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The Histological Features of Schwannoma in Frozen Section: A Case Report

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Abstract

Background: Intraoperative diagnosis by cytological and frozen section procedures is needed in some cases including peripheral nerve specimens. The results of the cytological evaluation and frozen sections can be relied upon to guide the surgeon in making intraoperative decisions. The pathologist provides information on gross and microscopic findings that correlate with the clinical, and radiological. Although the cytology and frozen section diagnosis approach has been carried out in a multidisciplinary manner, there are still limitations in the intraoperative diagnosis of peripheral nerve specimens. Limitations in this procedure can be overcome by understanding and analyzing possible errors and pitfalls during the procedure thereby increasing the accuracy of the diagnosis.
Case report: Schwannoma is a nerve sheath tumor consisting of neoplastic cells with Schwann cell differentiation that generally originates from peripheral nerves in the skin and subcutaneous tissue of the head and neck or along the flexor surfaces of the extremities. More than 90% of schwannomas are solitary and sporadic lesions that can affect any age but with a peak incidence in the fourth to sixth decades of life and there is no racial or gender predisposition.
Conclusion: Schwannomas often appear as asymptomatic masses or incidental findings. Intraoperative frozen section pathological diagnosis can be used in determining subsequent surgical management.

Keywords: Cytology, Peripheral nerve, Intraoperative frozen section

Introduction

Schwannoma is a nerve sheath tumor consisting of neoplastic cells with Schwann cell differentiation. This tumor grows slowly and often occurs in the peripheral nerves of the skin and subcutaneous tissue of the head and neck.[4] Schwannomas are often asymptomatic and therefore discovered incidentally on imaging examination, but depending on the location they can cause secondary symptoms such as swelling in the neck, dysphagia, and hoarseness. Some schwannomas can cause pain. Spinal schwannoma can cause sensory symptoms including radicular pain and motor symptoms if the growth is intraspinal. Vestibular schwannoma often presents with hearing loss and vertigo.[4,5,6]

The intraoperative frozen section procedure is a rapid histopathological tissue examination by cooling the tissue with a cryostat. A cryostat is a tool that functions to freeze tissue and cut frozen tissue so that it can be processed for microscopic examination. Frozen section is an intra-operative pathological consultation procedure that is used to make a rapid pathological diagnosis that can be used by the surgeon to determine the next surgical procedure.[7,8]

Dr. Priyanka Chand et al. also conducted a study evaluating the diagnostic accuracy of crush smears and frozen sections in central nervous system and peripheral nervous system lesions to analyze possible errors, pitfalls, and limitations of these procedures with standard histopathology.[9] Discrepancies between intraoperative diagnosis and final diagnosis may occur in less than 3% of cases. Intra-operative diagnosis of neurosurgical biopsy specimens is usually complicated due to their small size and multiple frozen nerve tissue artifacts. One

of the frequent peripheral nerve lesions is schwannoma. The literature and reported cases regarding intraoperative diagnosis of schwannoma are still few.[3,10]

Emel Ebru Pala et al. reported high diagnostic accuracy of frozen sections of 90% and smears ranging from 83%-95%. However, in some cases, it is sometimes impossible to make a definitive diagnosis with intra-operative frozen smears and sections due to tissue characteristics, technical problems, and the experience of the pathologist. When using the frozen section technique, the pathologist should be aware of its advantages and limitations so that the correlation of clinicopathological and morphological findings can be relied upon to assist in the interpretation of the diagnosis.[10]

Intraoperative diagnosis plays an important role in guiding neurosurgical biopsies and resections and has a high degree of accuracy in rapid diagnosis. High levels of sensitivity (98%) and specificity (94%) were reported for frozen section pathology of the nervous system and were excellent for detecting abnormalities with a positive predictive value of 99%. However diagnostic difficulties remain in this area with a disproportionate proportion of pathologies.[3,9]

Case Report

A 65-year-old female patient came for treatment to the surgical oncology polyclinic at RSUP Dr. M. Djamil Padang on March 2 2022 with complaints of a lump in the neck since 6 years ago. The lump started small but then felt bigger in the last 2 years and sometimes felt painful. The patient also complained of hoarseness but no difficulty swallowing or breathing. Past medical history, the patient has never had similar complaints before. Family history of illness, no family members with similar complaints. The patient was diagnosed as a suspected malignant left thyroid tumor with left colli lymphadenopathy by the surgical oncology department. The patient was advised to have a fine needle aspiration biopsy (FNAB) examination of a lump in the neck that was suspected of being a thyroid tumor and a lump in the left neck that was suspected of being lymphadenopathy. The patient underwent fine needle aspiration biopsy examination for left thyroid tumor and left neck lymphadenopathy at the Anatomical Pathology Laboratory of Dr. M. Djamil general hospital.

