

Role of RAMPS and Its Technique

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Recurrence after surgical resection of cancers of the body and tail of the pancreas is very common and survival rates remain low, even in expert hands. In part, this is because of the aggressive nature of this malignancy. It might also be attributable to the frequent failure of the usual surgical approaches to obtain the basic goals of an oncologic surgical resection—negative margins and N1 node dissection. Strasberg et al presented a modified technique of distal apncreatectomy, Radical antegrade modular pancreatosplenectomy (RAMPS), in 2003(1). In this method, dissection proceeds from right-to-left in 1 of 2 posterior dissection planes to achieve negative posterior resection margins. The accompanying N1 lymph node dissection is based on established anatomy of lymph node drainage of this part of the pancreas.

Posterior Resection Margin

RAMPS selects one of two posterior planes of dissection, based on the position of the tumor in the pancreas. It is always behind the anterior renal fascia, but varies with respect to whether the adrenal gland and Gerota fascia is removed. The more superficial plane of the anterior RAMPS procedure lies directly on the surface of the left adrenal gland and Gerota's fascia.

In the posterior RAMPS procedure, the plane of dissection is the posterior abdominal wall and the surface of the kidney, and exceptionally part or all of the left kidney can be removed.

The antegrade approach provides superior visualization of the posterior plane of the dissection to the standard retrograde approach. In the more anterior of the 2 possible planes of dissection, early identification of the renal vein and the anterior surface of the adre-

nal vein sets up the plane of dissection. Furthermore, in the antegrade approach, the major blood vessels, such as the splenic vein, adrenal vein, and renal vein, are controlled early in the dissection, adding to the safety of the dissection across the posterior plane.

Lymphatic Drainage

The lymphatic drainage of the body and tail of the pancreas has been reviewed in detail by O'Morchoe(2). There are 2 major nodal groups receiving lymph from the body and tail of the pancreas. The body and tail of the pancreas may be thought of as having 4 equally sized quadrants. The lymphatic vessels along the superior and inferior borders of the left half of the body and tail drain to splenic nodes in the hilum of the spleen or gastrosplenic nodes in the gastrosplenic omentum. Lymphatic vessels coursing along the superior and inferior borders of the right half of the body drain to the gastroduodenal and infrapancreatic nodes. These 4 sets of nodes form a ring of nodes. The second major group of nodes lies anterior to the aorta in relation to the celiac and superior mesenteric arteries. Pancreatic lymphatics may enter these nodes directly without first entering a node on the ring. Therefore, they should be considered as N1 and as N2 nodes. On the basis of this information, an operation designed to remove N1 nodes should remove nodes of the ring, the celiac lymph nodes, and the nodes along the front and left side of the superior mesenteric artery.

Recently, Fujita and colleagues have presented a pathological study revealing the site of actual lymph node metastases(3). Most positive nodes were found along the superior and inferior borders of the pancreas, but nodes in the splenic hilum and along the

celiac artery were never involved. Nodes along the superior mesenteric artery were occasionally involved.

Procedure

1. Division of the neck of the pancreas

After dissection of the greater omentum off the colon and division of the short gastric vessels close to the stomach, the neck of the pancreas is elevated off the superior mesenteric and portal veins from below. The lesser omentum is opened, and the lymph nodes along the common hepatic artery and around the hepatoduodenal ligament are dissected. The neck of the pancreas is divided.

2. Dissection of the celiac lymph nodes

Performance of the celiac node dissection at this time exposes the origin of the splenic artery from a superior position. The origin of the splenic artery from the inferior aspect of the celiac artery is now evident, and it is ligated and divided close at that point.

3. Determination of the posterior extent of the dissection and the formation of the medial wall of the dissection

The decision is made whether the eventual plane of dissection will be anterior to or behind the adrenal gland. The splenic vein is isolated at its junction with the superior mesenteric vein and divided. The plane of the dissection now proceeds vertically in the sagittal plane exposing the left side of the celiac and SMA down to the level of the aorta. The lymph nodes anterior to the aorta between the celiac artery and superior mesenteric artery and those anterior and to the left of the superior mesenteric artery are taken with this step.

4. Dissection plane anterior to the adrenal gland

The plane of dissection now turns to the left in an oblique plane that slopes posteriorly to the left. The left renal vein marks the inferior border of the dissection. The adrenal vein is identified, and the dissection is continued laterally, usually taking Gerota's fascia off the superior half of the kidney.

5. Dissection plane posterior to the adrenal gland

Instead of turning laterally when the anterior border of the aorta is reached, the dissection is continued posteriorly in the sagittal plane down the left side of the aorta onto the diaphragm. At a more superior level, the dissection is carried onto the diaphragm and the retroperitoneal muscle layers before turning laterally.

Result

Strasberg et al presented the long term result(4). Negative tangential margins were obtained in 89% of specimens. There were no 30-day or in-hospital mortalities. Mean and median follow-up times of living patients were 44.4 and 26.4 months. Median survival was 26 months and 5-year overall actuarial survival was 35.5%. Our hospital data also showed satisfactory 5- year survival rate.

RAMPS procedure can achieve negative tangential margins in a high percent of patients with resectable carcinoma of the body and tail of the pancreas. Median and overall survival rates are satisfactory for this type of tumor and are similar to rates reported for the Whipple procedure. RAMPS can be adopted as the standard method for the present time.

References

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