Comparison of the duration of hospital stay after laparoscopic or open distal pancreatectomy: randomized controlled trial

B. Björnsson1, A. Lindhoff Larsson1, C. Hjalmarsson2,3, T. Gasslander1 and P. Sandström1

1Department of Surgery and Clinical and Experimental Medicine, Linköping University, Linköping, 2Department of Surgery, Blekinge Hospital, Karlskrona, and 3Department of Clinical Sciences, Lund University, Lund, Sweden

Correspondence to: Dr B. Björnsson, Department of Surgery and Clinical and Experimental Medicine, Linköping University, SE-581-83 Linköping, Sweden (e-mail: berghbor.bjornsson@liu.se)

Background: Studies have suggested that laparoscopic distal pancreatectomy (LDP) is advantageous compared with open distal pancreatectomy (ODP) regarding hospital stay, blood loss and recovery. Only one randomized study is available, which showed enhanced functional recovery after LDP compared with ODP.

Methods: Consecutive patients evaluated at a multidisciplinary tumour board and planned for standard distal pancreatectomy were randomized prospectively to LDP or ODP in an unblinded, parallel-group, single-centre superiority trial. The primary outcome was postoperative hospital stay.

Results: Of 105 screened patients, 60 were randomized and 58 (24 women, 41 per cent) were included in the intention-to-treat analysis; there were 29 patients of mean age 68 years in the LDP group and 29 of mean age 63 years in the ODP group. The main indication was cystic pancreatic lesions, followed by neuroendocrine tumours. The median postoperative hospital stay was 5 (i.q.r. 4–5) days in the laparoscopic group versus 6 (5–7) days in the open group ($P = 0.002$). Functional recovery was attained after a median of 4 (i.q.r. 2–6) versus 6 (4–7) days respectively ($P = 0.007$), and duration of surgery was 120 min in both groups ($P = 0.482$). Blood loss was less with laparoscopic surgery: median 50 (i.q.r. 25–150) ml versus 100 (100–300) ml in the open group ($P = 0.018$). No difference was found in the complication rates (Clavien–Dindo grade III or above: 4 versus 8 patients respectively). The rate of delayed gastric emptying and clinically relevant postoperative pancreatic fistula did not differ between the groups.

Conclusion: LDP is associated with shorter hospital stay than ODP, with shorter time to functional recovery and less bleeding. Registration number: ISRCTN26912858 (www.isrctn.com).

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Introduction

Laparoscopic distal pancreatectomy (LDP) was first reported over 20 years ago, but widespread implementation has been slow outside a few specialist centres1. However, recent nationwide data2–4 indicated that laparoscopy accounted for 40 per cent of distal pancreatectomies at referral centres in the UK between 2006 and 2016, and for 60 per cent in Norway between 2012 and 2016, although the variation between different regions in the use of laparoscopy was large. Possible reasons for this include the fact that minimally invasive techniques are not without challenges, have long learning curves, and risk causing harm during the learning process5.

Pooled data from retrospective cohort studies have shown shorter hospital stays, less blood loss and reduced time to oral intake for laparoscopic compared with open distal pancreatectomy (ODP)6. However, only one prospective RCT7 comparing laparoscopic with open distal pancreatectomy has been performed. In the multicentre LEOPARD trial7, the laparoscopic group had a shorter time to functional recovery, reduced hospital stay, less perioperative blood loss, and less delayed gastric emptying compared with the open group. This came at the expense of a longer duration of surgery and a non-significant tendency towards a higher fistula rate in the laparoscopic group.

The need for further comparison of laparoscopic and open distal pancreatectomy is evident, and the setting of a single centre eliminates differences in local routines and traditions, allowing for hospital stay to be the primary endpoint. The aim of this study was to compare short-term...
surgical outcomes following LDP and ODP with the hypothesis that laparoscopy would shorten hospital stay in patients undergoing standard distal pancreatectomy.8

Methods

The study protocol was approved by the regional ethics board in the south-east health region of Sweden on 10 June 2015 (dnr. 2015/39-31). The study was registered at www.isrctn.com on 28 September 2015 (https://doi.org/10.1186/ISRCTN26912858).