The patient filled out an informed consent form and the FNAB procedure was performed. On physical examination of the anterior neck region which was suspected to be a thyroid tumor, a nodule measuring 4x3x2cm, rubbery, moved when swallowing, a reddish-brown liquid aspirate with a volume of around 1 cc. The aspirate was made into a smear with 96% alcohol fixation and dry fixation. On microscopic examination, the distribution and cluster of thyroid follicle epithelial cells with an increased N/C ratio, and round-oval nuclei, were with a groove image. Also visible was the distribution of lymphocytes, PMN leukocytes, and macrophages on a colloid mass background. Interpretation: Malignancy (Bethesda VI) is appropriate for papillary thyroid carcinoma (figure 1A).

The histopathological examination of the thyroid specimen was performed. On macroscopic examination a piece of 2-lobed thyroid tissue measuring 8x5x4 cm, brownish-white, firm, and chewy was visible. The largest lobe, size 5x4x3 cm in cross-section looks like a brownish solid mass with a diameter of 4.5 cm. The smallest lobe measuring 3x2x1.8 cm, brownish cross-section with no visible mass (Figure 2B).

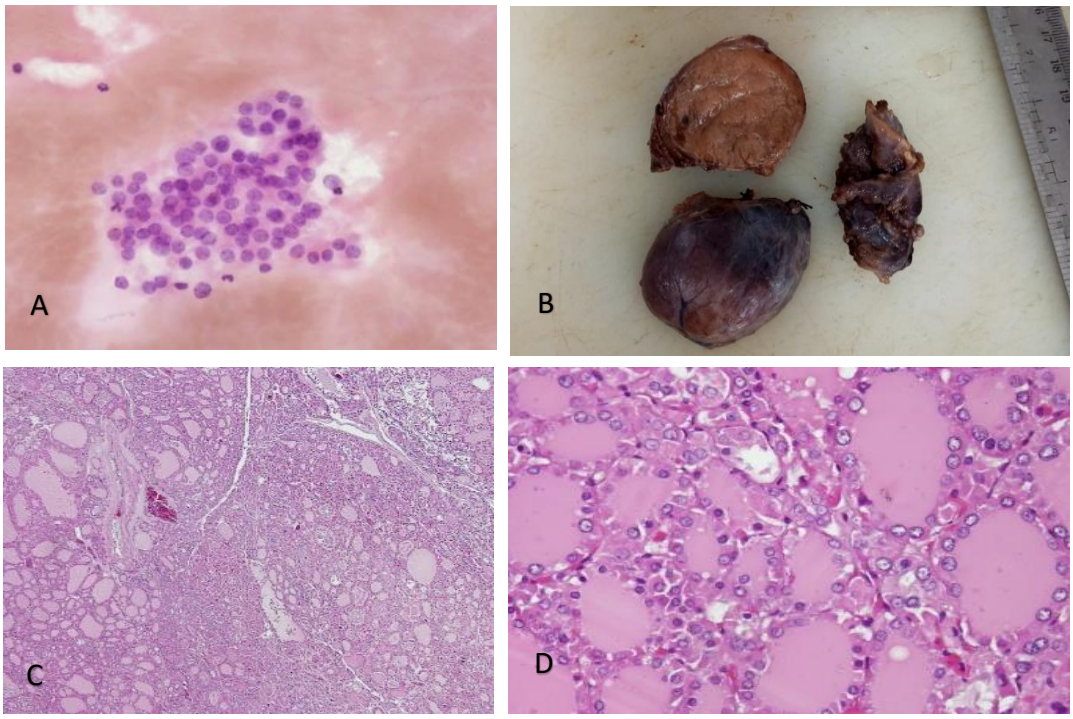

Figure 1. (A) Cytological examination of FNAB thyroid tumor nodule. Groups of thyroid follicle epithelial cells were seen with an increased N/C ratio, round-oval nuclei, some overlapping, there were nuclei with grooves and intranuclear pseudoinclusions. These cells are arranged to form a sheet and microfollicular structure with a colloid-filled lumen (asterisk). 400x magnification, Hematoxylin-Eosin. (B) Macroscopic appearance of thyroid tumor. (C) Histopathological examination of thyroid tumor. Microscopic view shows a section of thyroid tissue containing proliferation of follicular epithelial cells with overlapping, round-oval, vesicular nuclei, rough chromatin, clear nucleoli, ground glass appearance and groove. These cells are arranged to form a follicular structure. In other sections, there was a proliferation of cells with round-oval nuclei, vesicular, rough chromatin, eosinophilic cytoplasm which formed a solid sheet structure. (HE, magnification 40x (C), and 400x (D))

