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CASE REPORT

Three cases of retroperitoneal schwannoma diagnosed by EUS-FNA

Taiki Kudo, Hiroshi Kawakami, Masaki Kuwatani, Nobuyuki Ehira, Hiroaki Yamato, Kazunori Eto, Kanako Kubota, Masahiro Asaka

Taiki Kudo, Hiroshi Kawakami, Masaki Kuwatani, Nobuyuki Ehira, Hiroaki Yamato, Kazunori Eto, Masahiro Asaka, Department of Gastroenterology, Hokkaido University Graduate School of Medicine, Kita 15, Nishi 7, Kita-ku, Sapporo, 060-8638, Japan
Kazunori Eto, Kanako Kubota, Department of Surgical pathology, Hokkaido University Hospital, Kita 14, Nishi 5, Kita-ku, Sapporo, 060-8638, Japan
Author contributions: Kudo T and Kawakami H contributed equally to this work; Kawakami H managed the patients, performed the endoscopic examination, designed the research and provided discussion of clinical features and pathology; Kuwatani M, Ehira N and Yamato H analyzed the data and provided clinical advice; Eto K and Kubota K diagnosed the case and provided discussion of pathology; Kudo T and Kawakami H collected the data and wrote the paper; Kawakami H revised the paper; Asaka M supervised the research; all authors approved the final manuscript for publication.
Correspondence to: Hiroshi Kawakami, MD, PhD, Department of Gastroenterology, Hokkaido University Graduate School of Medicine, Kita 15, Nishi 7, Kita-ku, Sapporo, 060-8638, Japan. hiropon@med.hokudai.ac.jp
Telephone: +81-11-7161161-5918 Fax: +81-11-7067867
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Abstract

Schwannomas are peripheral nerve tumors that are typically solitary and benign. Their diagnosis is largely based on surgically resected specimens. Recently, a number of case reports have indicated that retroperitoneal schwannomas could be diagnosed with endoscopic ultrasound-guided fine-needle aspiration (EUS-FNA). We report the diagnosis of three cases of schwannoma using EUS-FNA. Subjects were two males and one female, ages 22, 40, and 46 years, respectively, all of whom were symptom-free. Imaging findings showed well-circumscribed round tumors. However, as the tumors could not be diagnosed using these findings alone, EUS-FNA was performed. Hematoxylin-eosin staining of the resulting tissue fragments revealed bland spindle cells with nuclear palisading. There was no disparity in nuclear sizes. Immunostaining revealed S-100 protein positivity and all cases were diagnosed as schwannomas. Ki-67 indexes were 3%-15%, 2%-3%, and 3%, respectively. No case showed any signs of malignancy. As most schwannomas are benign tumors and seldom become malignant, we observed these patients without therapy. All tumors demonstrated no enlargement and no change in characteristics. Schwannomas are almost always benign and can be observed following diagnosis by EUS-FNA.

Key words: Schwannoma; Endoscopic ultrasonography; Fine-needle aspiration; Retroperitoneal tumor; S100 proteins; Ki-67 index

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INTRODUCTION

Schwannomas are tumors that originate from peripheral nerve Schwann cells, and are typically solitary and benign. Schwannomas are difficult to diagnose using imaging

only, and as such, diagnoses are commonly confirmed with conventional surgical resection. In the present study, we diagnosed three schwannomas using endoscopic ultrasound-guided fine-needle aspiration (EUS-FNA) without the need for surgical resection, and provided follow-up of the patients.

