DIAGNOSTIC AND SURGICAL TECHNIQUES STEVEN G. KRAMER, EDITOR

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Abstract. When noninvasive techniques fail to confirm or rule out the suspicion of a malignant lesion, fine needle aspiration biopsy may provide an efficient, economical and relatively safe method of obtaining material for cytological study. The technique may also be valuable for intraoperative morphological evaluation. Traumatic complications produced by fine (21–25 gauge) needles are infrequent and almost never serious, and concerns about tumor seeding through the procedure have been largely dispelled by recent studies. Reliable results require a high level of skill in performing the aspiration procedure and in cytologically examining the small amount of material obtained. The authors review the history, applications, techniques and complications of fine needle aspiration biopsy, presenting guidelines for and illustrations of its use in specific ophthalmic situations. (**Surv Opthalmol 29:**410–422, 1985)

Key words. aspiration cytology • biopsy • cytology • fine needle aspiration biopsy • lesion • intraocular biopsy • malignant lesion • tumor

For many years, exfoliative cytology and ocular fluid aspiration were the accepted techniques for cytodiagnosis.[21,58,73] Exfoliative cytology refers to the evaluation of material exfoliated from the external surfaces (lid, conjunctiva, cornea)[21,28,49,91,101] spontaneously or by mechanical removal (scraping). Ocular fluid aspiration formerly referred to the obtaining of specimens from the anterior chamber only; however, recent advances in vitrectomy techniques have made it possible to aspirate fluids from the posterior chamber as well. During the past few years, another cytodiagnostic technique, fine needle aspiration biopsy (FNAB), has gained wide acceptance. With this technique, solid or cystic masses of the orbit, lid, or globe can be investigated promptly and inexpensively, greatly increasing the cytodiagnostic possibilities available to the clinical ophthalmologist.

The technical aspects of exfoliative cytology[33,49,64,98] and ocular fluid aspirations[15,23] have been well covered in the literature. Similarly, the clinical literature on anterior chamber fluid aspiration[62,63,77] and diagnostic vitrectomy[22,29] is ample. Thus, these techniques will not be covered in detail in this paper. Instead, this paper will focus on fine needle aspiration biopsy — its history, applications, techniques, complications, and interpretations.

Historical Background

According to Webb,[102] Kun first reported the use of aspiration biopsy as early as 1847; however, it was not until 1930 that the first well-known report on fine needle aspiration biopsy appeared in the literature.[53] Although it seems that this safe, fast,

and reliable technique should have been immediately established, its success took decades and required persistent advocacy.

After the papers of Martin and Ellis[53] and Stewart,[93] little more was heard of the technique for 20 years. It was in Sweden that FNAB finally began to receive its deserved attention, largely through the efforts of Stockholm Karolinska Institute cytologists — Franzen, Zajicek, Söderström and others. "The Scandinavian curiosity," as Fox called it in a thought-provoking article in 1979,[29] has now become a routine and well-documented cytologic technique used worldwide in the diagnosis of palpable or localizable tumors.[107,108] In a 1980 editorial, Koss[46] discussed the reasons for the troubled history of FNAB, concluding that ". . . it is my deep conviction that the thin needle aspiration biopsy is a procedure whose time has come."

Use of Fine Needle Aspiration Biopsy in the Study of Human Pathology

As documented in the current literature, almost all organs of the human body can be clinically investigated by FNAB.[1,69,81] In his *Handbook of Fine Needle Aspiration Biopsy Cytology*, Kline[45] devoted a chapter to areas (including orbit) in which the use of FNAB was in progress; now FNAB has a codified and correct use even in these areas.[7,9,45,67] Some organs can be evaluated with particular success (breast, thyroid, salivary and prostatic glands, and lymph nodes).[27,34,78,96] With the development of ultrasonography and computer assisted tomography (CAT) techniques, even intraabdominal and intrathoracic organs can be biopsied by FNAB. Although false-negative and false-positive results can occur, their incidence is low in the hands of skillful cytopathologists.

FNAB is not only an accurate procedure, but also a low-cost one. Except when it is performed on the intraabdominal organs or brain, FNAB is usually an outpatient procedure. Thus, it may eliminate hospitalization and surgery, or at least shorten the hospital stay by providing the pre-surgical testing on an outpatient basis.