On microscopic examination, the largest lobe of the thyroid tumor was visible containing a proliferation of follicular epithelial cells with overlapping, round-oval, vesicular nuclei, rough chromatin, clear nucleoli, visible ground glass, and grooves. These cells are arranged to form a follicular structure. In other sections, there was a proliferation of cells with round-oval nuclei, vesicular, rough chromatin, and eosinophilic cytoplasm which formed a solid sheet structure. Hyperemic capillaries and foci of calcification were also seen. Diagnosis: papillary thyroid carcinoma, follicular variant (Figure 1 C-D).

On microscopic examination the smallest lobe of the thyroid tumor contained a proliferation of follicles with varying sizes, the follicles are lined with cuboidal epithelium, the nuclei are monomorphic, and the lumen contains a colloid mass. Hyperemic capillaries and areas of bleeding were also seen. Diagnosis: adenomatous goiter.

The patient underwent a total thyroidectomy and a frozen section of left colli lymphadenopathy. Tissue suspected of being a lymph node was examined using a frozen section procedure and the specimen was sent to the anatomical pathology laboratory. Macroscopic examination (Figure 2 A-B) revealed a piece of yellowish white tissue measuring 2x1.5x1 cm, densely chewy, yellowish in cross-section with brownish parts.

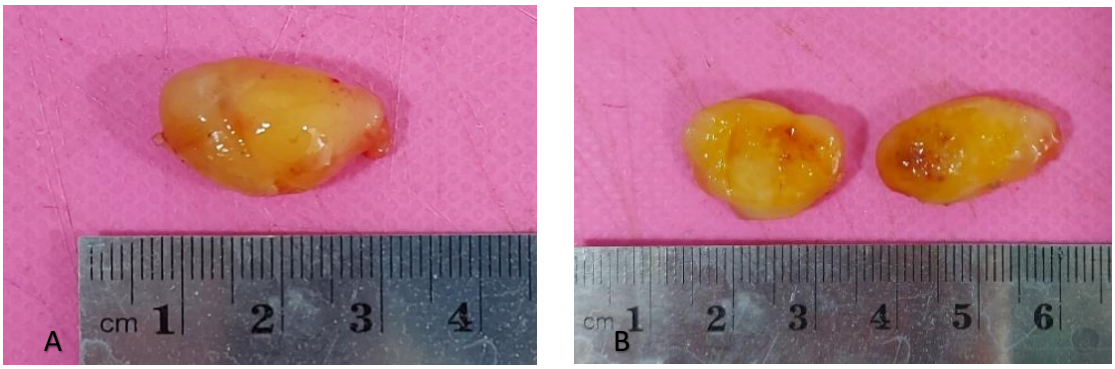

Figure 2. Macroscopic view of PJ-1302-2022. A piece of yellowish-white tissue, encapsulated, measuring 2x1.5x1 cm, dense chewy, encapsulated (A). Yellowish cross-section with brownish parts (B).

On microscopic smear examination, the distribution and grouping of spindle cells can be seen (Figure 3A). On frozen section examination (Figure 3 B), microscopic sections consist of connective tissue stroma containing spindle cells and cells with wavy nuclei. Conclusion: no lymph node tissue and thyroid tissue are visible in this preparation. The histopathological examination of the paraffin block (Figure 3 C-D) microscopically showed tissue sections consisting of connective tissue stroma containing a proliferation of Schwann cells with wavy nuclei, some of which are arranged to form Antoni A and Antoni B areas, some are arranged to form Verocay bodies. The connective tissue capsule is visible on the outside. This microscopic picture can be found in schwannoma.

