Answer

Pancreatic Schwannoma

Schwannoma (neurilemoma) is a benign tumor of neural crest–derived Schwann cells usually found on the extremities.[1-4] Pancreatic schwannomas are exceedingly rare and are thought to arise from either autonomic sympathetic or parasympathetic fibers coursing through the pancreas.[2,5] In contrast, neurofibromas, which can be associated with neurofibromatosis 1, have a greater chance for malignant degeneration.[4]

Microscopically, schwannomas are well-circumscribed, encapsulated tumors with a mixture of 2 growth patterns: Antoni A and Antoni B. The Antoni A pattern contains areas of high cellularity with spindle cells arranged in a palisading fashion and areas of low cellularity between the palisades called Verocay bodies. Antoni B areas have a hypodense cellularity with a loose meshwork of cells. If these areas show degenerative changes, such as cyst formation, stromal hemorrhage, hyalinization, calcification, and nuclear atypia, they are called ancient schwannomas.[1,5,6] The present case did have areas with degenerative changes consistent with an ancient schwannoma (**Figure 2**B).

On CT scan, tumors with predominately Antoni A areas appear as inhomogeneous hypodense masses with contrast enhancement. The hypodensity is caused by the high lipid content, while the contrast enhancement can be attributed to the hypervascularization of the tumor.[6,7] Tumors with predominately Antoni B areas may have a cystic or multiseptated appearance on CT scan caused by the poor cellularity and loose stroma.[8] The present case contained both Antoni A and B areas and appeared to be a septated partially cystic mass on ultrasonography (not shown), which was enhanced with contrast on CT scan (Figure 1). Immunohistochemistry can help provide a definitive diagnosis of pancreatic schwannoma. The spindle cells of schwannomas will stain diffusely positive for S-100 antibodies (Figure 2D).[1,3]

Only 40 cases of pancreatic schwannoma have been reported in the English and European literature. Most (40%) are located in the pancreatic head.[4] It is no surprise that preoperative diagnosis of pancreatic schwannoma is uncommon, and the diagnosis is usually made after a Whipple procedure to remove the mass, as in the present case. The preoperative imaging characteristics of pancreatic schwannoma can be similar to adenocarcinoma, nonfunctioning islet cell tumor, and mucinous cystadenoma.[2,9] Fasanella et al[10] recently reported the first case of a pancreatic schwannoma diagnosed preoperatively by endoscopic ultrasonography and fine needle aspiration. A preoperative diagnosis may allow a less aggressive resection.[9,10] In the present case, the chronic nature of the patient's pain, lack of duct dilation, and the well-circumscribed enhancing appearance of the lesion on imaging all suggested that the diagnosis was less likely to be adenocarcinoma. If preoperative endoscopic ultrasonography and fine needle aspiration had indicated a diagnosis, enucleation may have been appropriate because the tumor did not involve the main pancreatic duct.[11] In the literature there have been no reports of local recurrence or metastasis of pancreatic schwannomas.

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REFERENCES

1. Kumar V, Abbas A, Fausto N. *Robbins and Cotran Pathologic Basis of Disease.* 7th ed. Philadelphia, PA: Elsevier; 2005.
2. Paranjape C, Johnson SR, Khwaja K, Goldman H, Kruskal JB, Hanto DW. Clinical characteristics, treatment, and outcome of pancreatic Schwannomas. *J Gastrointest Surg.* 2004;8(6):706-712.
3. Almo KM, Traverso LW. Pancreatic schwannoma: an uncommon but important entity. *J Gastrointest Surg.* 2001;5(4):359-363.
4. Di Benedetto F, Spaggiari M, De Ruvo N, et al. Pancreatic schwannoma of the body involving the splenic vein: case report and review of the literature. *Eur J Surg Oncol.* 2007;33(7):926-928.
5. Tan G, Vitellas K, Morrison C, Frankel WL. Cystic schwannoma of the pancreas. *Ann Diagn Pathol.* 2003;7(5):285-291.
6. Akiyoshi T, Ueda Y, Yanai K, et al. Melanotic schwannoma of the pancreas: report of a case. *Surg Today.* 2004;34(6):550-553.
7. Novellas S, Chevallier P, Saint Paul MC, Gugenheim J, Bruneton JN. MRI features of a pancreatic schwannoma. *Clin Imaging.* 2005;29(6):434-436.
8. Morita S, Okuda J, Sumiyoshi K, et al. Pancreatic schwannoma: report of a case. *Surg Today.* 1999;29(10):1093-1097.
9. Soumaoro LT, Teramoto K, Kawamura T, et al. Benign schwannoma of the pancreas. *J Gastrointest Surg.* 2005;9(2):288-290.
10. Fasanella KE, Lee KK, Kaushik N. Clinical challenges and images in GI: benign schwannoma of the pancreatic head. *Gastroenterology.* 2007;132(2):489-830, 830.
11. Wu YL, Yan HC, Chen LR, Chen J, Gao SL, Li JT. Pancreatic benign schwannoma treated by simple enucleation: case report and review of literature. *Pancreas.* 2005; 31(3):286-288

Submissions

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