CASE REPORT

Case 1

A 22-year-old male consulted our department for further examination of a 20 mm hypoechoic mass in the head of the pancreas that had been detected by abdominal ultrasonography (US). His abdomen was flat and soft without tenderness. US showed a well-encapsulated, smooth-surfaced, homogeneous and hypoechoic mass near the pancreas at the right side of the superior mesenteric artery (SMA) (Figure 1). Contrast-enhanced US with Sonazoid (Daiichi-Sankyo, Tokyo, Japan), a lipid stabilized suspension of perfluorobutane gas microbubbles, revealed progressively increased enhancement in the mass (Figure 2). Computed tomography (CT) showed a 20 mm diameter low-density mass located just dorsal to the head of the pancreas. Contrast-enhanced CT of the tumor revealed minimal early contrast enhancement followed by delayed enhancement (Figure 3). Magnetic resonance imaging (MRI) showed a round mass with high signal intensity on T2-weighted images and low signal intensity on T1-weighted images. The borders of the mass were clear (Figure 4). To obtain a pathological diagnosis, three passes of EUS-FNA of the mass were performed with a curvilinear echoendoscope (GF-UCT240-AL5; Olympus Medical Systems Co., Tokyo, Japan) under conscious sedation through the duodenal wall using a 22 gauge EchoTip® Ultra (Wilson-Cook Medical Inc., Tokyo, Japan). Pathological findings using a hematoxylin-eosin stain showed bland spindle cells with regular nuclear palisading. Immunochemical staining of the tumor demonstrated S-100 positivity. We diagnosed the tumor as a schwannoma, with a Ki-67 index of 3%-15% (Figure 5).

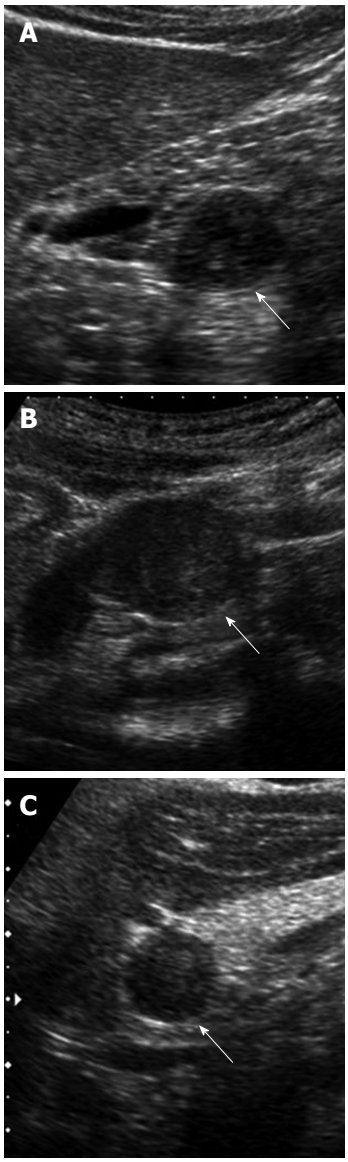

Figure 1 The borders of each of the tumors (arrows) are clearly defined. A: Case 1; B: Case 2; C: Case 3. Ultrasonography showed a round hypoechoic mass (arrows) with a slightly heterogeneous internal echo level.

Case 2

A 40-year-old female consulted an urologist and a retroperitoneal tumor was found incidentally on US. The abdomen was flat and soft without tenderness. When she consulted our hospital, she had no symptoms. US showed a well-encapsulated, smooth-surfaced, homogeneous and hypoechoic mass near the pancreas at the right side of the SMA (Figure 1). Contrast-enhanced US with Sonazoid revealed progressively increasing enhancement in the mass (Figure 2). CT showed a 27.4 mm diameter low-density mass located between the head of the pancreas and the SMA. Contrast-enhanced CT revealed deficient early contrast enhancement with slightly homogenous enhancement in the late phase. MRI showed a round mass with high signal intensity on T2-weighted images and low signal intensity on T1-weighted images. The borders of the mass were clear and the internal signal was heterogeneous. Two passes of EUS-FNA of the mass were performed through the duodenal bulb wall using a 22-gauge EchoTip Ultra. Pathologically the tumor consisted of bland spindle cells with nuclear palisading under hematoxylin-eosin staining. Immunochemical staining for S-100 was positive. The Ki-67 index of the tumor was 2%-3% (Figure 5).