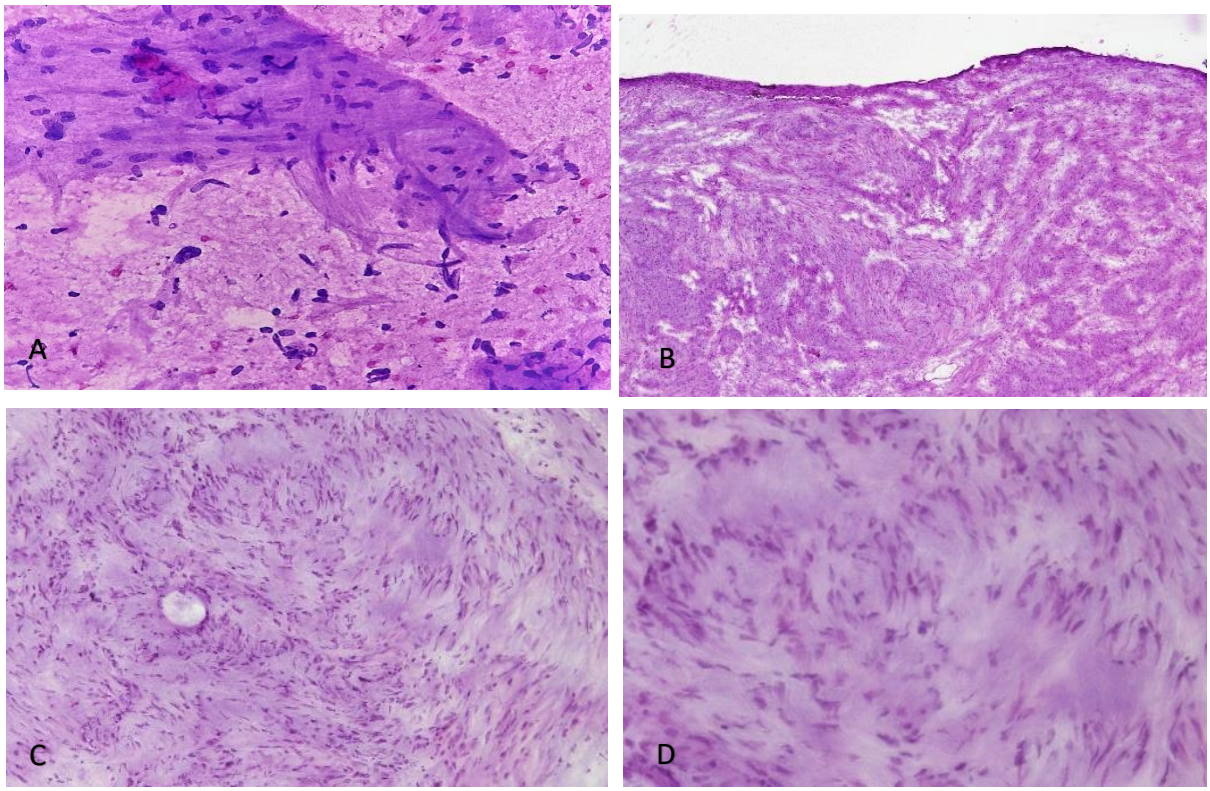

Figure 3. (A) Examination of smears from frozen section specimens. Microscopically, the distribution and grouping of spindle cells can be seen. Distribution of spindle cells with wavy nuclei. HE staining, magnification: 400x. (B) Microscopic examination of frozen sections. The microscopic image shows a piece of tissue consisting of connective tissue stroma containing spindle cells and cells with wavy nuclei that form hypercellular and hypocellular areas and there are cells arranged in palisading Verocay bodies. No tissue is visible as lymph nodes and thyroid tissue in this preparation. HE staining, magnification: C: 200x, D: 400x.

Discussions

The case of a 65-year-old woman who was clinically diagnosed with a thyroid tumor with left neck lymphadenopathy on physical examination and supporting examinations has been reported. Physical examination showed that there was a lump in the neck since 6 years ago and it felt bigger in the last 2 years. The patient was advised to undergo a FNAB examination for a lump in the neck with the results of a malignant lesion consistent with papillary thyroid carcinoma in a lump in the neck and non-diagnostic lumps suspected of being lymphadenopathy colli sinistra. The patient underwent surgical removal of the thyroid tumor and an intra-operative frozen section consultation procedure for a lump suspected to be colli sinistra lymphadenopathy. The results of the frozen section examination of the specimen suspected of sinistra colli lymphadenopathy suggested a benign lesion, not lymph node tissue and not thyroid tissue. Histopathological examination of the specimen suspected of left colli lymphadenopathy showed a diagnosis of schwannoma.

