Fine-Needle Aspiration Biopsy

Its Use in Orbital Tumors

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• **Fifteen orbital tumors have been evaluated with the fine-needle aspiration biopsy (FNAB) technique. The best indication for FNAB is supposed malignant orbital disease. The technique has not been helpful in tumors or inflammatory disease with a high fibrous content. Lesions that are suspected of being pseudotumors are not recommended for FNAB since, even in histologic sections, they are notoriously difficult to distinguish from well-differentiated lymphocytic malignant lymphoma. Benign encapsulated tumors should not be subjected to FNAB.**

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Interest has increased in the use of fine-needle aspiration biopsy (FNAB) techniques to diagnose neoplasms from a variety of different organs, ie, thyroid gland, lymph nodes, salivary gland, lung, pancreas, prostatic gland, and deep abdominal areas.[1-10] Although experience with FNAB and orbital tumors appeared in the literature in 1975 as an abstract from Sweden,[11,12] to our knowledge, there have been no other reports of its use in the orbit. During an 18-month period, we have used the FNAB technique in 15 patients with various orbital lesions. In seven of these patients, positive results were obtained, and subsequent events confirmed the presence of a neoplasm.

The best use of FNAB appears to be in establishing a diagnosis of a malignant unresectable orbital neoplasm, thus eliminating a need for further surgical intervention.

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METHODS

The method of the needle aspiration biopsy technique, as described by Einhorn and Franzen,[1] consists of the use of a No. 22- or 23-gauge, thin, disposable needle attached to a 20-mL syringe, which is in turn attached to a pistol-type syringe holder (Fig 1). With this equipment, the surgeon can obtain strong aspiration pressure with one hand.

The needle that is attached to this unit is introduced into the orbital mass without application of aspiration pressure. While suction is applied, the needle is moved back and forth and angled in different planes of the tumor. Aspiration pressure is released before the needle is removed from the mass. The whole procedure takes less than a minute.

The cytologist/pathologist or cytotechnologist, who is present at the time of the procedure, either in the office or in the operating room, prepares the cytologic specimens. These slides are quickly fixed in 95% alcohol and stained according to the Papanicolaou technique. In addition, any material that is left in the aspirating needle is removed and fixed for at least 20 minutes with 4% formaldehyde and then submitted as a cell block. This material is embedded in paraffin so that hematoxylin-eosin (H-E) histologic sections can be prepared. The latter preparations, in addition to giving added evidence for malignancy, are particularly suited for histologic identification of tumor type.

If an immediate diagnosis is required, the cytology preparations can be stained with H-E after fixation for a short period with 95% alcohol.

Perfection of this technique depends on consultation, close cooperation, and interest of the ophthalmologist, cytologist/pathologist, and ophthalmic pathologist.

RESULTS

The Table summarizes our experience in 15 cases in which the FNAB technique was used. Positive results were obtained in two patients with metastatic orbital tumors; one had an unresectable malignant orbital tumor, one had direct extension of carcinoma from the ethmoid sinus, and one had adenoidcystic from the lacrimal gland. Positive results were also obtained in a patient with a malignant glioma of the optic nerve that was subsequently confirmed by an incisional biopsy specimen and in a patient with a primary orbital meningioma. The value of the FNAB technique in the identification and management of patients with malignant orbital tumors can best be illustrated in the following specific cases.

REPORT OF CASES

Case 1.—A 77-year-old man had a 6-mm right proptosis of three months' duration without other symptoms except a 9.1-kg weight loss in the past six months. A coronal computerized tomographic (CT) scan demonstrated an abnormality in the roof of the right orbit adjacent to bone but was otherwise normal. His age, weight loss, CT scan abnormality, and proptosis strongly suggested metastatic disease. Systemic investigation disclosed that he had prostatic carcinoma, which was proved by a biopsy specimen. The cytologic FNAB specimen from the upper orbit was thought to be positive for malignant cells (Fig 2 and 3), which correlated well morphologically with prostatic carcinoma (Fig 4). Since undergoing an orchiectomy, he has had a 3-mm reduction in the right proptosis.