Case 3

A 46-year-old male consulted a doctor in a nearby hospital for further examination of a 15 mm hypoechoic mass near the head of the pancreas that had been detected by US. The abdomen was flat and soft without tenderness and the patient was asymptomatic. US showed a well-encapsulated, smooth-surfaced, homogeneous and hypoechoic mass located dorsal to the uncinate process of the pancreas (Figure 1). US contrast-enhancement

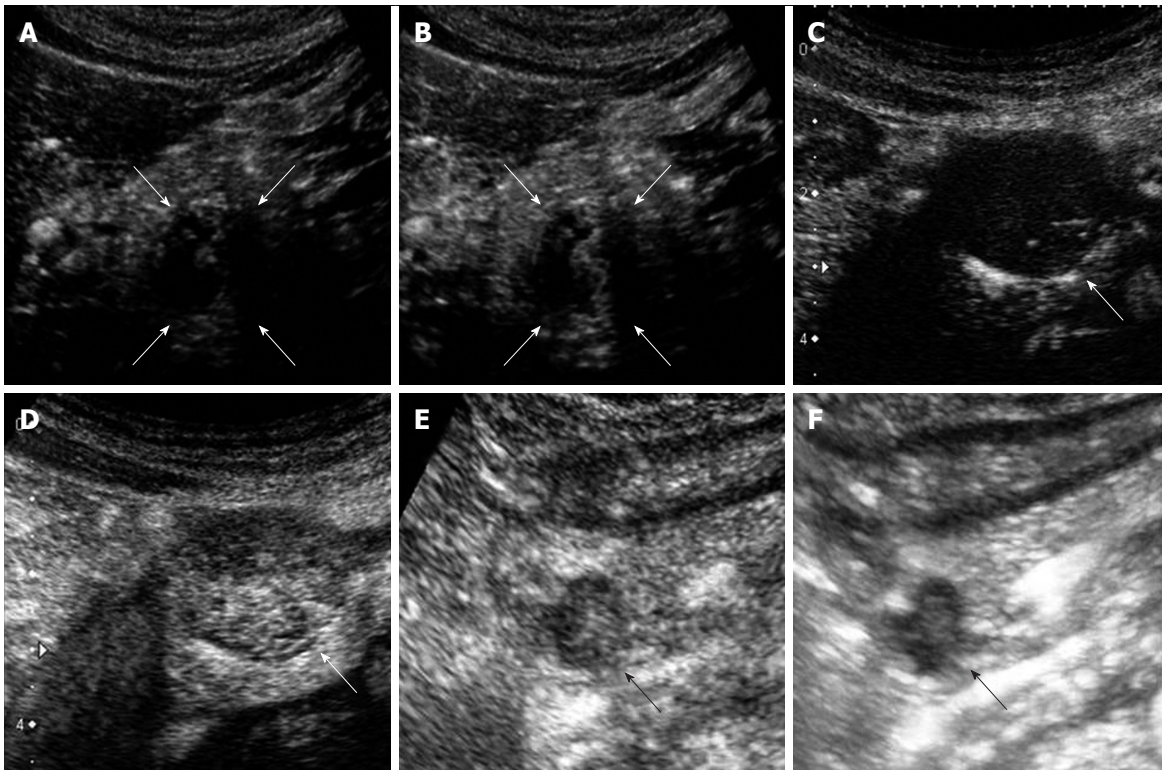

Figure 2 Sonazoid contrast-enhanced ultra sound showed no early enhancement and gradually increasing late phase enhancement. A: Vascular phase of Case 1; B: Post-vascular phase of Case 1; C: Vascular phase of Case 2; D: Post-vascular phase of Case 2; E: Vascular phase of Case 3; F: Post-vascular phase of Case 3. Tumors are indicated by arrows.

