ISSN: 03875547
Volume 45, Issue 06, August, 2022

A NOVELLY INTRODUCED APPLICATION ALL OVER THE PANCREATIC CUT END, EFFICIENTLY PROTECT AGAINST PANCREATIC LEAKAGE FOLLOWING LEFT PANCREATECTOMY (DEBAKEY TECHNIQUE)

Yasser A. Debakey[1]

Department of Oncology surgery National Cancer Institute Cairo - Kasr elainy street[1]

Keywords:
pancreatic stump, pancreatic fistula.

ABSTRACT

Pancreatic fistula (PF) is a common pancreas-specific complication after pancreatic resection, with an incidence of around 30% after left pancreatectomy, despite being largely performed in specialized hospitals. The current study describes a new technique of application of a seromuscular jejunal coverage over the pancreatic stump following left pancreatectomy. This study comprised patients at Cairo University's National Cancer Institute and Dar AlFouad Hospital in Egypt who had lesions in the pancreatic neck or body that allowed for a left pancreatectomy with a negative margin. The pancreatic stump was managed using two methods: first, sutures were used to close the end, and then a jejunal loop was used to compress the thick pancreatic stump in this group of patients. The pancreatic left end, which resembles the residual right stump after pancreatico-dudenectom in thickness, is securely covered, closed, and compressed by the newly described compression method in this area. Our innovative approach was used in 17 cases of left pancreatectomy. In eight of the seventeen cases, soft pancreas was present. The median age of the participants ranged from 19 to 67 years old. Transient fistula or biochemical leakage occurred in one case (5.88%). Our preliminary experience suggests that this approach is practical, safe, and quick, and that it can significantly reduce the risk of postoperative pancreatic fistula after left pancreatectomy, especially when the residual pancreatic stump is thick.

1. INTRODUCTION

Perioperative complications and death rates after pancreatic surgery have been steadily reducing since the turn of the century, in tandem with the concentration of pancreatic resections in high volume institutions [1], [2].

Even in these specialist hospitals, pancreatic fistula (PF) is still a common pancreas-specific complication following pancreatic resection, with an incidence of over 30% following left pancreatectomy [3].

Pancreatic surgeries that address a pancreatic pathology residing in the pancreatic neck, body, or tail, or as part of other procedures, most commonly splenectomies, are referred to as distal (left) pancreatectomy. Unfortunately, this phrase does not distinguish between procedures conducted on the pancreas' neck/body and those performed on the gland's most distal region. Without a doubt, the former's pancreatic stump is thicker than the latter's and, as a result, requires a more impermeable therapy.

A pancreatic fistula (PF) can cause subsequent bacterial infection, which can lead to intra-abdominal abscess formation, secondary bleeding, sepsis [4], and/or delayed gastric emptying [5]. Many various approaches have been described to avoid such issues.

Unligated pancreatic main duct, high BMI, and significant intraoperative blood loss have all been identified as risk factors for developing PF following a left pancreatectomy (LP) [6].

To date, no single surgical method has been shown to significantly reduce PF rates following LP in a prospective study [7].

Perhaps the continually high pancreatic fistula (PF) rates following left pancreatectomy (LP) indicate that our understanding of the pathophysiology of pancreatic fistula (PF) following left pancreatectomy (LP) is still lacking.

Furthermore, there appear to be differences in the reporting and interpretation of the findings from an increasing number of studies comparing alternative pancreatic stump closure procedures after left pancreatectomy (LP) [8].

2. Objective

Following left pancreatectomy, a new approach for applying seromuscular jejunal covering over the pancreatic stump is described in this article.

3. Patients and methods

Study design:

Retrospective study that was conducted on a prospective maintained database.

-Study Setting:

The study sample was collected from October 2018 till November 2021, patients attending the National Cancer Institute of Cairo University & Dar AlFouad hospital, Egypt.

Inclusion criteria:

Patients having lesions occupying the pancreatic neck or body and permitting left pancreatectomy with negative margin.

Exclusion criteria:

Patients with pancreatic head tumors, patients with lesions necessitating total excision of the gland, those with small & purely tail lesions or when the pancreatic tail is resected with splenectomy for splenic pathology

because of anatomical intents and patients with metastatic disease were excluded from the study.