Case 2.—A 63-year-old man had progressive vision loss to no light perception (NLP) in the right eye during a two-month period. Four months later, visual loss in the left eye began in the temporal field and progressed rapidly to include fixation. Visual acuity was NLP in the right eye and 6/12 in the left eye. The visual field showed an upper temporal depression in the left eye. There was a 3-mm right proptosis with chemosis of the conjunctiva and loss of lateral rotation. The right fundus showed a diffuse hemorrhage pattern with a sharp elevation of the optic disc that was suggestive of a malignant optic nerve tumor.[13] The left fundus was normal.

An ultrasonogram showed an enlarged optic nerve shadow behind the globe, and the CT scan showed diffuse enlargement of the optic nerve with an intracranial extension in the prechiasmatic cistern of a tumor mass. The aspiration biopsy technique was done under CT scan control of the right optic nerve tumor. A No. 22-gauge thin needle was introduced in the usual retrobulbar fashion through the lateral lower lid, and the position of the tip

of the needle was assessed by CT scan when it was thought to be located properly in the optic nerve tumor.[14] When the coronal and basilar CT scans confirmed that the needle was in the optic nerve, the syringe and pistol grip were attached, and the aspiration biopsy specimen was taken. Cytologic aspirate showed malignant cells, consistent with astrocytes. The needle biopsy diagnosis was confirmed by an anterior medial microorbitotomy.[15] A craniotomy was averted in this malignant gliomatous process. Radiation therapy resulted in a temporary improvement of vision of the left eye, which had rather rapidly deteriorated to 6/30 back to a level of about 6/9.

COMMENT

First described by Martin and Ellis[10] in 1930, the FNAB technique has not been popular in the United States due to understandable reluctance, bred by unfamiliarity, of both surgeons and pathologists. In Scandinavian countries, it has gained acceptance during the past two decades and more recently has been used in the United States to identify malignant tumors in various areas of the body.[1,2,5] Two Scandinavian articles have pointed to its potential in the orbit.[11,12]

A combination of relative loss of cohesion of neoplastic cells and strong suction allows aspiration of cells by the FNAB technique. The diagnosis of

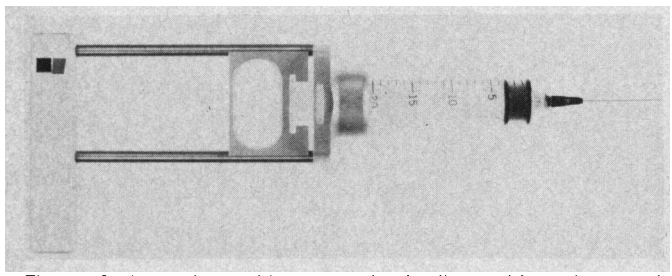

Fig 1.—Syringe pistol with 20-mL plastic disposable syringe and No. 22-gauge, 3.8-cm, disposable needle attached.

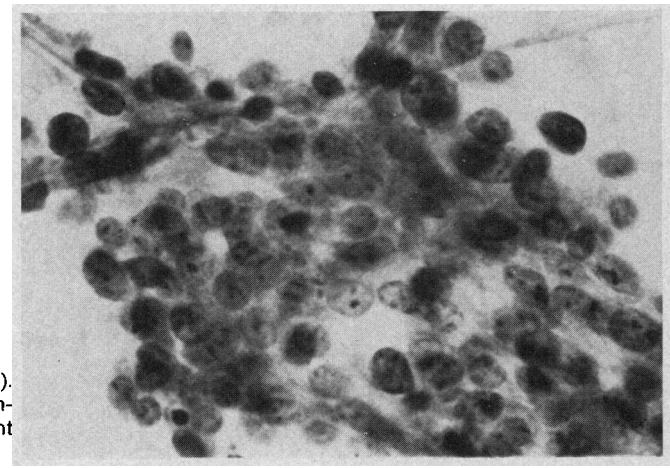

Fig 2.—Fine-needle aspiration biopsy preparation (case 1). Groups of cells with high nuclear-cytoplasmic ratio and occasional prominent irregular nucleoli are diagnostic of malignant process (Papanicolaou stain, ×788).