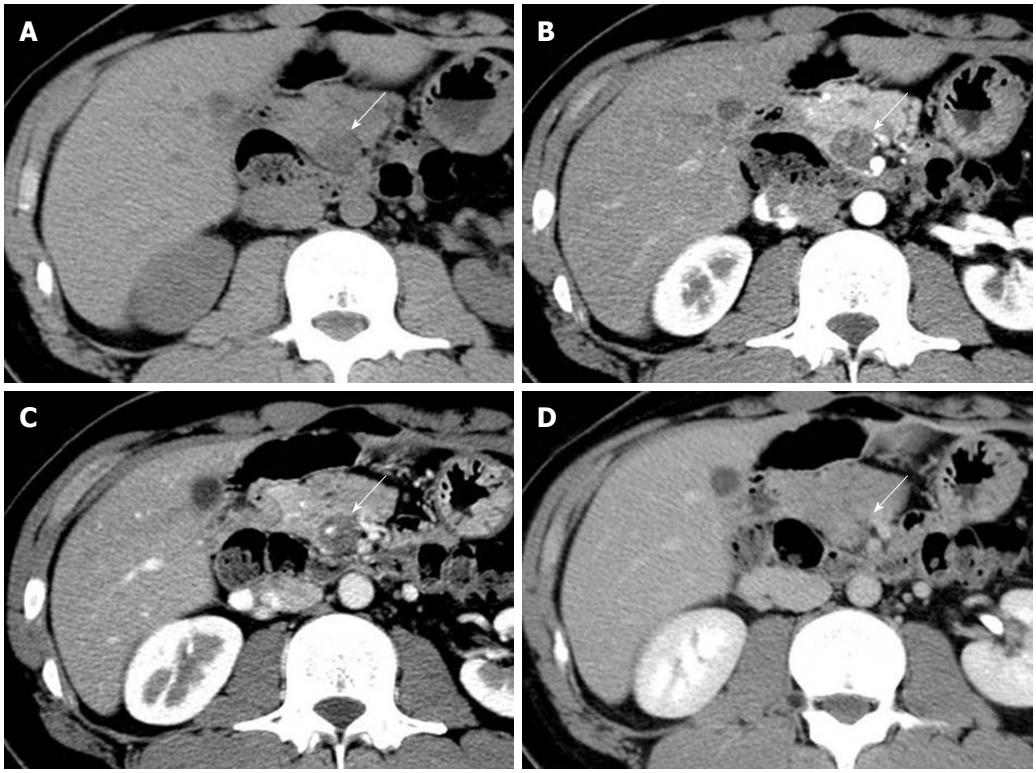

Figure 3 In Case 1, computed tomography indicated a round tumor (arrows) near the head of the pancreas. Gradually increasing enhancement of the tumor was shown by a dynamic computed tomography study. A: Plain; B: Early phase; C: Portal phase; D: Delayed phase.

with Sonazoid revealed slow contrast enhancement in the mass (Figure 2). CT showed a 15 mm diameter, smooth surfaced, well-bordered and round mass with a slightly higher density than normal pancreatic parenchyma. Con-

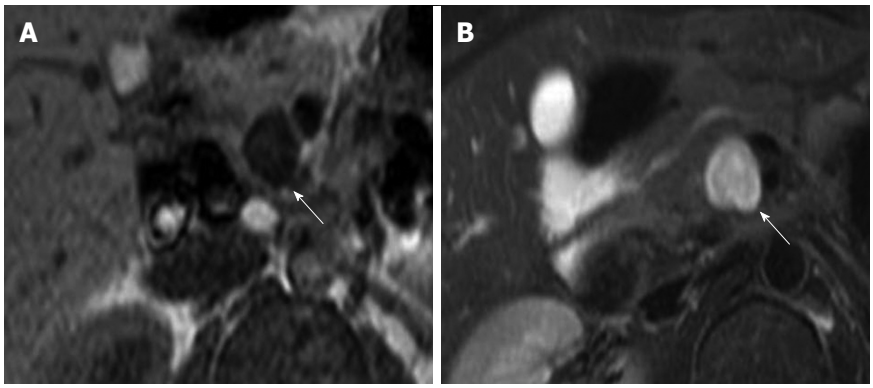

Figure 4 Magnetic resonance imaging of Case 1 showed a round mass (arrows) with low signal intensity in T1-weighted images and high signal intensity in T2-weighted images. The tumor signal was uniform. A: T1-weighted image; B: T2-weighted image.