Intervention:

- Detailed history taking including onset, course and previous medications and any comorbidity.
- Full surgical examination including swellings, pain and secretions.
- Routine laboratory investigations (CBC, Glucose level, renal & liver function tests).
- Pelvi- Abdominal Ultrasonography.

Perioperative investigation:

Endoscopic ultrasonography with fine needle aspiration cytology (FNAC) of the lesion is performed prior to surgery, and the aspirated cytology is tested for carcinoembryonic antigen. To complete the metastatic search, a CT scan with pancreatic procedure and a chest CT were frequently ordered. Serum tumour markers (CA19.9, CEA) were always accessible, together with a complete blood count, liver and kidney functions, and the patients' coagulation profile. Despite the use of all of our preoperative metastatic workup techniques, the procedure was always started with a laparoscopic assessment since omental or peritoneal deposits are typical in this group of patients. An open strategy was pursued once a non-metastatic illness was determined.

Preoperative instruction:

In terms of preoperative preparation, patients are not given drugs that cause long-term drowsiness starting at midnight the night before surgery. Second, subcutaneous enoxaparin 40 mg was administered 12 hours before the procedure was scheduled to prevent thromboembolism. Third, around an hour before surgery, patients were given a single-dose antibiotic prophylaxis against both anaerobes and aerobes.

At the completion of the treatment, two Nilaton drains were usually left in the Morrison's pouch and the pelvis. In this series, enhanced recovery after surgery (ERAS) was an important part of our postoperative program, which included encouraging early mobilization and independence. On POD 0, sips of water were permitted, and on POD 1, a liquid diet was administered. Soft diet was allowed on POD 2 as Long as a smooth postoperative course was anticipated. On PODs 1, 3, and 5, serial CBC and CRP measurements were taken. As a result, serial serum and drain amylase levels (at the Morrison's pouch) were tested, although only on PODs 3, 5, and 7.

Technique

Management of the remaining pancreatic stump (figure 1) was through adoption of two means; first closure of the end by sutures then tightly compressing the thick pancreatic stump in this group of patients using a jejunal loop. This newly described compression fashion in this area, firmly covers, closes and compresses the pancreatic left end which resembles in its thickness the remaining right stump after pancreatico-dudenectomy.

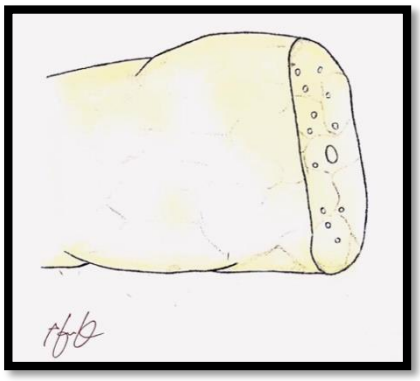

Figure 1: Pancreatic stump

A. Closure of the left pancreatic end (Figure 2, 3)

After ensuring adequate margin usually through frozen section examination in our center, the pancreatic parenchyma is transected with a sharp knife and/or electrocautery at the neck/body of the pancreas. Having completed the resection phase of left pancreatectomy with or without splenic preservation and after retrieval of the specimen, hemostasis is first ascertained using electrocautary or/and fine sutures.

Then, we prepare the remnant thick pancreatic left end for through & through closure using the monofilament PDS 3/0 suture, we believe it's less traumatic and causes less lacerations to the pancreatic parenchyma.

Before ending this phase, a jejunal loop, usually 20-30 cm from the dudeno-jejunal flexure, is moved towards the pancreatic stump through a trans-mesocolic route (i.e retrocolic) and is adjusted for the next step.