Fifteen Cases With Use of Fine-Needle Aspiration Biopsy Technique

Case/ Age, yr	Clinical Summary*	Cytologic Finding	Histologic Diagnosis†
1/77	Case 1 in text	Adenocarcinoma	Adenocarcinoma (prostatic biopsy)
2/63	Case 2 in text	Highly suspicious for malignant astrocytoma; atypical astrocytes, including mitotic figures	Malignant glioma of optic nerve
3/63	Progressive right proptosis with visual loss and frozen globe followed by rapid extension of mass from orbit to preauricular area	Carcinoma	Not performed
4/24	Progressive vision loss OD to bare LP causing right optic atrophy with shunt vessel; posterior enlarged optic nerve seen on CT scan	Meningioma (whorls of meningothelial cells)	Not performed
5/21	Acute left proptosis with frozen globe; undifferentiated carcinoma in left parotid gland area previously diagnosed	Carcinoma	Undifferentiated carcinoma
6/27	Large ethmoid mass extending into both orbits with predominantly left proptosis for 3 mo	Carcinoma	Poorly differentiated adenoidcystic carcinoma of the ethmoid sinus
7/23	Rapid left proptosis with no functional deficit; large mass in lateral orbit extending into temporal and middle cranial fossa on CT scan	Carcinoma	Adenoidcystic carcinoma of lacrimal gland
8/50	Right superior anterior orbital mass causing ptosis and vertical diplopia for 1 mo	Mature lymphocytes	Lymphoid hyperplasia (lymphoid pseudotumor)
9/67	Left superior anterior orbital mass causing ptosis, proptosis, mild pain, and blurred vision for 6 mo	Mature lymphocytes	Lymphoid hyperplasia (lymphoid pseudotumor)
10/7	Left posterior medial orbital mass causing ptosis, proptosis, and upgaze limitation for 2 mo	No identifiable cells obtained	Inflammatory pseudotumor with reactive fibrosis
11/31	Mass in left inferior anterior orbit for 1 mo; subsequent pulmonary sarcoid discovered	Fibrous connective tissue	Granulomatous inflammation consistent with sarcoid
12/26	Left lacrimal mass for 6 yr that enlarged slowly	Mature lymphocytes	Benign lymphoepithelial lesion of Godwin, lacrimal gland
13/39	Right superior anterior orbital mass for 7 mo with ptosis	Macrophages	Granulomatous inflammation consistent with sarcoid
14/31	Left lateral orbital mass since childhood with recent enlargement	Keratin debris and hair shafts	Dermoid cyst
15/50	Lymphosarcoma for 7 yr; mass in right inferior anterior orbit noted for 1 mo	Erythrocytes	Cavernous hemangioma

*LP indicates light perception; CT, computerized tomography.
†Diagnosis was confirmed by results of incisional or excisional biopsy.

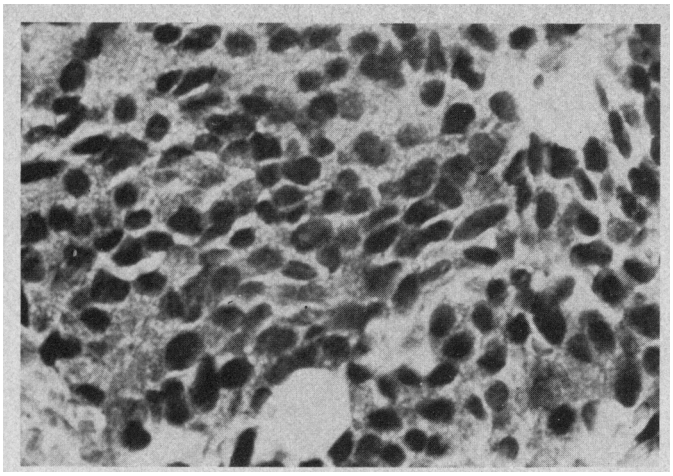

Fig 3.—Cell block preparation (case 1). Note occasional acinar grouping of cells indicating adenocarcinoma (hematoxylin-eosin, ×788).

