

Distal Pancreatectomy with Spleen Preservation. Should it be the Norm?

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Traditionally, distal pancreatectomy has often included a splenectomy due to the anatomical proximity of the pancreatic tail to the hilum of spleen and the close association of the splenic vessels with the pancreas. Splenectomy in conjunction with Distal Pancreatectomy (DPS) is clearly indicated in most patients with adenocarcinoma of the pancreas, as splenic preservation may compromise the oncologic resection. However for benign lesions or tumours with low grade malignant potential, the issue of splenic preservation remains controversial. Should it be the norm?

Splenic preservation has been reported by some to have the advantages of lesser blood loss, shorter operative time and fewer postoperative complications such as pancreatic fistula, abscesses in the resection bed, and shorter length of hospitalization [1-8]. However of greater significance is its ability in reducing the long-term risk of post splenectomy sepsis related to capsulated bacteria, which is reported in asplenic patients to be around 5% with related mortality of up to 50% [9]. In addition, there is also a concern with regard to increased risk of myocardial infarction [10], diabetes [11,12] and even malignancy in patients with elective splenectomy, in later years [13]. Thus Spleen Preservation during Distal Pancreatectomy (SPDP) has been proposed as a means to reduce the risk of postsplenectomy sepsis, and haematologic and immunologic disorders [10-13]. A review of literature however highlights the inconsistencies of the outcome, both during the procedure and postoperatively. While most authors feel that the operation is safe [1-4,8,12], the reported complications are inconsistent in breadth and severity [14-20]. This is particularly so regarding the incidence of pancreatic fistula which is reported to occur anywhere from 4% to 50% based on the ambiguous definitions [21].

Preservation of the spleen with distal pancreatectomy can be accomplished in either of two ways: (1) meticulously separating the splenic artery and vein from the pancreas, by isolating and dividing each of the many small branches between the pancreas and these vessels or (2) taking the splenic artery and vein with the pancreas but carefully preserving the collateral blood supply of the spleen from the short gastric and left gastroepiploic vessels first described by Warshaw [8]. With advances made in laparoscopic technique and experience gained, laparoscopic distal pancreatectomy is now regarded as safe and effective treatment modality for benign and borderline malignant tumors of distal pancreas [6,7,15,18].

Outcomes

Splenectomy versus spleen preservation

For decades, concomitant splenectomy was considered a necessity in distal pancreatectomy, until splenic preservation with intact splenic vessels was formally described by Mallet and Vachon [22] in 1943. However in earlier reports, the splenic preservation was reported to be possible in around 16% of the patients [23]. But in recent years, distal pancreatectomy with spleen preservation has been achieved in 29% to 95% of patients [12,15,20]. There are conflicting reports of the morbidity of distal pancreatectomy with concomitant splenectomy. A comprehensive review by Holdsworth et al. [24] describes low complication rates when splenectomy is included with the distal

pancreatectomy. Similar experience has been reported by others who have found no difference in operative time, blood loss, mortality and morbidity between the two groups [2,17,19]. Conversely, others have identified a trend towards increased infectious complications and length of stay with addition of a splenectomy [4,6]. Considering the technical demands of spleen preserving distal pancreatectomy compared with conventional distal pancreatectomy, some may argue against the efforts when preserving the spleen. This is particularly so, if one believes that despite the theoretic background of spleen's role, clinical adverse events related to splenectomy appear to be rare particularly in adults. This has been strongly contested by others who feel that the subjective feeling of lower incidence of adverse effects of splenectomy, such as Overwhelming Post Splenectomy Infection (OPSI), may be due to limited follow up studies [6]. When these patients have been followed up for longer period of time, the interval between splenectomy and OPSI has been reported to be between 10 to 19 years and the overall mortality reached approximately 50% in them [24]. In recent years there are several reports to suggest distinct advantage in preserving the spleen. Carrere et al. [1] reported a series of distal pancreatectomy in 76 patients half with splenectomy and half with splenic preservation. Intraoperative complications and postoperative infection occurred in 34 and 18% respectively in the splenectomy group, compared with 13 and 3% in the splenic preservation group. The splenic preservation in this study utilized the Warshaw technique successfully in 36 of 38 attempts and was judged to be fast, safe and effective [1]. In another report, splenectomy was found to have a negative influence on the long-term survival, independent of disease related factors in pancreatic cancer [25]. In a series of 259 patients, 74 patients underwent SPDP by Warshaw technique while the remaining 185 underwent DPS [2]. Preservation of spleen did not increase the morbidity in them as there was no difference between the two groups in the incidence of postoperative complications including collections, abscesses, pancreatic fistula or wound healing problems [2].

Spleen vessel preservation versus splenic vessel resection

The attempt to save the spleen with its artery and vein is particularly difficult with a chronically inflamed pancreas or with an obese body habitus and in these patients there may be significant risk of intraoperative bleeding and loss of the spleen [23,26]. The perceived advantage of spleen vessel preservation is that the concern of splenic infarction in patients undergoing Warshaw technique is addressed. The patency of these preserved vessels may however be compromised, particularly in those undergoing laparoscopic splenic

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vessel preserving SPDP where energized instruments are used close to the vessels along with significant amount of handling of these vessels. Studying the patency of splenic vessels after performing laparoscopic SPDP, the patency of splenic artery and vein was found to be 16/22 (72%) and 5/22 (22.7%) respectively at the end of 1 month and 19/22 (86%) and 9/22 (40.9%) at the end of 6 months [27]. The significant finding however in them was that, despite this, the splenic perfusion was well preserved [27]. While successful SPDP with splenic vessel preservation have been carried out in 85 to 100% of cases in recent years [18,20], there are reports of technical difficulty in doing so leading either to splenectomy or conversion to lesser demanding Warshaw technique. Fernandez-Cruz et al. [3], using laparoscopic approach tried to save the splenic vessels but had to convert to the Warshaw technique in 5/11 (45.5%) cases because of bleeding [28]. They found a shorter operative time (165 versus 232 min) and lower blood loss (225 versus 495 ml) with the Warshaw technique [28].

