underwent laparoscopic distal pancreatectomy and 811 laparoscopic pancreaticoduonectomy and 305 Robotic distal pancreatic resection, 385 robotic pancreaticoduonectomy surgery. As a result, our study considered each subgroup divided by procedure to be separate for purposes of data analysis, yielding 47 individual studies.

Operative Outcomes

There were 47 publications selected for our study, which we divided into two groups, the laparoscopic group (laparoscopic distal pancreatectomy, laparoscopic pancreaticoduodenectomy) and the Robotic group. Operative Time: All 45 articles were included to determine the overall effect regarding operative time the laparoscopic group was associated with a significantly lower operative time compared to rootic technique (MD=23.35). EBL:

Ref	Year	Country	Cases	OT (min)	EBL (ml)	Mort (%)	Morb (%)	Conv (%)	LN	PF (%)	LOS (%)	Res (%)
Giulianotti et al. [35]	2010	USA	60	421	394	3.3	26	18.3	21;14	21.6	22	94.9
Zeh et al [36]	2012	USA	50	568	350	2	56	16	17	22	10	89
Daouadi et al. [10]	2013	USA	30	293	150	0	32	0	19	46.6	6	100
Zhan et al. [31]	2013	China	16	164	343.8	NA	62.6	0	NA	56.3	19.5	NA
Zureikat et al. [34]	2013	USA	132	527	NA	1.5	62	8	19	17	10	87.7
Balzano et al. [30]	2014	Italy	31	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bao et al. [48]	2014	USA	28	431	100	7	NA	14	15	29	7.4	75
Shakir et al. [42]	2015	USA	100	236	150	0	72	2	12.5	42	6	95.7
Chen et al. [27]	2015	China	60	410	400	1.7	35	1.7	13.6	13.3	20	97.8
Baker et al. [37]	2015	USA	22	454	425	0	40.9	13.6	NA	4.6	7	77.8
Eckhardt et al. [46]	2016	Germany	12	229	100	0	59	8	NA	50	10.5	NA
NA: Not Available												

Table 1: Descriptive Date of Laparoscopic pancreatic Surgery Post-Operative Outcomes Included in our Studies.

Ref	Year	Country	Cases	OT (min)	EBL (ml)	Mort (%)	Morb (%)	Conv (%)	LN	PF (%)	LOS (%)	Res (%)
Kendrick et al. [4]	2010	USA	65	368	240	4.6	7	41.9	17.7	1.6	15	89
Gumbs et al. [49]	2011	USA	12	300	175	8.3	17	8.3	8	8	4	100
Asbun et al. [32]	2011	USA	29	182	50	NA	17.2	0	14	10.3	4	96.6
Zureikat et al. [50]	2011	USA	14	456	300	14.2	8	64.2	35.7	7.1	18.5	NA
Asbun et al. [14]	2012	USA	53	541	195	16.9	8	NA	16.7	5.7	23.44	94.9
Kim et al. [39]	2013	Korea	100	487.3	NA	4.7	15	33.3	25.7	0.9	13	100
Corcione et al. [51]	2013	Italy	22	392	NA	9.1	23	63.6	27.3	4.5	15	100
Wellner et al. [29]	2014	Germany	40	343	NA	40	14	87	24	2.5	15	86
Ricci et al. [14]	2015	Italy	41	210	NA	0	43.7	12.5	NA	26.8	9	NA
Palanisamy et al. [28]	2015	India	130	310	110	0.7	8	29.7	8.46	1.5	18.15	NA
Song et al. [33]	2015	Korea	97	480.4	592	NA	14.1	26.8	29.9	0	12.5	90
Dokmak et al. [47]	2015	France	46	342	368	6.5	25	74	48	2.1	20	60
Shin et al. [52]	2016	Korea	152	234	NA	0	40.1	0	11	31.6	8	82.9
Stauffer et al. [40]	2016	USA	44	254	332	2.3	13.6	11.4	25.9	13.6	5.1	NA
NA: Not Available												

Table 2: Descriptive Date of Robotic Pancreatic Surgery Post-Operative Outcomes Included in our Studies.

39 studies reported results regarding blood loss in both group .An overall significant reduction in blood loss was observed in laparoscopic group compared to robotic group (MD = 57ml) less in the robotic group than in the laparoscopic group. Conversion was considered as switching to an open or hand assisted during the operation. 42 articles of the 47 papers included in the meta-analysis reporting data regarding conversion, and on statistical significant overall difference were observed, Laparoscopic procedures were found to be 1.85 times more likely to be converted to an open procedure compared with the robotic approach. LOS: Two of the 47 studies did not report LOS. Data analysis yielded no significant difference in LOS between the two groups, mean difference around (MD= 0.3-2.5 days). Mortality and Morbidity: Due to the different reporting methods in the papers, overall results regarding mortality were impossible to calculate in some articles 40-d mortality was reported [29]. Five of the studies did not report any data on mortality [30-33]. Finally mortality rate for both Laparoscopic and robotic procedures in this review are similar. However, the mortality was significantly higher in the laparoscopic group compared to the robotic group, 7.07% vs 1.54%. Regarding overall morbidity, data were not reported in the all of studies there was six did not reported morbidity , and no overall difference were observed (OR=2,74%),There was no significant difference between the robotic and laparoscopic approaches. Resection rate, No statistically significant difference was found between the two approaches (OR=89.94 vs 96.48), seven studies not reported resection rate.