After passing and analysing an institutional learning curve including 37 patients operated on with LDP, a randomized 1:1, controlled, unblinded, parallel-group, single-centre superiority trial was designed.9 The study protocol has been published previously.10

The study was carried out in the south-east health region of Sweden, an area with approximately 1.1 million inhabitants. The study site, Linköping University Hospital, is the only hepatopancreatobiliary centre in this region, primarily responsible for almost half of the total population. There are six referral hospitals in the region, accounting for just over half of the population. From these hospitals, patients with hepatopancreatobiliary malignancy are referred to the trial centre. During the study period, September 2015 to February 2019, all patients undergoing planned distal pancreatectomy were screened for participation in the study.

Inclusion and exclusion criteria

Adult patients with benign or malignant lesions in the body or tail of the pancreas considered resectable with standard distal pancreatectomy at a regional tumour board, and not in need of additional simultaneous procedures or extended pancreatectomy, were eligible for inclusion in the study. Pregnancy and lactation were exclusion criteria, as was the predefined need to resect organs other than the pancreas and spleen, or to divide the pancreas to the right of the mesenteric vein. Patients expected to be unable to comply with the protocol for reasons of language or cognitive function, as well as patients younger than 18 years, were also excluded.
### Randomization

Surgeons at the outpatient clinic provided written and oral information about the study. Patients who agreed to participate signed a written informed consent form. Randomization was performed with computer-generated random numbers in blocks of ten (5:5). The randomization was performed by a research nurse not participating in the care of the patients. Sealed, opaque, serially numbered identical envelopes containing group allocations were opened once the patients had agreed to inclusion in the trial.

### Primary and secondary outcomes

The primary outcome of the study was the length of postoperative hospital stay, analysed as the initial stay at the hepatopancreatobiliary centre.

Secondary outcomes were: total hospital stay before discharge home (including stay at the referral hospital) as well as the total length of stay in the 90 days after surgery, including any readmissions, and functional recovery, defined as the number of postoperative days to reach no need for parenteral fluids or drug administration (except for subcutaneously administered low molecular weight heparin), as well as being ambulatory and able to perform the activities of daily living. Calorie intake was not included in the definition of functional recovery, as absence of parenteral fluid administration was used to define adequate intake. Other documented outcomes were duration of surgery, estimated intraoperative blood loss, 90-day postoperative complications according to the Clavien–Dindo classification, and mortality. Severe complications were defined as Clavien–Dindo grade III or above. Complications specifically related to pancreatic surgery as defined by the International Study Group on Pancreatic Surgery, including postoperative pancreatic fistula (POPF), postoperative delayed gastric emptying (DGE) and postpancreatectomy haemorrhage (PPH) were analysed. The outcomes were cross-checked against those registered in the Swedish National Pancreatic and Periampullary Cancer Registry.
Table 1 Baseline characteristics of patients randomized to laparoscopic or open distal pancreatectomy

|                        | LDP (n = 29) | ODP (n = 29) |
|------------------------|--------------|--------------|
| Age (years)*           | 68(12)       | 63(13)       |
| Sex ratio (M:F)        | 19:10        | 15:14        |
| BMI (kg/m²)*           | 27(6)        | 28(6)        |
| ASA grade              |              |              |
| I                      | 7            | 5            |
| II                     | 9            | 18           |
| III                    | 13           | 6            |
| Radiological size of lesion (mm)* | 27(11)  | 31(19)  |
| Indication for surgery |              |              |
| IPMN                   | 13           | 12           |
| Cystic tumour (excluding IPMN) | 3     | 4     |
| Neuroendocrine tumour  | 4            | 7            |
| Adenocarcinoma         | 7            | 3            |
| Other                  | 2            | 3            |
| Previous abdominal surgery | 16     | 14     |
| Charlson Co-morbidity Index score† | 3 (3–5) | 3 (2–4) |
| ECOG performance status|              |              |
| 0                      | 12           | 12           |
| 1                      | 15           | 15           |
| 2                      | 2            | 2            |
| From referral hospital | 17           | 15           |

Values are *mean(s.d.) and †median (i.q.r.). LDP, laparoscopic distal pancreatectomy; ODP, open distal pancreatectomy; IPMN, intraductal papillary mucinous neoplasia; ECOG, Eastern Cooperative Oncology Group.