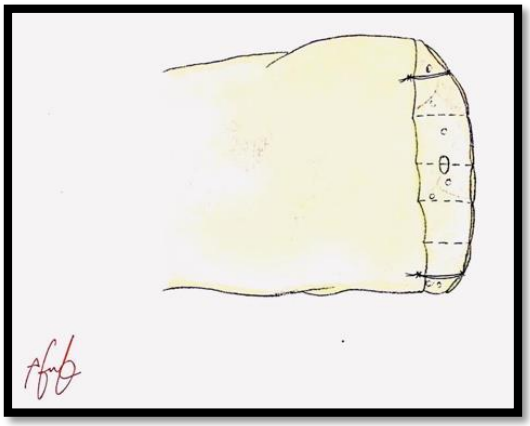

Figure 2: through & through closure

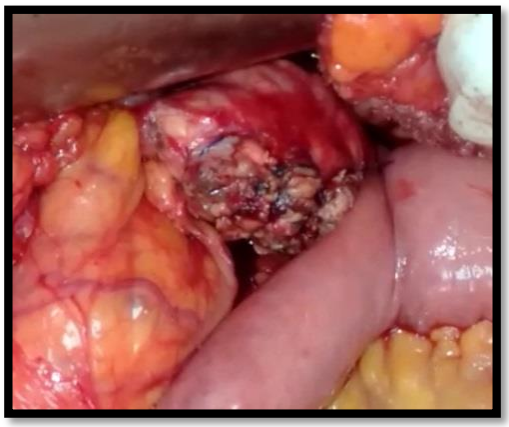

Figure 3: Pancreatic stump after through & through closure

B. The new newly described compression fashion for pancreatico-jejunal suturing

1. The pancreatic cut edge accommodated six to seven fastening sutures to accomplish this step in all our series. Each one compromises of a full thickness pancreatic suture (anterior to posterior) 1-1.5 centimeters from the stump edge with a posterior U-shaped jejunal seromuscular stitches close to the mesenteric border in a parachuting tactic, then again the needle passes trans-pancreatic in a reverse manner (posterior to anterior) to come out near the point of entry, keeping 1–1.5 cm distal from the cut edge. As such, next suture is undertaken and in the same manner the needle comes to be hanged over the anterior surface of the pancreas

ISSN: 03875547
Volume 45, Issue 06, August, 2022

and so on till reaching the other end of the pancreatic stump. (Figure 4)

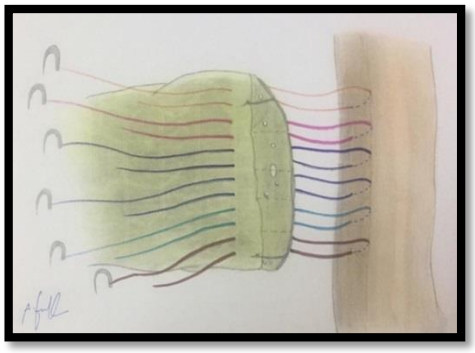

Figure 4: starting the pancreatico-jejunal suturing

2. Drawing the sutures (Figure 5)

Now there are 6-7 sutures, we start to tow all of them in order to allow the jejunal loop to come in contact and firmly compress the pancreatic stump also to allow part of the jejunal loop to go beneath the posterior stump end.

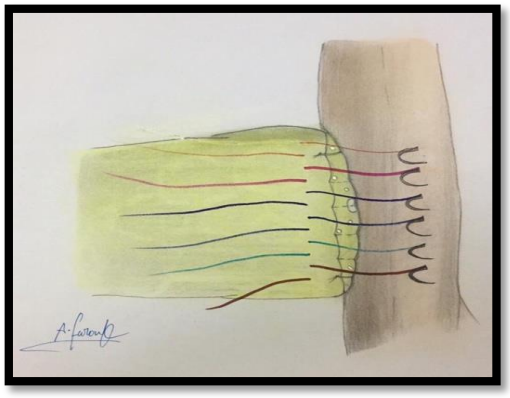

Figure 5: Anterior U-shaped seromuscular jejunal sutures

3. Completion of the double U-shaped sutures (Figure 6, 7)

Via using the hanged needles, seromuscular jejunal sutures (second U suture) are taken but now near the other side of the antimesenteric border of small bowel loop. After that, the jejunum is fastened firmly to fold over the anterior surface of the pancreas by evenly tightening the stitches one by one in a reverse manner of their arranged order.

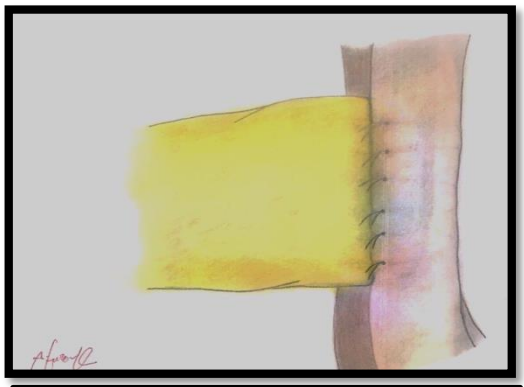

Figure 6: final step describing the compression fashion of pancreatico-jejunal suturing

Figure 7: the pancreas is tightly compressed by the jejunal wall

We adopt the same technique for both soft and hard glands; the only difference was PDS 3/0 for hard pancreas and 4/0 for the soft gland. The tension was equally distributed across all stitch sites.