In addition to the extensive clinical applications of FNAB, the procedure will undoubtedly be valuable for obtaining tissues for use in the development of new processing methods. Tissue culture, immunologic analysis for specific markers using either immunoperoxidase reagents or immunofluorescence, detection and measurements of hormone receptors, and electron microscopy studies are among the real and potential areas for research.[6,18,60]

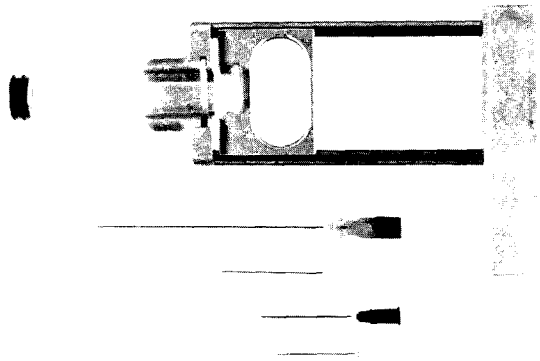

Fig. 1. The equipment for performing fine needle aspiration: a 10 ml disposable syringe, a syringe-holder and some fine (less than 1 mm external diameter) needles of different lengths, with and without obturator.

TECHNIQUE

The procedures and equipment described below are sometimes different from those used in certain ophthalmic applications of FNAB. These differences will be discussed in the appropriate sections.

The basic equipment required for FNAB is simple: some fine (21–25 gauge) needles in various lengths from 3.5 to 20 cm; 10 and 20 ml disposable syringes; a syringe-holder (pistol); some glass frosted-end slides; and one or two fixative substances (95% ethyl alcohol, Cytofix). Fig. 1 illustrates the equipment we currently use.

A transcutaneous FNAB is performed as follows. After thorough cleaning of the skin, the area above the tumor is held firmly with one hand in a position convenient for the operator. The needle, attached to the syringe which has been connected to the syringe-pistol, is inserted through the skin into the lesion. No anesthesia is generally required; in fact, FNAB is usually less painful than a venipuncture. When the needle enters the tumor, the operator retracts the plunger of the syringe-holder, obtaining a negative pressure in the system. In order to aspirate sufficient material, the needle is moved back and forth into the lesion, always maintaining the vacuum. Then the plunger is released, pressure is equalized into the system, and the needle is withdrawn from the mass (Fig. 2). In nonpalpable, nonvisible lesions, the operator generally reaches the target mass with the aid of ultrasonography or CAT-scan.

With the material now in the needle, the syringe is detached from the needle (and from its holder), filled with air and connected again; the air is forced through the needle whose tip is into light contact with a glass slide. The aspirate is expressed onto the slide and rapidly macroscopically inspected. It generally consists of a drop of fluid with or without the admixture of blood or of semisolid material. Immediately, the collected specimen is spread along the

slide with another glass slide by the use of flat pressure. Fixation and staining are the next steps. We recommend two standard procedures: air-dried and wet-fixed (95% ethanol or Cytofix) smears. Common staining methods include May-Gruenwald-Giemsa (air-dried material) and Papanicolaou standard stains. The use of both staining methods allows a more complete study of cell details and cell relations. A new method of rapid staining to assess the adequacy of samples or to achieve, if possible, a fast accurate diagnosis has recently been introduced.[8] When one is performing a perioperative diagnostic FNAB, rapid cytologic diagnosis can be of paramount importance in proper planning of surgical procedure. Different and specific fixation and staining methods may be used depending on the clinically suspected nature of the lesion (microbial or fungal infection, inflammation, peculiar neoplasms) or on particular investigative procedures (electron microscopy, hormone markers detection, etc.).

COMPLICATIONS

Traumatic Complications

Traumatic complications of FNAB are infrequent and almost never serious. A hematoma may appear at the site of aspiration, but it generally causes little or no discomfort. Following lung FNAB, a pneumothorax may appear. It usually resolves spontaneously and in only 4% of cases (mainly in older people) is drainage necessary.[70] Transabdominal FNAB does not damage the viscera through which the needle passes, as the needle is smaller than commonly used surgical sutures. Some other rare complications (thyroid swelling[42] and cardiac tamponade[47]) have been described; however, these are single case reports and, considered with the thousands of FNAB procedures performed, they are insignificant.