Laparoscopic distal pancreatectomy (intervention group)

A detailed description of the operative procedure has been published previously10, and a brief overview given in Fig. 1. The pancreas was divided at the portal–mesenteric confluence, or to the left of it, with a linear stapler without reinforcement (Endo GIA™ Ultra; Medtronic, Minneapolis, Minnesota, USA). One surgeon performed all laparoscopic pancreatic resections using conventional laparoscopy. The gradual stepwise compression technique and division was applied, as described previously16. A 24-Fr passive drain was placed in proximity to the pancreatic resection line and emerged in the subcostal region on the left side of the abdominal wall.

Open distal pancreatectomy (control group)

ODP was performed through a midline laparotomy incision by one of three senior pancreatic surgeons. Division of the pancreas was achieved as described above, and drains were placed in the same way.

Table 2 Primary and secondary outcomes

|                        | LDP (n = 29) | ODP (n = 29) | P† |
|------------------------|--------------|--------------|----|
| Primary outcome        |              |              |    |
| Postoperative stay at hepatopancreatobiliary centre (days)* | 5 (4–5)  | 6 (5–7)  | 0.002 |
| Secondary outcomes     |              |              |    |
| Discharge to home      | 14           | 14           | 1.000 |
| Postoperative stay, including referral hospital (days)* | 6 (5–8)  | 8 (6–10)  | 0.007 |
| Readmission            | 4            | 6            | 0.487 |
| Total postoperative hospital stay (90 days) (days)* | 6 (5–9)  | 8 (7–13)  | 0.008 |
| Time to functional recovery (days)* | 4 (2–6)  | 6 (4–7)  | 0.007 |

*Values are median (i.q.r.). LDP, laparoscopic distal pancreatectomy; ODP, open distal pancreatectomy. †Mann–Whitney U test, except ‡χ² test.

Conversion to open surgery

Conversion (in the laparoscopic group) was defined as any incision that was not intended for trocar placement or removal of the surgical specimen.

Postoperative treatment

All patients were observed in a postoperative recovery unit for 6 h after surgery, and were then transferred to the specialized hepatopancreatobiliary unit for the rest of their hospital stay. Ward staff did not participate in any of the operations and were not involved in the study. A fast-track programme was followed for both patient groups. The programme omitted the use of a nasogastric tube directly after surgery (in the operating theatre). Oral intake and mobilization were encouraged as soon as possible. Epidural anaesthesia was allowed in the ODP group (at the anaesthetist’s discretion), but was not used routinely in the LDP group. Drains were removed when output was less than 20 ml in 24 h, or when the drain amylase level was less than three times the upper serum amylase limit.

Statistical analysis

The primary endpoint, length of stay at a hepatopancreatobiliary centre, was used for sample size calculations. Because LDP has not been associated with an increased length of stay compared with that for ODP in previous publications, a one-sided sample size calculation was used. Based on previous data9, mean hospital stay for LDP and ODP were assumed to be 5 and 7.5 days respectively. With
Duration of hospital stay after distal pancreatectomy

