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Imaging and biochemical diagnosis of gastric nerve sheath tumour

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Abstract: Nerve sheath tumour is a rare tumour of the gastrointestinal tract with a high preoperative misdiagnosis rate and is easily misdiagnosed as a gastric mesenchymal tumour, also from the intrinsic muscular layer of the stomach. This article focuses on a review of the characteristics of ultrasound endoscopy, nuclear magnetic, CT and immunohistochemistry in gastric mesenchymal tumours, in the hope that it will help to improve the accuracy of pre- and post-operative diagnosis and be useful for clinical selection of appropriate treatment and prognostic follow-up.

1. Introduction

Nerve sheath tumors, also known as neuropil cell tumors or Schwann cell tumors, can develop at all ages, most often between 20 and 50 years of age.[1, 2] The proportion of female patients with gastric nerve sheath tumours (GS) is higher than that of male patients, and the proportion of male and female patients with gastric mesenchymal tumours (GIST) is similar.[3] The nerve sheath tumour originates from the nerve sheath and is encapsulated by the neuroperiphery, and can occur in all parts of the body, most commonly in the head and neck (44.9%) and extremities (32.6%).[4] They occur mainly in the large peripheral nerves[5] It is rare in the stomach and intestines. It accounts for approximately 0.2% of tumours of the stomach[6] However, GIST is much more malignant than GS and carries a risk of recurrence and metastasis after surgery, so early surgery is recommended and chemotherapy is chosen according to its malignancy, whereas GS is mostly benign and rarely malignant. However, GS is often misdiagnosed due to the similarity of its clinical presentation (asymptomatic, abdominal distension, acid reflux, vomiting blood, black stools), age release and GIST, and the lack of specific imaging features. Currently, the definitive diagnosis of neurogenic tumours of the gastrointestinal tract relies mainly on pathological diagnosis, with benign and malignant diagnoses based on cellular anisotropy and nuclear splitting images.

2. Ultrasound endoscopy (EUS)

Ultrasound gastroscopy can identify the layer of the stomach wall where the tumor is located, and EUS examination[7] GS mainly shows a round-like hypoechoic mass originating from the intrinsic muscular layer of the gastric wall, with clear borders and a homogeneous internal echogenicity, which is significantly weaker than that of the adjacent muscular layer. On ultrasound physical examination, an epigastric mass may be detected. To differentiate it from a liver mass, the patient may be asked to drink water to observe the origin of the mass. Gastroscopically, the gastric mucosa is smooth, normal in colour, without mucosal white patches, tough and clear, with an intact envelope, swollen growth, good mobility, no adhesions to surrounding tissues, no peritoneal tumour metastases, often with "bridging folds" in the mucosa and occasional superficial ulcers. Compared to GIST, GS often has a halo, a "bridge-shaped fold", neat margins, non-infiltrating growth, lobulation, cysts and calcification are less common, whereas GIST usually has no halo and cysts and necrosis are more common, which can help differentiate.

3. Magnetic Resonance Imaging (MRI)

GS occurs in the body of the stomach, mostly on the side of the greater curvature, followed by the gastric sinus; GIST occurs mostly in the body and fundus of the stomach. According to Xiu Zhigang[8] According to a statistical analysis of more than 80 patients, the following were found: intact cytosol, pyknotic morphology, central fissure sign (low-signal fissure-like lesions with clear borders and no enhancement), subcytosolic cystic lesions (indeterminate cystic areas under the intact cytosol of the lesion), target sign (ring-shaped high signal at the edge of the lesion with low signal in the middle on T2WI The eight signs are statistically significant: the bundle sign (multiple thin linear hyposignal shadows within the lesion and its borders on T2WI), the point of enhancement sign (dotted or tubular vascular shadows within the lesion on enhanced MRI), the nerve access sign (bundles of low or equal signal at the ends of the lesion, which appear well on MRN), and the fat separation sign (complete or partial encircling fat signal around the lesion).

