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Editorial

Orbital biopsy

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Diagnosis and management of orbital diseases are urgent, difficult and challenging due to wide diversity of disorders, in spite of small size of orbit and multiple anatomical structures originating from all the three germ layers.^{1–6} If untreated timely these disorders can lead to severe complications such as optic nerve compression and corneal exposure, potentially resulting in permanent vision loss.^{7–9} The conventional orbital radio-imaging like ultrasonography, CT Scan & MRI and newer techniques such as CT angiography, magnetic resonance angiography and PET Scan etc. play vital role in making diagnosis and surgical planning. In about 20-25% cases diagnosis can not be reached based solely on clinical and radiological evaluation.

Orbital biopsy is important diagnostic tool recommended if an orbital space occupying lesion is suspected but cannot make a clear diagnosis by clinical examination or radiological imaging. Biopsy is a tissue sampling for morphological. In general orbital biopsy is necessary in different situations for example where the diagnosis is uncertain, if the condition have recurred, or if patient refuses treatment without confirming the diagnosis and for prognostic purposes.^{4,5} Common indications of orbital biopsy are primary orbital tumors (Pleomorphic adenoma, Adenoid cystic Carcinoma etc.), lymphoproliferative disorders (lymphoma), secondary invasion of sinonasal

malignancies, orbital metastasis of carcinoma breast, prostate & thyroid and there is non-specific diffuse orbital inflammation.^{6,10–14}

The techniques of orbital biopsy depends on several factors, including the size and nature of the lesion, location & depth of lesion, suspected diagnosis, and the proximity of critical structures such as the orbital apex and optic nerve. The various techniques of orbital biopsies are excisional biopsy, incisional biopsy, core biopsy, fine needle aspiration biopsy and intraoperative Frozen section biopsy.¹⁵

1. Fine Needle Aspiration Biopsy (FNAB)

FNAB is a diagnostic method involving a thin needle to extract cells or tissue samples or fluid from abnormal mass, which is considered minimally invasive and quick.¹⁶ It's reported to have a high accuracy rate for diagnosing malignant orbital tumors, particularly in cases where other diagnostic tools show discrepancies.^{16,17} However, FNAB's effectiveness can be limited, especially in cases involving benign encapsulated orbital tumors except in diagnosis of lymphoid tumors or in inflammatory conditions with significant fibrosis, such as pseudotumors.^{17–19}

FNAB is contraindicated in unwilling or uncooperative patients, case where clinic-radiological diagnosis is accurate e.g. optic nerve glioma, optic nerve sheath meningioma etc., in arterial or A-V malformations and in patients having bleeding diathesis.

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It is also critical to highlight the importance of specialized expertise in both the surgical and cytopathological aspects of FNAB to ensure accurate diagnosis.¹⁹ It must be noted that FNAB is less beneficial for certain orbital conditions like intraocular tumors and might present challenges due to the complex anatomy of the orbit especially in cases of deep seated tumors.^{19,20}

Studies by Gupta et al. and Rastogi and Jain have demonstrated its effectiveness in diagnosing various conditions such as histiocytosis X, cryptococcosis, non-Hodgkin's lymphoma, schwannoma, cysticercosis, and lacrimal gland epithelial tumors.^{21,22} The procedure, using a 25-gauge needle, has been reported to have minimal complications.²¹ However, these authors also stress the importance of using radiological imaging alongside FNAB for accurate diagnosis. Despite its utility, some experts, like Agrawal et al., caution against relying solely on FNAB for making significant treatment decisions. In many cases, clinical examination and imaging studies alone are sufficient for diagnosing orbital lesions, which may reduce the necessity for FNAB.²³

In summary, while FNAB is a useful tool in orbital pathology, its success depends heavily on the experience of the medical professionals involved and the specific characteristics of the tumor being examined.

2. Core Needle Biopsy (CNB)

Core-needle biopsy (CNB) is a procedure used to obtain tissue samples for histopathological examination, particularly in malignant lesions. Unlike fine-needle aspiration biopsy (FNAB), CNB require a larger needle, allowing for a more substantial tissue sample. This makes it superior for diagnosing soft-tissue lesions and performing immunohistochemical (IHC) staining.^{24,25}

CNB can be guided by various imaging techniques, including ultrasonography (US), CT scans, and MRI. US guidance is advantageous due to its real-time monitoring and lack of ionizing radiation, while CT is useful for accessing certain lesions based on their location.^{26,27}

The procedure is generally safe, with a low complication rate. The study from 2013 by Yarovoy et al., involving 50 CNB samples of orbital lesions indicated minimal complications, such as mild retrobulbar hematoma in only two patients, with no serious adverse effects like visual acuity loss, globe or optic nerve injury, or infection.²⁵ CNB is recommended over FNAB for challenging histopathological diagnosis, including cases of rhabdomyosarcoma, lymphoma, and certain inflammatory diseases, due to its ability to provide sufficient tissue for comprehensive analysis.²⁵

Proper technique is crucial for obtaining a representative tissue sample. A 2014 report by Jeng Tyng et al. detailed the technique for CT-CNB, emphasizing the importance of accurate needle placement. In their cases, the biopsies were

performed under conscious sedation with local anesthesia using a coaxial method, which involved inserting a 17-gauge needle along specific orbital routes to avoid damaging critical structures. This technique allowed for the successful collection of tissue fragments without complications.²⁷

Overall, while CNB is a valuable tool for diagnosing orbital lesions, careful consideration of technique and potential complications is essential for optimal outcomes.