Table 1 Patient characteristics

	Case 1	Case 2	Case 3
Age (yr), sex	22, M	40, F	46, M
Detection method	Screening	Screening	Screening
First assessment modality	US,CT	CT	US
CEA (ng/mL)	2.5	1.7	7.1
CA19-9 (U/mL)	0.0	14.0	10.0
Tumor diameter (mm)	20.0	27.4	15.0

CEA: Carcinoembryonic antigen; CA: Carbohydrate antigen; F: Female; M: Male; US: Ultrasonography; CT: Computed tomography.

Table 2 Lesion characteristics

	Case 1	Case 2	Case 3
Border	Clear	Clear	Clear
US	Hypoechoic	Hypoechoic	Hypoechoic
CT	Low density	Low density	Low density
MRI	T1 low, T2 high	T1 low, T2 high	T1 low, T2 high
Ki-67(%)	3-15	2-4	3
Follow-up duration (mo)	23	9	15

US: Ultrasonography; CT: Computed tomography; MRI: Magnetic resonance imaging.

trast-enhanced CT revealed that the tumor was slightly enhanced. MRI showed a round mass with high signal intensity on T2-weighted images and low signal intensity on T1-weighted images. The borders of the mass were clear and the internal signal was homogenous. Two passes of EUS-FNA of the tumor through the duodenal bulb wall were performed using a 22-gauge EchoTip Ultra. On pathological examination with hematoxylin-eosin staining, the tumor consisted of bland spindle cells with nuclear palisading. Immunochemical staining showed S-100 positivity, and the Ki-67 index was 3% (Figure 5). We diagnosed the tumor as a retroperitoneal schwannoma.

All three patients were asymptomatic and none of the tumors exhibited malignant signs (Tables 1 and 2). Therefore, after obtaining informed consent from the patients, we observed all three without therapy for 26, 12, and 18 mo of follow-up, respectively. No changes in tumor size or features were noted.

DISCUSSION

Schwannomas are tumors that originate from Schwann cells[1]. They are ordinarily seen in the head, neck, and extremities, and are only rarely found in the retroperitoneum; a retroperitoneal location accounted for 0.3%-3.2% of all primary schwannomas[2-6] and 0.3%-6.0% of all retroperitoneal tumors[7-12]. Schwannomas seldom cause symptoms and are often discovered incidentally. Most commonly, imaging studies show a well-defined round mass, sometimes with cystic changes[13]. Histologically, schwannomas consist of spindle cells in a hypercellular palisade arrangement area (Antoni type A) and myxomatous cells in a hypocellular organized area (Antoni type B). Schwannomas are characterized immunohistochemically by S-100 positivity[14,15]. As previously described, US findings of schwannomas generally show a well-defined hypoechoic mass with a slightly heterogeneous internal echo level. The majority of schwannomas have poor vascularity. Contrast-enhanced CT findings of these tumors often show a low-density and gradually enhanced mass. Our three cases demonstrated imaging findings similar to those described above, which are not specific to schwannomas. The MRI T2-weighted image signals of Antoni A areas were reported to exhibit a slightly high intensity, while those of Antoni B areas exhibited very high intensity[16]. According to a review of 199 schwannomas, 162 lesions (81%) showed biphasic macroscopic and microscopic patterns of central Antoni A and peripheral Antoni B cells, while 118 lesions (59%) also showed a biphasic pattern on MRI[17]. Gadolinium-enhanced T1-weighted images showed central high intensity and peripheral low intensity, whereas T2-weighted images showed peripheral high intensity and central low intensity. The specificity of these signs in schwannomas was 100% and the sensitivity was 59%[17]. However, when large in size, schwannomas are more likely to show secondary degenerative changes such as cystic degeneration, hemorrhage, necrosis, and calcification,