Tumor Dissemination

In 1962, Berg and Robbins[5] concluded their paper about the safety of large (1.25 mm diameter) needle aspiration biopsy of breast cancer affirming: "There is no reason to consider this procedure detrimental to the patient."[5] In 1967, von Schreeb et al reviewed 150 cases of renal carcinoma and drew the same conclusion.[101] Nonetheless, clinical and experimental investigations on local and distant dissemination of neoplastic cells after FNAB have been conducted. The principal studies are described below.

In 1971 Engzell et al[24] performed aspiration biopsy (18 gauge needle) of lymph node metastases from Vx2 carcinoma rabbits. When carcinoma cells were present in the aspirated material they were also found outside the capsule of the node at the site of needle puncture. This suggests that some tumor cells may escape through the capsular perforation caused by needle biopsy of an encapsulated tumor and may spread along the needle track. In the same report, Engzell et al evaluated some large series of needle aspirations (22-gauge) performed on patients affected by pleomorphic adenoma of the salivary glands (124 patients followed for at least 10 years) and prostatic carcinoma (469 patients treated only with hormonal medication). None of these patients manifested recurrence of the tumor due to aspiration biopsy. Explaining these contrasting data, the authors suggest that in a clinical situation the number of malignant cells along the needle track is small and these cells are destroyed before giving rise to local growth. These conclusions are supported by previous reports on tumor growth. Additionally, these authors reported that they were not able to detect Vx2 carcinoma cells in the lymphatic or local blood circulation of rabbits affected by Vx2 carcinoma node metastases following needle aspiration biopsy. Based on their own study and on previous reports, the authors conclude that even though individual Vx2 cells might have been present but not morphologically appreciated, distant dissemination is certainly uncommon and that individual circulating tumor cells may die without giving metastases. Host defenses presumably prevent metastatic implantation in most instances. Thus, the authors conclude that the use of fine needle aspiration biopsy in the diagnosis of malignancy should not impair prognosis. It should also be remembered that most malignant tumors, including the needle track, are treated by excision or irradiation after the diagnosis, further reducing the possibility of metastases.

Sinner and Zajicek[88] reported the occurrence of a single case of implantation metastasis among 1264 cases of malignant lung lesions diagnosed by percutaneous transthoracic needle (18–22 gauge) aspiration biopsy. They emphasized the importance of external diameter of the needle (1.1 mm = 18 gauge as maximum external diameter), noting that in previous reports on local dissemination larger needles had been used. Fine needles greatly decrease the danger of spreading cells; the cross-sectional area of a 22-gauge needle is approximately five times less than that of Meneghini needle and twelve time less than that of a Vim Silverman needle.[74] Most investigators now use only 21–25 gauge needles. With the use of these fine needles only sporadic cases of malignant seeding (local and general) are reported and many investigators could not find any instance of needle tract implantation in large series of patients who had undergone FNAB.[4,25,50,90,96]

In a recent experimental semiquantitative study, Ryd et al[72] studied local seeding. Using highly ma-

lignant transplantable tumors, they demonstrated that a considerable number of malignant cells contaminate the needle track (10^2–10^4 intact cells from solid tumors and 10^3–10^4 cells from ascitic tumors). However, they point out that the conditions of their study are extreme and their results cannot be directly applied to clinical situations. They state that cell seeding is unavoidable with the use of FNAB (although less than with large needles or open surgical biopsy), but that the risk must be compared with the hazards of treating a tumor without a morphologic diagnosis.

In summary, we concur with Frable that "the outcry against fine needle aspiration biopsy because of tumor seeding remains without convincing foundations."[27]

CYTOLOGICAL INTERPRETATION

Only a small amount of material can be obtained by FNAB and clinicians are sometimes skeptical about the ability to obtain a correct diagnosis from one small drop of aspirated material. A FNAB smear is more difficult to evaluate than a histologic section, and it therefore requires a highly skilled cytopathologist with excellent training and experience in human pathology as well as specific experience with this method.

Fine Needle Aspiration Biopsy in Ophthalmology

Although reports on aspiration biopsy in ophthalmology can be found in the literature early in this century,[40,55] its common use in the cytodiagnosis of eye disease is recent. In this section, we will discuss the current use and future potential for this procedure in the evaluation of ophthalmic disorders. A few selected cases, with their histologic correlations, are reported.