Table 3 Intraoperative and postoperative outcomes

|                                | LDP (n = 29) | ODP (n = 29) | P† |
|--------------------------------|-------------|-------------|----|
| **Duration of surgery (min)**  | 120 (105–140)| 120 (103–149)| 0.482‡ |
| **Estimated blood loss (ml)**  | 50 (25–150) | 100 (100–300) | 0.018‡ |
| **Additional resection**       | 2           | 4           |     |
| **Splenectomy**                | 19          | 23          | 0.240 |
| **Clavien–Dindo complications at 90 days (≥ grade III)** | | | |
| IIa                            | 4           | 8           | 0.195 |
| IIb                            | 0           | 1           |     |
| IVa                            | 0           | 1           |     |
| IVb                            | 0           | 0           |     |
| V                              | 0           | 1           |     |
| **Postoperative pancreatic fistula** | | | |
| Grade B                        | 9           | 10          |     |
| Grade C                        | 0           | 1           |     |
| **Postoperative delayed gastric emptying** | | | |
| Grade A                        | 1           | 2           | 0.085 |
| Grade B                        | 0           | 1           |     |
| Grade C                        | 0           | 2           |     |
| **Postpancreatectomy haemorrhage** | | | |
| Grade A                        | 1           | 0           | 0.313 |
| Grade B                        | 0           | 0           |     |
| Grade C                        | 0           | 0           |     |

*Values are median (i.q.r.). LDP, laparoscopic distal pancreatectomy; ODP, open distal pancreatectomy. †χ² or Fisher’s exact test, except ‡ Mann–Whitney U test.

A standard deviation of 3:5, type I error of 0:05, and 1 − β value of 0:8, 25 patients were needed for each group. To account for the risk of drop-outs, a total of 60 patients were included in the trial.

All statistical analyses were performed in an intention-to-treat (ITT) manner; all operated patients were analysed according to their group allocation by the randomization process. Data are presented as the median (i.q.r.) or mean(s.d.) values, as appropriate. The primary endpoint, hospital stay at the hepatopancreatobiliary centre, was evaluated using the Mann–Whitney U test. Dichotomous variables were assessed with χ² or Fisher’s exact tests, and continuous variables were assessed with the independent-samples t test or the Mann–Whitney U test, as indicated. A two-sided P < 0.050 was considered statistically significant. All analyses were performed using SPSS® version 26 (IBM Corp., Armonk, New York, USA).

Results

During the study period, a total of 105 adults with lesions in the body or tail of the pancreas were screened for study eligibility. A total 68 patients were found to meet all the inclusion criteria, of whom 60 patients agreed to participate in the study and were randomized (Fig. 2).

Age, sex distribution, size of lesion and other baseline characteristics, except for ASA fitness grade, were similar in the two groups (P = 0.043). More than half of the patients were referred from other hospitals (Table 1).

Of 30 patients randomized to LDP, 29 were operated on (and included in the analysis); one patient was excluded before any surgery had been performed owing to disseminated disease found on radiology before the planned operation. One patient in the laparoscopic group had conversion to open surgery due to oozing and slow progression of the dissection (included in the laparoscopy group for ITT analysis). Of the 30 patients assigned to ODP, one was excluded as they were operated on in another hospital; the remaining 29 patients were included in the analysis. One patient in the open group had a diagnostic laparotomy and biopsy of the peritoneum only (included in the open group for ITT analysis), and 28 had an ODP.

The initial hospital stay at the hepatopancreatobiliary centre was 5 (4–5) days in the laparoscopic group compared with 6 (5–7) days in the open group (P = 0.002) (Table 2).

Estimated intraoperative blood loss was significantly reduced in the LDP group compared with that in the ODP group, although other intraoperative outcomes were similar (Table 3).
The overall complication rate and complications specifically related to pancreatic surgery were also similar in the two groups (Table 3). In the laparoscopic group, three patients had ultrasound-guided drains placed after surgery owing to fluid collections in the abdomen, with or without increased amylase levels, and one patient had both drainage of the abdomen and endoscopic retrograde cholangiopancreatography with placement of a pancreatic duct endoprosthesis. In the open group, eight patients had severe complications, one of whom was treated in the ICU for POPF and respiratory failure. One patient in the ODP group died, after discharge, 51 days after surgery from a cerebrovascular incident. In addition, four patients underwent abdominal drainage, one patient was treated with transgastric drainage of a pancreatic fluid collection, and another had a gastroscopy for pain related to food intake.