Subperitoneal cystic lesion: domestic and foreign studies[6, 9] It is believed that subepithelial cystic degeneration is one of the characteristic manifestations of nerve sheath tumor, and is often seen as an indefinite T1WI low signal and T2WI high signal shadow with clear borders. ischemic necrosis and cystic degeneration in the AntoniB region.[9] The reason for this is probably due to the siphoning effect on the blood supply to the AntoniB region, which predisposes to ischaemic necrosis and cystic transformation of the AntoniB region. This is different from the common tumour where the liquefied, necrotic area is located in the centre of the tumour, so this is a useful differentiator from other tumours.

Bundle sign: A nerve sheath tumour with multiple, ring-like or twisted low signal shadows (nerve fibres) on a high signal background on T2WI, with delayed enhancement on delayed T1WI. On pathological sections, dotted or linear T2WI low-signal tumours (nerve fibre bundles) can be seen in the centre or at the edges of the tumour, suggesting that the tumour is of neurological origin, mostly benign, and can be used to differentiate between benign and malignant tumours of neurogenic origin.[10] It can be used to differentiate benign from malignant tumours.

4. CT

CT images[11] Most of the tumours appear as round-like masses that grow both internally and externally across the gastric lumen.[12] GS has a regular morphology with well-defined margins, but if combined with infection or bleeding, the tumour may have blurred borders, less often lobulated, and when the tumour is large, it may be superficially lobulated; calcification is rare, and it is often small and speckled; cystic changes are rare and occur in larger tumours; necrosis is rare, and the

surface may be accompanied by The possibility of GS should be considered first when the mass forms an ulcer on the elevated surface of the cavity[13] The possibility of GS should be considered first. It may or may not be homogeneous, which may be related to the AntoniA and AntoniB areas. The GS contains a large number of inflammatory cells, with lymphocytic reactive bands around the edges of the tumour, and lymphocytic sets and even germinal centres, which may stimulate lymph node proliferation around the tumour. The tumour is often surrounded by enlarged lymph nodes.

GIST metastasises mainly via the bloodstream and although the tumour can grow very large, infiltration of surrounding tissues rarely occurs.[14, 15] GISTs can be round or lobulated in shape, and due to their rapid growth rate, necrosis and cystic changes are common within the tumour.

According to Pan Dongmei[16] According to the analysis of the CT characteristics of 30 GS patients: GS showed a homogeneous slightly hypointense shadow with a CT value of about 35HU on scan, and a mild to moderate slow and homogeneous progressive enhancement with a CT value of about 48-51HU in the arterial phase, 64-68HU in the portal phase and 68-71HU in the delayed phase; GIST lesions showed uneven density with patches of hypointense GIST lesions have uneven density and patchy low-density necrosis, with CT values of approximately 32-35HU at plain CT, 34-44HU at arterial CT, 41-59HU at venous CT, and 46-66HU at delayed CT.[17-19] There is no statistical difference between neurogenic tumours of the gastrointestinal tract and mesenchymal tumours in terms of growth pattern, haemorrhage, calcification and margins, but there are statistical differences in size, morphology, cystic necrosis, enhancement pattern and degree of enhancement, which can be used as a reference for differential diagnosis.

5. Pathology

Post-operative pathological biopsy is the gold standard for the diagnosis of GS. The cut surface of the tumour is seen to be greyish or greyish yellow, hard, with haemorrhage or cystic changes. The nerve sheath tumour is predominantly composed of spindle cells, similar to mesenchymal tumours, with a pale red HE stain and darkly stained nuclei with some heterogeneity. The short spindle-shaped cells in the centre of the tumour and the surrounding 'lymphocyte jacket' are its most distinctive features. In the former, the cells are tightly arranged, such as fenestrations, swirling structures, onion skin-like structures, with an abundant blood supply; in the latter, the cells are loose and disorganised, in the form of asteroids, with a lot of fluid and vacuoles inside and outside the cells, an abundant mucus matrix, and a small number of cells. However, there is no exact pattern of arrangement between the two cellular areas.