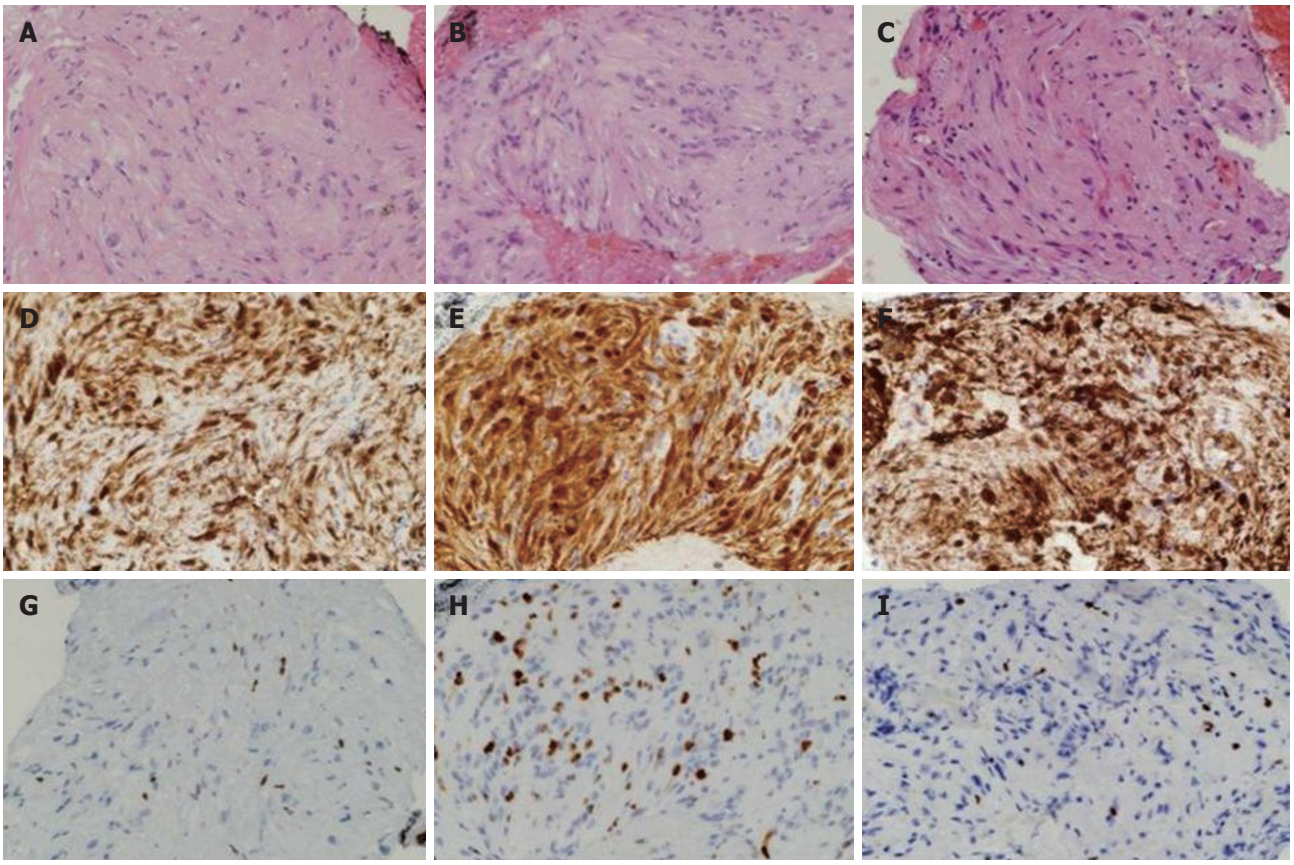

Figure 5 In all three cases the tissue fragments consisted of densely packed, bland spindle cells with nuclear palisading under hematoxylin-eosin staining (× 400). A: Case 1; B: Case 2; C: Case 3; D-F: S-100 reaction was also positive in all case. D: Case 1; E: Case 2; F: Case 3; G-I: Ki-67 indexes were 3%-15%, 2%-4%, and 3% for Cases 1, 2, and 3, respectively. G: Case 1; H: Case 2; I: Case 3.