The number of patients with pancreatic adenocarcinoma was low in both groups, limiting the possibility of statistical analysis for this parameter. However, in the LDP group, the median number of assessed lymph nodes was 15 (9–18), and four of six patients had an R0 resection with a 1-mm margin.

Table 4 shows the histopathological outcomes.

### Discussion

This randomized trial has demonstrated a shorter hospital stay for LDP compared with ODP, confirming earlier published data\(^2\),\(^3\),\(^7\), even in settings where the hospital stay after ODP was already short. The shorter hospital stay occurred not only in the hepatopancreatobiliary centre, but also included the full hospital stay until the patients were discharged home. The difference persisted when length of stay during readmission for up to 90 days after surgery was included in the analysis. The reduction in hospital stay did not involve an increase in the duration of surgery or readmission rate.

The laparoscopically treated patients had significantly less blood loss, although the number of complications was not reduced. In addition, the significantly higher ASA grade in the laparoscopic group, as well as somewhat higher age (although not significantly different), did not translate to a higher complication rate. The significant difference in time to functional recovery further supported the obtained results. Pancreas-specific complications, POPF and PPH, did not differ significantly between the groups, further indicating that laparoscopy is a safe approach for distal pancreatectomy. DGE is a well-known complication of pancreatic surgery, and was encountered more frequently in the open group in this study, although the difference was not significantly different from that in the laparoscopy group. When assessed for only clinically relevant (grade B and C) DGE, no difference was found.

The results of the present study are in most aspects similar to those of de Rooij and colleagues\(^7\). The present patients were somewhat older and had higher ASA grades, especially in the LDP group, whereas BMI, previous abdominal surgery and preoperative tumour size were approximately the same. The differences in duration of surgery and blood loss may be attributed to the higher proportion of spleen-preserving procedures in the LEOP-ARD trial\(^7\), as well as the multicentre nature of that trial, which included some centres with a very small number of patients. This is further supported by the larger i.q.r. for duration of surgery and blood loss in that trial, whereas the single-centre nature of the present trial accounts for the narrow i.q.r. observed for most variables. The main outcomes of the studies, overall length of stay and functional recovery (despite small differences in the definitions used), are the same, supporting the generalizability of the present results. Furthermore, previous non-randomized studies\(^2\),\(^3\) also had similar results, despite variations in the use of laparoscopy as well as outcomes.

A notable difference between this study and that of de Rooij et al.\(^7\) comparing LDP and ODP is the higher proportion of cystic pancreatic lesions in the present RCT. This may be related to different criteria applied for resections of cystic pancreatic lesions and possibly expansion of operability criteria, as suggested by higher mean age in the present study population. However, the introduction of laparoscopy per se has not changed the surgical indications for cystic pancreatic lesions in the authors’ hospital.
Some study limitations warrant discussion. The number of patients included was not powered to detect differences in the secondary outcomes. Blinding was not found to be practical at the time of study commencement, and was therefore not applied. Nevertheless, as the study included patients from only one centre, the perioperative programme was the same for all patients, both at the hepatopancreatobiliary centre and at their referral hospitals. As this laparoscopic group included only patients operated on by a single surgeon in a single centre, the generalizability and reproducibility of the results is low. However, previous research\textsuperscript{2,3,7}, including multicentre and nationwide data, supports the findings of the present study. Furthermore, the study started after almost 40 patients had been operated on using the laparoscopic approach, which is double the number of patients suggested for the learning curve for the procedure\textsuperscript{17–19}.

Owing to the inclusion criteria, many patients with indications for extended pancreatic tail resection or simultaneous resection of other organs were not included. Therefore, the results cannot be applied to advanced tumours in the body or tail of the pancreas. Because this study included a limited number of patients with pancreatic ductal adenocarcinoma, and these were allocated primarily to LDP, statistical analysis of oncological outcomes is of limited value, and no conclusions about the oncological adequacy of LDP can be drawn. The ongoing DIPLOMA trial (ISRCTN44897265; www.e-mips.com) will hopefully clarify the role of LDP in the setting of ductal adenocarcinoma of the pancreas.