Intraoperative consultation for neurosurgical specimens can be challenging due to various factors. Most neuropathologists prefer frozen smears and sections to achieve the most reliable diagnosis. Smears are more useful for background analysis and nuclear and cytoplasmic images. The experience of Emel Ebru Pala et al. In diagnosing schwannoma, it is not enough to use a smear alone, but a combination of frozen sections can be relied on for an accurate diagnosis.[10] In this case, the cytomorphological images obtained from smears and frozen sections were correlated with microscopic findings from paraffin block preparations so that a diagnosis of schwannoma was concluded. This is in line with Emel Ebru Pala et al.

In this case, the tissue was initially thought to be enlarged cervical lymph nodes due to metastatic papillary thyroid carcinoma. A frozen section of the tissue suspected to be a lymph node is carried out with the aim that if metastases of papillary thyroid carcinoma are found in the lymph node then a wide excision of the lymph node will be carried out. On macroscopic examination, tissue was found to be encapsulated, densely chewy, whitish yellow with a whitish yellow, shiny cross-section.

Specimens of fibrotic, desmoplastic, spongy, and hard tissue are difficult to smear by smearing or squeezing so other smear techniques need to be applied. When the outer surface of the tissue is extensively cauterized, it is advisable to divide the tissue in half and make a cytology preparation with a new surface. For fibrous and desmoplastic tissue, collecting cells using tissue scraping techniques gives good results.[5] In this case, cytology preparations are made using scraping techniques because the tissue is rubbery.

Microscopically, the smear preparations showed a distribution and grouping of spindle cells. Microscopic images of frozen section examination show tissue consisting of connective tissue stroma containing spindle cells and cells with wavy nuclei. Based on examination of the smear and frozen section, it was concluded that the lesion was benign, not lymph node tissue or thyroid tissue.. The microscopic image of the paraffin block shows spindle cells arranged to form hypercellular (Antoni A) and hypocellular (Antoni B) areas. In hypercellular areas, some form Verocay bodies. A thin capsule of connective tissue is visible on the outside. These microscopic features can be found in schwannoma.

The classic appearance of schwannoma in the form of Verocay bodies can help in the diagnosis of schwannoma. However, in the diagnosis of intracranial schwannoma, morphology alone is not enough because it is often discrepant with fibroblastic meningioma, so an immunohistochemical examination is needed to differentiate them. The schwannoma immunohistochemical test showed strong positive S100 immunoreactivity in the tumor cells which is a specific marker for schwannoma. 30 In this case, the histopathological picture of the tumor tissue showed a schwannoma appearance with characteristics of spindle cells with grooved nuclei that formed hypercellular areas with Verocay bodies and hypocellular areas. and there is a connective tissue capsule on the outside. Based on the location of the lesion and the morphological characteristics in this case, the diagnosis of schwannoma can be made without using immunohistochemical examination.

Schwannomas can originate from cranial, peripheral, or autonomic nerves. Around 25%-45% of schwannomas occur in the head and neck area, of which around 10% originate from the vagal or sympathetic nervous system.

Schwannomas are often asymptomatic, but depending on the location some can cause secondary symptoms such as swelling in the neck, dysphagia, or hoarseness.[6]

In some cases, intracranial and extracranial schwannomas can be difficult to distinguish from other spindle cell lesions, especially meningiomas with a fibroblastic appearance. Schwannomas and meningiomas have spindle cells so it is often difficult to differentiate them using frozen sections. To differentiate this, there must be good communication between the surgeon and the pathologist so that complete information is obtained regarding the clinical history, radiological findings, intra-operative findings and adequate tumor samples so that an accurate diagnosis can be made.[12]

Mohamad Saekhu et al. reported a case diagnosed as meningioma on frozen section but with histopathological confirmation as schwannoma. The discrepancy between frozen section and histopathological diagnosis is around 2.7%, most of which originate from spindle cell lesions including schwannoma and meningioma.[12]

Conclusions

Intraoperative cytology and frozen section techniques are reliable techniques in the diagnosis of schwannoma. Although schwannomas have characteristic morphologies, in some cases intracranial schwannomas can be confused with other spindle cell lesions, especially meningiomas with a fibroblastic appearance. Knowledge of the artifacts that can be found on frozen section and the characteristic cytologic features on smears will help in reaching a diagnosis of schwannoma in frozen section procedures.

Declarations of competing interest

No potential competing interest was reported by the authors.

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