Postoperative complication:

1-Wound infection.

2- Fistula: Transient fistula or biochemical leakage, according to the last classification system of the international study group of postoperative pancreatic fistula (ISGPF) definition and grading (9).

ISGPF classification for pancreatic fistula:

- No fistula: Drainage amylase on or after postoperative day 3 is not three times than upper normal serum amylase value.

- Grade A: No specific treatment was required even though drainage amylase on or after postoperative day 3 is three times than upper normal serum amylase value.

- Grade B: Requires a change management or adjustment of clinical pathway (antibiotics, total parenteral nutrition, or repositioning of drainage tubes).

- Grade C: Requires major charge in the clinical pathway; clinical intervention is aggressive and often in the ICU setting.

Ethical consideration:

The approval of the Institutional Review Board of the National Cancer Institute was obtained (approval number: 2201-510-001). Data were collected anonymously and after full explanation of the aim of the study, participants were educated about the target and benefits of the analysis. Participants in the study were voluntary. In addition, written consent was provided first. The confidentiality of the data collected was ensured for the participants.

Study outcomes:

As a result of our approach, we were able to lower the risk of PF and associated complications while also starting adjuvant chemotherapy for our patients on time, allowing them to achieve their primary goal of

curative therapy.

Statistical analysis:

Statistical method:
Data will be analyzed using SPSS statistical package version 26. Numerical data will be summarized as mean and standard deviation or median and range.

4. RESULTS

The study included 17 participants ranging from 19-67 years,7 males (41.2%), and 10 females (58.8%). Eight of patients (41.2%) had pancreatic adenocarcinoma, four patients (23. %) had solid pseudopapillary tumor (SPT), three (17.6%) Intraductal papillary mucinous neoplasm (IPMN) and three (17.6%) Mucinous cystic neoplasms (MCN). Soft pancreas existed in eight out of the seventeen cases (table 1).

Table 1: Demographic characteristics and pathological subtypes of the participants

Characteristics	**(n=17)**
Age	47 (19-67)
Sex	
Male	7 (41.2%)
Female	10 (58.8%)
Pathology	
Adenocarcinoma	7 (41.2%)
IPMN	3 (17.6)
MCN	3 (17.6)
SPT	4 (23.5)

SPT:Pseudo papillary tumor, IPMN:Intraductal papillary mucinous neoplasm and MCN :Mucinous cystic neoplasms.

As regard operative time and postoperative complication: the mean operative time was 23.7±7.5 minutes, ranging from 15-45 minutes. 76.5% of the participants didn't acquire any complications.

One patient (5.9%) of cases with Intraductal papillary mucinous neoplasm (IPMN) and soft pancreas had a grade B fistula, as well as leucocytosis and wound infection, according to the ISGPF grading system.

The leak was treated with conservative techniques such as Nothing Per Oral (NPO), entire parental nourishment, and appropriate drainage. The patient was discharged on POD18.

The remaining ten cases (94.11%) had a smooth surgical recovery with no biochemical leaks. (table 2).

Table 2: Operative technique time & complication

Characteristics	**(n=17)**
Operative time (minutes)	

Mean ± SD	23.7±7.5
Median (range)	21.0 (15-45)
Complications	
None	13 (76.5)
P.F A	2 (11.8%)
P.F B, Wound infection	1 (5.9%)
Wound infection	1 (5.9%)

SD: standard deviation, P.F A: Pancreatic Fistula A. P.F B: Pancreatic Fistula B.

As regard Postoperative serum, drain amylase: The standard deviations and means of serum and drain amylase on POD 3, 5, 7 are shown in table 3. The mean serum amylase was decreased at day 7 compared to day there post-operative (54.7±9.5 versus 78.4±25.6), in addition Drain Amylase was decreased at day 7 compared to day there post-operative (132.5±238.9 versus 275.5±247.5).