3. Incisional Biopsy

Incisional biopsy is a surgical procedure that involves partial tissue excision for histopathological examination, can be performed under general or local anesthesia. Significant advantage of incisional biopsy is that it allows for the fixation of the extracted specimen, eliminating the need for a cytopathologist to be present during the procedure. Additionally, it provides a larger tissue sample compared to techniques like fine-needle aspiration, which only yield cells.^{28,29}

For effective incisional biopsy, surgeons must ensure that they obtain an adequate and representative sample directly from the lesion to avoid inconclusive pathology results. Inadequate sampling or mistakenly extracting tissue from adjacent normal orbital tissue can lead to non-diagnostic results, requiring repeat biopsies, which burdens the patient and may delay diagnosis.^{28,29}

Incisional biopsy is particularly useful for specific orbital conditions, including idiopathic orbital inflammation, immunoglobulin G4-related disease, lymphoproliferative lesions, autoimmune-related changes, and sarcoidosis. It is also the preferred method for primary malignant and metastatic orbital tumors, especially when the tumor is too large for complete excision, when subtyping of a diagnosed malignancy is needed, or when therapeutic total excision is not required.³⁰

4. Excisional Biopsy

Excisional orbital biopsy is not exactly a biopsy somewhat a misnomer, it is total surgical excision of orbital mass with histopathological examination. This method is advantageous as it provides an ample of tissue sample for a definitive histopathological diagnosis, especially when other methods like fine-needle aspiration biopsy (FNAB) fail to yield sufficient tissue.²⁸

Excisional biopsy is not only diagnostic but also therapeutic, particularly in cases such as cavernous venous malformations, lacrimal gland pleomorphic adenomas, cystic lesions, and other well-circumscribed benign or malignant lesions. In some instances, therapeutic excision is performed after a diagnosis has been confirmed by FNAB, minimizing unnecessary tissue removal. Following excision, the tissue can be further analyzed to predict prognosis and plan subsequent treatment.²⁸

However, excisional biopsy has its drawbacks, including associated morbidity and higher costs. The specific surgical approach for excisional biopsy varies depending on the location and size of the lesion.

5. Handling Pathology Specimens in Orbital Biopsies

Proper handling of specimens is crucial for accurate diagnosis, especially in orbital biopsies where specimens are often small and delicate. Guidelines from pathology laboratories emphasize careful handling to avoid damaging the specimen, which can adversely affect the diagnostic outcome.

5.1. Key recommendations include

1. **Avoiding Damage:** Surgical instruments, especially heat-driven ones, should be used sparingly to prevent crushing or thermally injuring the specimen. During dissection and removal, care should be taken to avoid tearing, cauterizing, or crushing the tissue.
2. **Immediate Fixation:** After collection, the specimen should be immediately placed in a fixative to preserve its integrity. If a fixative is not available, the specimen should be kept in a sterile basin with sterile saline and transported to the laboratory for refrigeration as soon as possible.
3. **Proper Containers:** Specimens should be placed in containers that are unbreakable, impermeable, rigid, and nonreactive to the fixative used, ensuring they are safely transported to the pathology lab.
4. **Avoiding Drying and Hemorrhage:** To prevent drying, which can interfere with histopathological results, the specimen should be promptly fixed. Additionally, excessive hemorrhage should be avoided to minimize trauma to both the eye and the specimen.
5. **Special Precautions for Fragile Tumors:** Tumors such as lymphomas and soft mesenchymal tumors are particularly fragile and prone to crushing. Gentle handling with forceps is recommended to maintain specimen integrity. For biopsies of the anterior part of the extraocular muscle, a disposable dermatological biopsy punch is advised to reduce the risk of trauma.

Following these guidelines ensures that the specimen remains intact and suitable for accurate histopathological analysis, thereby improving the chances of a correct diagnosis.

6. Intraoperative Frozen Section Examination

Intraoperative diagnosis using techniques such as frozen section and cytologic diagnosis has shown promise in orbital and oculoplastic surgery, though it remains underexplored. These methods are particularly beneficial when there is no preoperative diagnosis or when the surgical management might change based on real-time findings during surgery.

This technique is valuable for assessing surgical margins, especially in cases of adnexal malignancy.

Cytologic Techniques: Techniques such as squash and imprint cytology allow for rapid intraoperative diagnosis. Vemuganti et al. demonstrated the effectiveness of these methods in ocular pathology, showing that a working diagnosis could be established within 5–8 minutes of receiving a sample, with a high accuracy rate. Their study found complete concordance with the final histopathological diagnosis in 91% of cases, with partial concordance in a few cases and only one inconclusive result.

The success of intraoperative diagnosis depends on the skill of the cytologist and the ophthalmic pathologist, who must meticulously examine the samples to avoid misdiagnosis. The demand for expertise highlights the need for specialized training and experience in these techniques to ensure accurate and reliable results.²⁸

Overall, while intraoperative diagnostic methods like frozen section and cytologic diagnosis show high accuracy and can significantly influence surgical decisions, their application in orbital and oculoplastic surgery requires further study and refinement.

We can conclude that there is increasing recognition of orbital biopsy as a crucial diagnostic tool, particularly for cases involving orbital malignancies and inflammatory diseases. Despite its value, the practice of orbital biopsy varies across different centers worldwide due to differences in experience, learning curves and available societies.

We must emphasize the need for further research on the techniques used for periocular and ocular lesions, calling for more comparative studies. Additionally, we must highlight the importance of practical training for oculoplastic surgeons to master various biopsy techniques and to choose the most appropriate method for diagnosis and treatment.

7. Conflict of Interest


None.

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