Table 3 Reported cases of schwannoma diagnosed by endoscopic ultrasound-fine needle aspiration

Case No.	Age (yr)	Sex	Symptom	Tumor diameter (mm)	Position	US	Surgery
1[14]	79	F	Dry cough	30	SMP	Hypo	-
2[15]	59	M	None	40	Retro	Hypo	Done
3[16]	29	M	Epigastralgia	35	Retro	Hypo	Done
4[17]	37	M	None	16	Intra	Hypo	Done
5, 6, 7, 8[28]	54.5[1]	M:F = 3:1	None	23.7[1]	Retro	NA	-
Our case 1	22	M	None	20	Retro	Hypo	-
Our case 2	40	F	None	27.4	Retro	Hypo	-
Our case 3	46	M	None	15	Retro	Hypo	-

[1]Mean. Hypo: Hypoechoic; Intra: Intrapancreatic schwannoma; NA: Not available; Retro: Retroperitoneum; SMP: Superior mediastinum posterior; F: Female; M: Male; US: Ultrasonography.

and to reveal mixed patterns[13,18]. As such, it is difficult to confirm the diagnosis of a schwannoma using only the MRI findings discussed above. As a result, almost all retroperitoneal schwannomas are surgically resected and diagnosed from the resected specimen. CT- or US-guided FNAs for schwannoma diagnosis prior to surgery have been reported. However, the accuracy of both biopsy targeting and diagnosis were poor[18,19]. Li *et al*[20] reported that of 73 cases with total tumor resection and nine cases with exploratory laparotomy, 13 cases (15.9%) could be diagnosed as schwannomas preoperatively, and histological diagnosis by US-guided FNA was performed in only one case. In our three cases, we performed EUS-FNA to obtain a pathological diagnosis as we could not provide diagnosis by imaging alone. For the diagnosis of pancreatic tumors, the sensitivity of EUS-FNA was reported to be over 90%, with a specificity of approximately 100%[21,22]. A randomized comparison between EUS-FNA and CT- or US-guided FNA for malignant pancreatic tumors also revealed sensitivities of 84% and 62%, respectively. Thus, EUS-FNA was superior to CT- or US-guided FNA, especially for small masses difficult to detect with CT or US[23].

Using FNA of schwannomas, it is difficult to find a safe route from the skin to the lesion, especially in mediastinal, perirectal or retroperitoneal masses[21], as there are vessels

or other organs between the skin and the lesion. A recent report on the diagnosis of retroperitoneal tumors indicated a sensitivity of 50%, specificity of 100%, and a positive predictive value is 100%[24]. Previous case reports have described eight cases with schwannomas or neurilemmomas diagnosed preoperatively by EUS-FNA (retroperitoneum, seven cases; mediastinum, one case)[10,25-28]. In the present study the three cases with retroperitoneal schwannomas received surgery after diagnosis with EUS-FNA[10,26,27] (Table 3). Tumor recurrence or malignant transformation after complete resection is very rare for retroperitoneal schwannomas[15,29-31], and the features of malignant schwannomas include tumor diameter over 5 cm, ambiguous borders separating the tumor from the surrounding tissue, intratumor bleeding or necrosis, and a Ki-67 index of 5%-65%[32]. Therefore, asymptomatic retroperitoneal schwannomas with no indications of malignancy diagnosed by EUS-FNA[28] can be observed without the need for surgery.

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