Table 3: Postoperative serum, drain amylase

Characteristics	S. Amylase POD3 (U/L)	S. Amylase POD5(U/L)	S. Amylase POD7 (U/L)	D. Amylase POD3 (U/L)	D. Amylase POD 5 (U/L)	D. Amylase POD7 (U/L)
Mean ± SD	78.4±25.6	60.0±14.0	54.7±9.5	275.5±247.5	200.4±228.1	132.5±238.9
Median (range)	77.0 (40-125)	60.0 (40-90)	52.0 (39-72)	205.0 (87-1150)	125.0 (60-1044)	81.0 (38-1054)

SD: standard deviation, POD: Postoperative day, D. Amylase: Drain Amylase,
S. Amylase: Serum Amylase

5. DISCUSSION

A recent systematic meta-analysis evaluated all surgical options for dealing with the pancreatic remnant after distal pancreatectomy [8]. However, new surgical procedures were unable to appreciably lower the prevalence of PF in many cases. When a pancreatic tumour occupies the pancreatic neck or body, the subsequent resection line, whether to the right or left of the superior mesentric vein, would be through rather substantial pancreatic tissue. When compared to a more distal pancreatectomy, such as in cases of small lesions occupying the most distal part of the gland or when combining distal pancreatictomy with splenectomy for splenic pathologies for anatomical reasons, we believe that this condition necessitates a different management of the resultant stump.

Several studies have attempted to identify better techniques for preventing PF after distal pancreatectomy. These strategies can be divided into the following categories: I hand sewing of the pancreatic stump [3], ii) stapler-only transsection and closure [3], iii) combination of stapler and manual suturing along the stapler line [10], iv) pancreatico-gastric or -enteric anastomosis [10], v) use of fibrin/coagulation factor-like biosealants [11], vi) application of serosal or seromuscular patches [12] on the pancreatic stump.

Some of these strategies have been compared in the context of a few randomised trials over the last two decades [3], [12], and the results from retrospective investigations did not always correspond to the evidence supplied by such trials [13]. Furthermore, there is a wide range of pancreatic fistula (PF) rates after left

pancreatectomy (LP), ranging from 12% to 51% [14], [15], as well as considerable differences in stump closure methods in different pancreatic centres across the world.

Many authors of previous work indicated that their technique was the most effective; however, we do not believe that there have been enough cases to determine which strategy is the most effective. Without a doubt, these various approaches reflect the clinical variety in this area [16].

Add to that the lack of randomized trials; type 2 statistical errors due to small sample size, variable sites of transection line in the pancreas, heterogeneous study populations, and non-unified fistula criteria make the impact of these procedures difficult to transfer.As a result, we developed this method, which combines two suturing approaches for the pancreatic stump in a trial to deal with major ducts, as well as our newly reported tactic of tightly compressing the gland's raw cut surface with a seromuscular jejunal layer. We feel that this newly introduced application, which is applied all over the pancreatic cut end, is effective in preventing pancreatic leakage from minor pancreatic ducts at the gland cut surface.

6. Conclusion

Our preliminary experience suggests that this approach is practical, safe, and quick, and that it can significantly reduce the risk of postoperative pancreatic fistula after left pancreatectomy, especially when the residual pancreatic stump is thick.

Limitation:
Because this is a single surgeon's experience, investigations with a larger number of patients are needed to determine whether this new strategy is preferable to others.

7. References

[1] Huttner F, Koessler-Ebs J, Hackert T, Ulrich A, Buchler M, Diener M. (2015): Meta-analysis of surgical outcome after enucleation versus standard resection for pancreatic neoplasms. Br J Surg.; 102(9):1026–36. https://doi.org/10.1002/bjs.9819 PMID: 26041666.

[2] Chua TC, Saxena A. (2010): Extended pancreaticoduodenectomy with vascular resection for pancreatic cancer: a systematic review. J Gastrointest Surg.; 14(9):1442–52. https://doi.org/10.1007/s11605-009-1129-7 PMID: 20379794.

[3] Diener MK, et al. (2008): DISPACT trial: a randomized controlled trial to compare two different surgical techniques of DIStal PAnCreaTectomy—study rationale and design. Clin Trials.; 5(5):534–45. https://doi.org/10.1177/1740774508096140 PMID:18827046.

[4] Fitzgibbons TJ, Yellin AE, Maruyama MM, Donovan AJ.Management of the transected pancreas following distal pancreatectomy. Surg Gynecol Obstet 1982; 154: 225-231 [PMID:7058483].