Post-operative immunohistochemistry is essential to differentiate mesenchymal tumours from nerve sheath tumours. Microscopically, the cell morphology of the two is similar, both being shuttle-shaped, but the "lymphocyte set" is characteristic of GS. On immunohistochemical staining, GIST is positive for CD117 and CD34 and negative for S-100, while GS is the opposite[7] S-100 (++), diffuse cytoplasm (++), glial fibrillary acidic protein (GFAP) (+), CDll7 (I), CD34 (I), smooth muscle actin (SMA) (I), Dog I (I), Desmin (I), Ki-67 (+) (<5%. For gene sequencing, mutations in the C-kit and PDGFRA genes are common in GIST, but not in GS.[20] GS has no mutations in either gene.

V. Malignant peripheral nerve sheath tumour (MPNST)

Malignant peripheral nerve sheath tumours account for 5%-10% of soft tissue sarcomas due to their low incidence[21] It has a high degree of malignancy, limited treatment options, and is prone to recurrence and metastasis after surgery[22] It is currently reported in the national and international literature on a case-by-case basis. Early stage[23] The typical MPNST is mostly involving large nerves in the neck or proximal limbs, such as the brachial plexus and sciatic nerve.[24] but rarely shows direct connection to the nerve[25] In contrast to benign nerve sheath tumours, which are associated with nerves, the tumour is often mass-like or lobulated, mostly large in diameter, exceeding 5 cm, with

clear or blurred borders. MRI shows a mixed signal of equal or equal low density on T1WI, a slightly high signal shadow on T2WI, a complete or incomplete envelope, a slightly high signal edema band in the adjacent tissues, a mixed high signal on DWI, and a characteristic T1WI lipid suppression with a mixed high signal; the enhancement contrast shows a heterogeneous, progressive, edge-oriented enhancement. This may be related to the distribution of the AntoniA and AntoniB regions.[26] This may be related to the distribution of the AntoniA and AntoniB regions.

The postoperative biopsy showed a greyish-white, "fish-flesh" tumour with intact or incomplete envelope and some haemorrhage and necrosis; HE staining showed a 'fenestrated' arrangement of spindle-shaped tumour cells with high cellular anisotropy and nuclear fission. Immunohistochemical results showed[22] Negative s-100 markers were found in 5.2% of patients.[27] The tumour specimens with negative s-100 expression were 5 times more likely to have distant metastasis than positive patients, and the overall survival rate was reduced in 84.8% of the patients with positive s-100 marker results; Ki67 expression can reliably and rapidly reflect the proliferation rate of malignant tumours and is related to the development, metastasis and prognosis of many malignant tumours. The Ki67 index 220% is an independent risk factor affecting the 3-year local recurrence rate and the 3-year distant metastasis rate of patients. The literature reports that[28] When the Ki67 proliferation index is 220%, it indicates poor prognosis.

6. Summary

Nerve sheath tumours have a high rate of preoperative misdiagnosis and can be identified by the following imaging and pathological signs

1. EUS: originated in the lamina propria, regular morphology, clear borders, rare necrosis, cystic changes, calcifications, superficial ulcers and "bridging folds", haloes at the edges of the tumour.

2. MRI: intact cytosol, central fissure sign, subcystic lesions, target sign, fasciculus sign, intensification point sign, nerve access sign, fat separation sign.

3. CT: clear borders, regular morphology, moderate intensity enhancement, mostly slow and homogeneous, enlarged lymph nodes visible around the tumour.

4. Pathology: spindle cells, lymphocyte sets, germinal centres, S-100 (+), CD117 (-), CD34 (-), Dog-1 (-), SMA (-), Desmin (-).

5. MPNST: Large diameter (>5 cm), mixed CT density or MRI signal, lobulated or burred tumour borders, rarely shows direct connection to nerves, oedema-like changes at tumour margins. Osteolytic destruction and metastases to the lung or other sites may be seen. s-100 and Ki67 indices may predict disease prognosis.

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