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**References**

1. Gagner M, Pomp A, Herrera MF. Early experience with laparoscopic resections of islet cell tumors. *Surgery* 1996; 120: 1051–1054.
2. Lof S, Moeckte AL, Al-Sarireh B, Ammori B, Aroori S, Durkin D et al.; Minimally Invasive Liver and Pancreatic Surgery Study Group – UK (MI-LAPS UK). Multicentre observational cohort study of implementation and outcomes of laparoscopic distal pancreatectomy. *Br J Surg* 2019; 106: 1657–1665.
3. Søreide K, Olsen F, Nymo LS, Kleive D, Lassen K. A nationwide cohort study of resection rates and short-term outcomes in open and laparoscopic distal pancreatectomy. *HPB* (Oxford) 2019; 21: 669–678.
4. Søreide K, Nymo LS, Kleive D, Olsen F, Lassen K. Variation in use of open and laparoscopic distal pancreatectomy and associated outcome metrics in a universal health care system. *Pancreatology* 2019; 19: 880–887.
5. van Hilst J, de Rooij T, Bosscha K, Brinkman DJ, van Dieren S, Dijkgraaf MG et al.; Dutch Pancreatic Cancer Group. Laparoscopic versus open pancreaticoduodenectomy for pancreatic or periampullary tumours (LEOPARD-2): a multicentre, patient-blinded, randomised controlled phase 2/3 trial. *Lancet Gastroenterol Hepatol* 2019; 4: 199–207.
6. Mehrabi A, Hafezi M, Arvin J, Esmaeilzadeh M, Garoussi C, Emami G et al. A systematic review and meta-analysis of laparoscopic versus open distal pancreatectomy for benign and malignant lesions of the pancreas: it’s time to randomize. *Surgery* 2015; 157: 45–55.
7. de Rooij T, van Hilst J, van Santvoort H, Boerma D, van den Boezem P, Daams F et al.; Dutch Pancreatic Cancer Group. Minimally invasive versus open distal pancreatectomy (LEOPARD): a multicenter patient-blinded randomized controlled trial. *Ann Surg* 2019; 269: 2–9.
8. Hartwig W, Vollmer CM, Fingerhut A, Yeo CJ, Neoptolemos JP, Adham M et al.; International Study Group on Pancreatic Surgery. Extended pancreatectomy in pancreatic ductal adenocarcinoma: definition and consensus of the International Study Group for Pancreatic Surgery (ISGPS). *Surgery* 2014; 156: 1–14.
9. Hasselgren K, Halldestam I, Fraser MP, Benjaminsson Nyberg P, Gasslander T, Björnsson B. Does the introduction of laparoscopic distal pancreatectomy jeopardize patient safety and well-being? *Scand J Surg* 2016; 105: 223–227.
10. Björnsson B, Sandström P, Larsson AL, Hjalmarsson C, Gasslander T. Laparoscopic versus open distal pancreatectomy (LAPOP): study protocol for a single center, nonblinded, randomized controlled trial. *Trials* 2019; 20: 356.
11. Dindo D, Demartines N, Clavien PA. Classification of surgical complications: a new proposal with evaluation in a cohort of 6336 patients and results of a survey. *Ann Surg* 2004; 240: 205–213.
12. Bassi C, Marchegiani G, Dervenis C, Sarr M, Abu Hilal M, Adham M et al.; International Study Group on Pancreatic Surgery (ISGPS). The 2016 update of the International Study Group (ISGPS) definition and grading of postoperative pancreatic fistula: 11 years after. *Surgery* 2017; 161: 584–591.
13. Wente MN, Bassi C, Dervenis C, Fingerhut A, Gouma DJ, Izbicki JR et al. Delayed gastric emptying (DGE) after pancreatic surgery: a suggested definition by the International Study Group of Pancreatic Surgery (ISGPS). *Surgery* 2007; 142: 761–768.
14. Wente MN, Veit JA, Bassi C, Dervenis C, Fingerhut A, Gouma DJ et al. Postpancreatectomy hemorrhage (PPH): an International Study Group of Pancreatic Surgery (ISGPS) definition. *Surgery* 2007; 142: 20–25.
15. Tingstedt B, Andersson B, Jönsson C, Formichov V, Brattlie SO, Ohman M et al. First results from the Swedish National Pancreatic and Periampullary Cancer Registry. *HPB* (Oxford) 2019; 21: 34–42.
Editor's comments