[5] Wente MN, Bassi C, Dervenis C, Fingerhut A, Gouma DJ, IzbickiJR, Neoptolemos JP, Padbury RT, Sarr MG, Traverso LW, Yeo CJ,Büchler MW.(2007): Delayed gastric emptying (DGE) after pancreatic surgery: a suggested definition by the International Study Group ofPancreatic Surgery (ISGPS). Surgery; 142: 761-768 [PMID:17981197 DOI: 10.1016/j.surg.2007.05.005].

[6] Bilimoria MM, Cormier JN, Mun Y, Lee JE, Evans DB, Pisters PW. (2003): Pancreatic leak after left pancreatectomy is reduced following main pancreatic duct ligation. Br J Surg.; 90(2):190–6.

https://doi.org/10.1002/bjs.4032 PMID: 12555295.

[7] Goh BK, Tan YM, Chung YF, Cheow PC, Ong HS, Chan WH, et al.(2008): Critical appraisal of 232 consecutive distal pancreatectomies with emphasis on risk factors, outcome, and management of the postoperative pancreatic fistula: a 21-year experience at a single institution. Arch Surg.; 143(10):956–65. https://doi.org/10.1001/archsurg.143.10.956 PMID: 18936374.

[8] Tieftrunk E, Demir IE, Schorn S, SargutM, Scheufele F, Calavrezos L, et al. (2018): Pancreatic stump closure techniques and pancreatic fistula formation after distal pancreatectomy: Meta-analysis and single-center experience. PLoS ONE 13(6): e0197553. https://doi.org/10.1371/journal.pone.0197553.

[9] Bassi C, Marchegiani G, Dervenis C, Sarr M, Abu Hilal M, Adham M et al. (2017):The (2016) update of the International Study Group (ISGPS) definition and grading of postoperative pancreatic fistula:11 years after. Surgery;161:584-91.

[10] Okada K, Kawai M, Tani M, Hirono S, Miyazawa M, Shimizu A, et al. (2014): Isolated Roux-en-Y anastomoses of the pancreatic stump in a duct-to-mucosa fashion in patients with distal pancreatectomy with en-bloc celiac axis resection. J Hepatobiliary Pancreat Sci.; 21(3):193–8. https://doi.org/10.1002/jhbp.16PMID: 23878017.

[11] Suc B, Msika S, Fingerhut A, Fourtanier G, Hay JM, Holmieres F, et al. (2003): Temporary fibrin glue occlusion of the main pancreatic duct in the prevention of intra-abdominal complications after pancreatic resection: prospective randomized trial. Ann Surg.; 237(1):57–65. https://doi.org/10.1097/01.SLA.0000041259.01594.33 PMID: 12496531.

[12] Olah A, Issekutz A, Belagyi T, Hajdu N, Romics L JR. (2009): Randomized clinical trial of techniques for closure of the pancreatic remnant following distal pancreatectomy. Br J Surg.; 96(6):602–7. https://doi.org/10.1002/bjs.6620 PMID: 19434697.

[13] Zhang H, Zhu F, Shen M, Tian R, Shi CJ, Wang X, et al. (2015): Systematic review and meta-analysis comparing three techniques for pancreatic remnant closure following distal pancreatectomy. Br J Surg.;102(1):4–15. https://doi.org/10.1002/bjs.9653 PMID: 25388952.

[14] Kleeff J, Diener MK, Z'Graggen K, Hinz U, Wagner M, Bachmann J, et al. (2007): Distal pancreatectomy: risk factors for surgical failure in 302 consecutive cases. Ann Surg.; 245(4):573–82. https://doi.org/10.1097/01.sla.0000251438.43135.fb PMID: 17414606.

[15] Soga K, Ochiai T, Sonoyama T, Inoue K, Ikoma H, Kikuchi S, et al. (2011): Risk factors for postoperative pancreatic fistula in distal pancreatectomy. Hepatogastroenterology. ; 58(109):1372–6. PMID:21937410.

[16] Knaebel HP, Diener MK, Wente MN, Büchler MW, Seiler CM. (2005):Systematic review and meta-analysis of technique for closure of the pancreatic remnant after distal pancreatectomy. Br J Surg ;92: 539-546 [PMID: 15852419 DOI: 10.1002/bjs.5000].