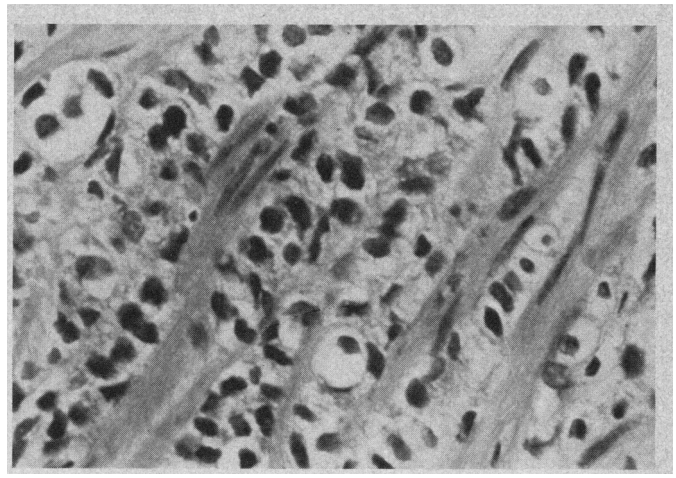

Fig 4.—Biopsy specimen from prostate gland with neoplastic cells infiltrating muscle bundles (case 1). Note resemblance of cells to those seen in Fig 3 (hematoxylin-eosin, ×788).

malignancy depends on the presence of so-called malignant criteria in cells, such as an altered nuclear-cytoplasmic ratio, irregularity and clumping of chromatin, and abnormality of nucleoli. These are identical to the criteria used in standard exfoliative cytology. Since identification of the tumor type guides eventual therapy, an effort is always made to determine this. The appearance of the cytoplasm and grouping of cells in relation to each other in the cell block is helpful in this regard (Fig 3). However, the FNAB is a cytologic technique where extent of invasion cannot be determined, as it can in histologic preparations, though this does not make it any less accurate.

The FNAB has been most helpful in identifying malignant epithelial tumors, suspicion of which is the main indication for its use in the orbit. Case 2, however, indicates that nonepithelial malignant tumors can also be diagnosed with this technique.

The FNAB plays a lesser role in evaluation of pseudotumors. This diagnosis cannot be made by cytologic criteria alone, but depends primarily on histologic architecture, in conjunction with cytologic features, in appropriately prepared H-E histologic sections. Although malignant lymphoma was not seen in this study, we anticipate that the diagnosis could easily be made by this method, especially in the poorly differentiated lymphocytic or histiocytic varieties, since we have detected them in other sites previously. The negative results of some of the biopsies, not unexpectedly, have been from tumors with a predominantly fibrous matrix where cohesion is strong and cellularity diminished or from cystic masses.

Tumors of a well-circumscribed type, thought to be benign, should not be subjected to needle biopsy. This is especially true in the case of benign mixed lacrimal tumor or hemangiopericytoma where capsule violation might alter the nature of the tumor to a more aggressive locally infiltrative behavior. The physician should always be aware of sampling problems that might arise with this technique and recognize that a negative report should not preclude the use of other methods to confirm a strong clinical impression.

Secondary carcinoma that involves the orbit, either by direct extension from an adjacent structure or as a result of distant metastasis, may account for a large number of orbital neoplasms. These amounted to 19% of the orbital tumors in Henderson's series of 465 consecutive cases that were seen at the Mayo Clinic.[16] It is in this area, as case 1 indicated, that FNAB has great value, ie, in patients with inoperable metastatic orbital disease, but in whom a firm microscopic diagnosis is desired to guide further treatment, such as radiotherapy, chemotherapy, or ablative endocrine therapy. We have demonstrated that epithelial cells are readily obtainable by this method, and a diagnosis of malignancy can be established with a great degree of certainty depending, of course, on the cytologist's familiarity with the technique, which in this laboratory extends to several hundred specimens from different sites. Furthermore, FNAB can be done as an outpatient procedure with only slight discomfort to the patient and minimal surgical intervention.

No appreciable complications have occurred with this technique. Patient 2 with malignant optic nerve glioma had a slowly forming subconjunctival hemorrhage that subsided spontaneously.

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