

## Laparoscopic Surgical Treatment of Neuroendocrine Pancreatic Tumors

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### Neuroendocrine Tumors of the Pancreas

Pancreatic Endocrine Tumors (PNETs) represent a rare, but important subset of pancreatic neoplasms. These tumors account for 2–4% of all clinically detected pancreatic tumors. Their overall incidence is approximately 1 of 100 000 people per year [1,2]. PNETs consist of single or multiple benign or malignant neoplasms and are associated with multiple endocrine neoplasia type 1 (MEN1) in 10–20% or Von Hippel-Lindau (VHL) syndrome. The natural history of PNETs is highly variable. Small, benign neoplasms such as 90% of all sporadic insulinomas are readily curable by surgical resection [3]. Although most gastrinomas grow slowly, 60–90% are malignant. The natural course of sporadic ZES is more aggressive than of MEN1-ZES with 15 years survival rates of 70–80 and 100%. Rare functional tumors (RFTs) such as VIPoma and glucagonoma, as well as most NF-PNETs have a less favorable prognosis [1,2]. Approximately 80% of patients already have metastases at initial presentation [1,2]. Five year survival for the group with advanced disease is 29–45% [1,3] and 60% overall.

### Laparoscopic Surgery for PNETs

Most patients with insulinomas are ideal candidates for a minimally invasive approach, because these tumors are small, solitary and benign. The first successful laparoscopic resection was first reported by Gagner et al. in 1996 [4]. As mentioned earlier, the most sensitive method of localization is intraoperative palpation and IOUS. In laparoscopic surgery, palpation is not possible. We and others have reported that preoperative localization, mainly by endoscopic ultrasonography, is crucial for the decision to operate laparoscopically [3,5–7] and that minimally invasive surgery for PNETs should be undertaken only if laparoscopic ultrasound is available. Laparoscopic ultrasound helps the surgeon to decide whether to use enucleation or resection, a decision that will depend on the proximity to the main pancreatic duct or large blood vessels.

Laparoscopic enucleation is reserved for tumors less than 2 cm diameter located on, or near, the surface of the pancreas, and not in contact with splenic vessels, the portal vein or the main pancreatic duct. If these criteria are not met, laparoscopic spleen-preserving distal pancreatectomy should be the preferred choice [5–7]. Patients with NF-PNETs may also be candidates for laparoscopic surgery, if their lesions are small and without signs of malignancy.

MEN1 patients who have an insulinoma or small NF-PNETs can also benefit from a laparoscopic approach. Since virtually all MEN1 patients have multiple PNETs and it is almost impossible to determine preoperatively which one is the insulinoma, spleen-preserving distal pancreatectomy should be the preferred laparoscopic approach. Gastrinomas are yet not considered candidates for a laparoscopic approach for 2 reasons. First, most gastrinomas are usually located in the duodenum and bidigital palpation after duodenotomy is essential to identify the small tumor. Second, most pancreatic gastrinomas are over 2 cm in diameter at diagnosis and reveal metastases in up to 70% of patients requiring a meticulous lymphadenectomy, which is not ideal for a laparoscopic approach. The same holds true for rare functioning PNETs and for malignant NF-PNETs.

Overall, laparoscopic surgery for PNETs, which consist mainly of insulinomas and small NF-PNETs, is both feasible and safe [5–8]. Nevertheless, it seems clear that such treatment should be offered only by surgeons who are experienced in both endocrine pancreatic operations and advanced laparoscopic surgery.

### References

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