ORBIT, OPTIC NERVE AND LIDS

The application of FNAB in ophthalmology was introduced in 1975 by Schyberg, in Sweden, for the diagnosis of orbital neoplasms.[79] Within the orbit there is an enormous variety of normal tissues (muscular, glandular, nervous, fatty, vascular and bony structures) and consequently a variety of possible pathologic processes. Therefore the diagnosis of orbital disorders often presents intriguing problems.[71] The diagnostic possibilities of surgical biopsy without aggressive procedures are limited to the anterior orbit. However, surgical biopsy is a painful and time-expensive approach. Ultrasonography and computed tomography have revolutionized the evaluation of patients affected by orbital disorders and today by means of these techniques we can accurately locate most orbital tumors and, occasionally, define their histologic characteristics.[12,14] However, the morphology of the mass cannot be studied by these means, and this is an important aspect of evaluating solid or cystic lesions. Therefore, an atraumatic and precise biopsy technique such as FNAB represents a major contribution to the diagnosis of orbital disorders.[66] Since its introduction in 1975, a number of authors have reported on the accuracy and reliability of FNAB.[30,41,43,89,103] The cytohistologic correlation performed in most instances is especially encouraging.[42,56,97]

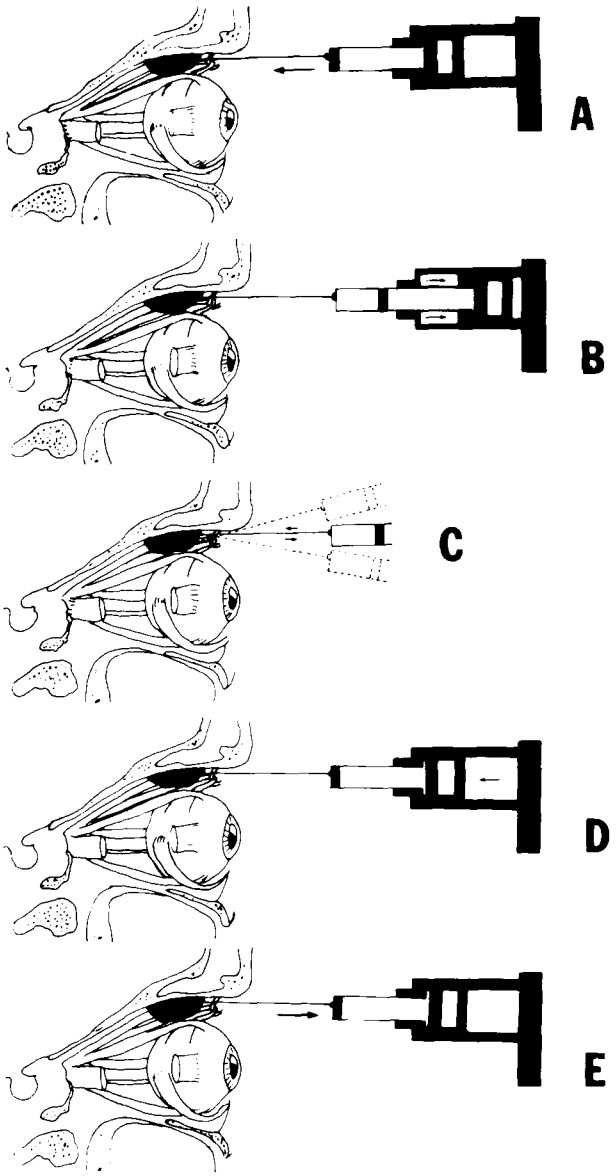

Fig. 2. Schematic drawing of the technique of fine needle aspiration. An orbital tumor as target mass is shown.

As a rule, the work-up of a patient with an orbital lesion includes first a clinical examination and then standard X-ray films, ultrasonography and CAT-scans (and sometimes angiographic investigations

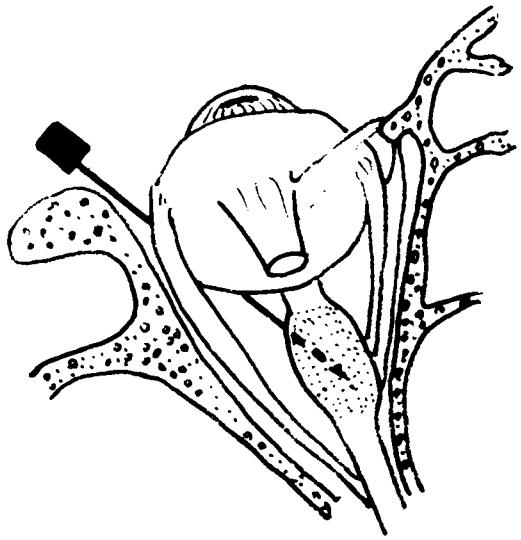

Fig. 3. Schematic drawing of the collection of cytologic material from a neoplastic lesion of the optic nerve performed by means of FNAB (superior view).