Discussion and Fundamental Differences

This meta-analysis of 47 publications and over 2753 patients comparing robotic and laparoscopic pancreatectomy surgery comprises the most comprehensive and current results available on the subject. The data suggests that the robotic approach is as safe and effective as the laparoscopic approach. It is important to discuss the fundamental differences between laparoscopic-robotic approaches to pancreatic surgery in order to understand differences in clinical outcome between the two operations. The primary differences between the two procedures are the method of access

(OT ,EBL, LOS,MOR,MORB,CONV,RES,).

Operative time in robotic procedures was approximately 23.35 minutes longer than in laparoscopic procedures - of the studies included for analysis, all indicated that robotic procedures had longer operating times [10,34-37].

EBL was 57 mL less in robotic procedures than in laparoscopic. Although statistically significant, there was no clinically relevant difference [29,33,38-40].

In addition to minimizing blood loss, the biggest theoretical advantage touted by proponents of the LapRob approach is the decreased necessity for converting the procedure to laparotomy. However, this meta-analysis showed that the robotic approach was 1.85 times more likely to be converted to an open procedure than the laparoscopic approach [4,33,37,41]. This important finding contradicts the popular belief that the robot's benefit of finer dissection over laparoscopy allows the decreased need to convert procedures to open. In fact, it negates one of the most significant theoretical advantages of robotic surgery over laparoscopy in the years 2015 and 2016. In assessing the rate of conversion to laparotomy, a history of previous abdominal surgery in a patient can be a confounding factor. Studies with a higher proportion of patients who have had prior surgery may have a higher rate of conversions.

With respect to oncologic resection, there was no difference between the robotic and laparoscopic approaches in terms of the number of lymph nodes harvested in pancreatic procedures performed for malignancy. note, among the 47 study populations included for this analysis14 study no reporting lymph nodes, laparoscopic groups yielded an average number of nodes <1,99 compared with the robotic groups. Laparoscopy has been previously shown to yield sufficient nodal retrieval for an oncologic resection, yet this meta-analysis showed similar outcomes for both laparoscopic and robotic approaches [42-45].

LOS, did not differ significantly between the groups. As operative time is not related to the number of days a patient spends postoperatively in the hospital laparoscopic group was longer then robotic (14,395 vs 11,84). But there was no real difference between the 2 groups in terms of number of days to flatus [31,46,47].

The reporting of morbidity and complications differed greatly between studies. Because of the complexity and variation in reporting, statistical analysis was based on the absolute total number of complications reported and yielded no significant difference between robotic and laparoscopic approaches.

Mortality was greater in the laparoscopic than robotic. The mortality was significantly higher in the laparoscopic group compared to the robotic group, 7.07% vs 1.54%, as shown in. After 3 years the mortality remained higher in the laparoscopic group but the recent years 2015 and 2016 was significantly lowered laparoscopic group 2.23% Vs 0.69% in robotic group. After years of experience, the difference in mortality was further decreased but remained statistically significant.

In addition to evaluating new technology for safety and efficacy in comparison to the current standard of treatment, the issue of cost is of great importance given the fluctuating state of the health care system.

Addition there was previous studies have also compared published literature on laparoscopic, robotic pancreatic surgery. In a systematic review by Yi Ping Mou et al. [23] examining 217studies encompassing 568 patients who underwent laparoscopic, and robotic pancreatic surgery between 1992and 2015, the investigators found there significant difference in longer operative times between two groups, lower blood loss, shorter LOS. In stark contrast however, more than half of their included studies reported lower conversion rates with the robotic compared with the laparoscopic approach.

Although this meta-analysis is comprehensive and the most current evaluation of robotic and laparoscopic approaches to pancreatic surgery, it should be interpreted in the context of some limitations. This has a number of implications on the data, including effects on the operative time and perioperative complications. Current randomized controlled trials further limits the results of our meta-analysis and review and each study has its own biases and limitations, with different inclusion and exclusion criteria, varying indications for surgery, and different types of included pancreatic procedures.

Despite these two approaches being relatively equal in outcomes at the moment, it must be remembered that robotic technology is only in its formative years and has the potential to greatly decrease mortality, mobidity and complications from this difficult operation. The traditional surgical approach to pancreas resection requires four to five ports incisions and entails possible postoperative complications such as wound infections and incisional hernia. With modern life of Robotic and Laparoscopic surgery has the advantage of requiring smaller incisions and less infections manipulation than does open surgery,

Conclusion

In conclusion, this systematic literature review and meta-analysis suggests that the robotic approach is equally safe and efficacious in comparison with the conventional laparoscopic pancreatic approach. However, the robotic approach tended to have longer operating times, less blood loss, and a higher rate of conversion to an open procedure compared with laparoscopy. On the basis of the findings of this meta-analysis, there does not appear to be any clear advantage of a robotic approach over a laparoscopic one for pancreatic surgery. Future studies encompassing prospective randomized controlled trials and cost-effectiveness are warranted to establish the place of LapRob inpancreatic neoplasm resections.

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