Laparoscopic distal pancreatectomy and spleen preservation

The advent of minimally invasive technique was marked by a paradigm shift towards the use of laparoscopy including in pancreatic surgery [6,7,15,18,26,28]. Laparoscopic distal pancreatectomy is becoming favoured for many neuroendocrine tumours, cystic neoplasms and some inflammatory disorders [1,6,8]. Maintaining the spleen by either vascular preservation [7] or vascular resection with collateral preservation [1,6] can be accomplished laparoscopically. Generally Warshaw technique has been found to be easier, faster and most likely to have a successful outcome [1,6]. However in a recent report of 58 patients who underwent laparoscopic SPDP, splenic vessel preservation was possible in 84.4% of the cases [18]. A multicenter European trial reported 124 cases of distal pancreas lesions among which 58 patients (45.6%) underwent SPDP. Pancreatic related complications were noted in 31% which included 17% rate of clinical pancreatic fistula and a median hospital stay of 7 days (3-67 days) [26]. In a recent report comparing laparoscopic SPDP with DSP, higher grade of postoperative complications were noted in lap DPS ($p=0.003$). These included more postoperative pancreatic fistula of higher grade ($p=0.026$) and longer hospital stay (12 ± 10.8 versus 7.1 ± 2.3 days, $p=0.004$) [6]. On long term follow up more episodes of common cold or flu ($p=0.026$), more instances of easy fatigability ($p=0.014$) and poor health conditions were noted in patients with lap DSP [6]. With experience gained in recent years, laparoscopic SPDP is considered a safe operation, without significantly increasing the morbidity, yet adding to the benefit of preserved spleen [6,8].

Early and late outcomes of splenic preservation

The desired outcome of saving the spleen in reducing the risk of postsplenectomy sepsis, haematologic and immunologic disorders, has been cited previously [8-13]. This goal can be accomplished by preserving the spleen with or without division of splenic vessels. However, concerns have been expressed about the early and late consequences of both these techniques.

In splenic vessel preserving SPDP, the potential advantage of maintaining perfusion to the spleen should be balanced against the splenic artery and vein occlusion and the potential risk of left sided portal hypertension [27]. In one report splenic vein occlusion was noted in 77.3% and 50.1% at the end of 1st and 6th month respectively after laparoscopic SPDP [27]. Fortunately, despite the compromised patency of the preserved splenic vessels, perfusion was well maintained in most patients [27]. The risk factors in the early post operative period that are detrimental for the poor patency of the splenic vessels include

pancreatic fistula and intra-abdominal collections [27]. In addition, in patients undergoing lap SPDP, the proximity of the ultrasonic shear to the preserved vessel might provoke thermal damage of the vessel and subsequent stricture and obliteration of the vessel [29].

In Warshaw technique, reliance on the collateral circulation for splenic perfusion has its own limitations [8]. This is particularly so, when the spleen is enlarged, as collaterals have been found to be insufficient to maintain the increased volume of an enlarged spleen. It is thus important to assess the size of the spleen, early in the operation. The risk of such infarct is about 2% [8]. The variability in number and size of short gastric vessels, compound matters as they could influence the incidence of postoperative splenic infarction. Hence, their sufficiency should be evaluated before a final intraoperative decision is taken to preserve the spleen.

Examination of the spleen after the completion of distal pancreatectomy is essential [8]. While invariably its color is darker than before the vascular interruption, a burgundy or dark color indicating perfusion and viability should still be discernible [8]. However if the spleen appears dark gray or black, with sharply demarcated areas indicating a zone of probable necrosis, a decision of splenectomy would then be based on the volume of critical ischaemia [8].

It is obvious that there is reduced perfusion of the spleen after division of the splenic artery and vein in Warshaw technique. This may lead to small areas of apparent infarction. When less than 1/3 of the spleen is involved, as evidenced by contrast enhanced tomography or radionuclide scan [8,30], it has been found that they are well tolerated and do not require intervention. Improved blood supply is achieved in a short time, through accommodation by collateral flow, facilitating adequate perfusion of the spleen [30].

These collaterals so developed, as a consequence of splenic vein interruption, could however lead to the potential risk of gastric varices [8,27]. However inspite of the observation of gastric varices they have hardly been reported to be bleeding from them [8].

Conclusion

Distal pancreatectomy with preservation of spleen is generally feasible, particularly for benign lesions, and is desirable for long-term benefits. However there are several inconsistencies in the literature of the outcome, both during the procedure and postoperatively. While most reports would suggest good early outcome [1,2,4,6,16], there are few reports that have noted no difference [15,19]. Based on the present evidence in the literature, it appears that every attempt should be made to preserve the spleen while performing distal pancreatectomy for benign or borderline pancreatic disorders. However, well-conducted randomized clinical trials with multi-institutional collaboration would go a long way in throwing more light, regarding the short term and long term benefits of spleen preserving distal pancreatectomy. This could guide us, as to whether it should be a norm in cases of distal pancreatectomy for benign and borderline pancreatic tumors.

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