Benefits and boundaries to laparoscopic distal pancreatectomy

The LAPOP trial is only the second trial to randomize between open and laparoscopic distal pancreatectomy. The implementation of laparoscopic distal pancreatectomy has been documented to be rather slow and variable, despite several reported short-term benefits over open surgery. Shorter time to recovery, less bleeding and shorter hospital stay feature among the results reported across studies. However, the accumulated data stem mainly from retrospective series, and balanced group comparisons have been lacking. Thus, the LAPOP trial adds to the body of evidence for laparoscopic distal pancreatectomy, confirming a short-term benefit with a one-day reduction in length of stay at the treating institution. Also, a reduced total number of hospital days was reported as well as a quicker time to functional recovery. There were no differences in complications with a 31 and 38 per cent postoperative pancreatic fistula rate in both arms. The other randomized study (the Dutch multicentre LEOPARD trial), found a similar gain in reduced length of stay and hence laparoscopy was cost-similar to open distal pancreatectomy, but with no differences in quality of life or perception of cosmesis between the groups after one year.

The LAPOP trial started in a period when little data existed for laparoscopic distal pancreatectomy, and was designed and run as a single-surgeon laparoscopic arm, which is a limitation. BJIS is committed to prioritizing future randomized trials and studies in this respect to widen the generalizability of results and document the effects on outcomes. Also, the predominant indication of cystic lesions in LAPOP, several of a smaller size, should be viewed in light of an evolving understanding for indications for resection of pancreatic cystic lesions. Some lesions may be tempting to resect as low hanging fruit, but indications should remain the same independent of surgical access. Few patients with cancer were included, as expected from the uncertainty around oncological issues at the time when the trial was designed. The debate around the role of minimal access and outcomes in this setting remains unsettled. Despite this, the LAPOP trial brings controlled data together with the LEOPARD trial to confirm short-term gains with the laparoscopic approach. The next boundaries to cross will be further safe implementation, generalizability and more widespread use of laparoscopy, demonstrating similar efficacy for other indications than predominantly smaller cystic lesions and, for neoplastic disorders, to confirm a non-inferiority in oncological outcomes to open resection.

K. Søreide
Editor, BJIS

References

1 Björnsson B, Lindhoff Larsson A, Hjalmarsson C, Gasslander T, Sandström P. Comparison of the duration of hospital stay after laparoscopic or open distal pancreatectomy: randomized controlled trial. Br J Surg 2020; 107.
2 Lof S, Moekotte AL, Al-Sarireh B, Ammori B, Aroori S, Durkin D et al. Multicentre observational cohort study of implementation and outcomes of laparoscopic distal pancreatectomy. Br J Surg 2019; 106: 1657–1665.
3 Søreide K, Nymo LS, Kleive D, Olsen F, Lassen K. Variation in use of open and laparoscopic distal pancreatectomy and associated outcome metrics in a universal health care system. Pancreatology 2019; 19: 880–887.
4 Fingerhut A, Uranues S, Khatkov I, Boni L. Laparoscopic distal pancreatectomy: better than open? Transl Gastroenterol Hepatol 2018; 3: 49.
5 van Hilst J, Strating EA, de Rooij T, Daams F, Festen S, Groot Koerkamp B et al. Costs and quality of life in a randomized trial comparing minimally invasive and open distal pancreatectomy (LEOPARD trial). Br J Surg 2019; 106: 910–921.