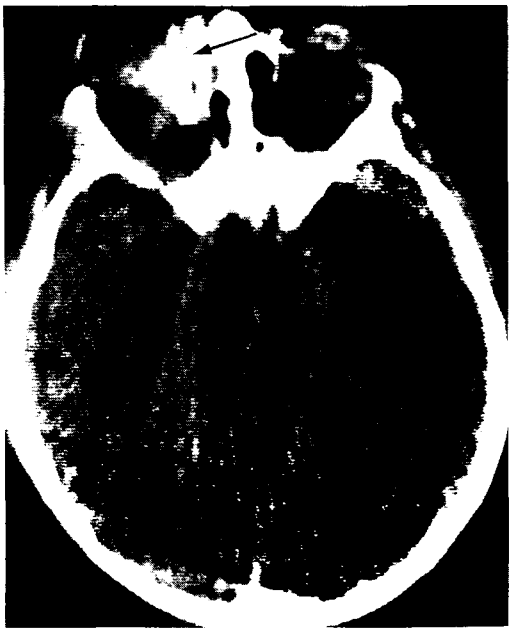

Fig. 4. CAT-scan control of the position of the needle (arrow) during FNAB of a posterior orbital mass. The needle appears larger than actual size because of radiation interference with its metal structure.

with contrast medium). After the initial diagnostic work-up, FNAB may be performed.

If the lesion is in the anterior orbit and is palpable, the probing is done as previously described in the "Techniques" section (Fig. 2). Usually the needle can be guided without the aid of additional visualization techniques. After the conjunctiva has been anesthetized with a local anesthetic, two or three transconjunctival aspirations are performed. We prefer to use the transcutaneous route for firm lesions attached to or involving the orbital rim, particularly if they do not move under finger pressure. If the tumor is in the posterior half of the orbit, we insert the needle without its attachments; we prefer a spinal needle for suspected cystic lesions. The needle, freely movable, may be much more easily directed toward the tumor. The route may be transconjunctival or transcutaneous and the site where the fine needle is inserted depends on the previously assessed location of the mass. The shortest way is generally chosen, even if we sometimes prefer to use at least two different approaches — one for each aspiration — to obtain a more accurate needling of the lesion.

Optic nerve tumors are probed by inserting the needle in the manner commonly used for retrobulbar anesthesia (Fig. 3). With any posterior tumor, the position of the tip of the needle is assessed as soon as the operator has inserted the needle into the lesion. CAT-scans are commonly used (Fig. 4); good results using ultrasonography have also been reported.[20,92] When the tip is correctly positioned, the syringe equipment is attached to the needle and the aspiration is performed. Orbital and optic nerve FNAB is carried out on an outpatient basis, except when it is performed on children who need a slight general anesthesia. The most frequent, although rare, complication is a subconjunctival hemorrhage; rarely, an orbital hematoma may ensue.

There is not general agreement about the use of FNAB in various orbital neoplasms. Char proposes a "conservative" approach, preferring to perform FNAB only when an orbital metastasis is suspected and in patients with multiple recurrent basal cell carcinoma of the inner canthus with suspected orbital invasion.[13] Other authors advocate a wider application of FNAB.[13,56]

If FNAB is diagnostic, histologic study is not necessary; however, if the aspirated material is not diagnostic further aspirations must be performed. If the result is still doubtful an open surgical biopsy is mandatory. FNAB never prevents a surgical biopsy, because the needle tract does not modify the structural characteristics of the tumor under investigation.

Based on the literature and our experience, we feel that FNAB is particularly useful in the orbit to identify malignant epithelial tumors and metastatic neoplasms (Fig. 5).[19,43,57,80] With FNAB, we can also accurately diagnose nonspecific mixed inflammatory masses, orbital hematomas, orbital abscesses (an interesting case of orbital aspergillosis has been recently reported) and lymphoid lesions.[3] The ability of FNAB to correctly diagnose orbital (and lid)

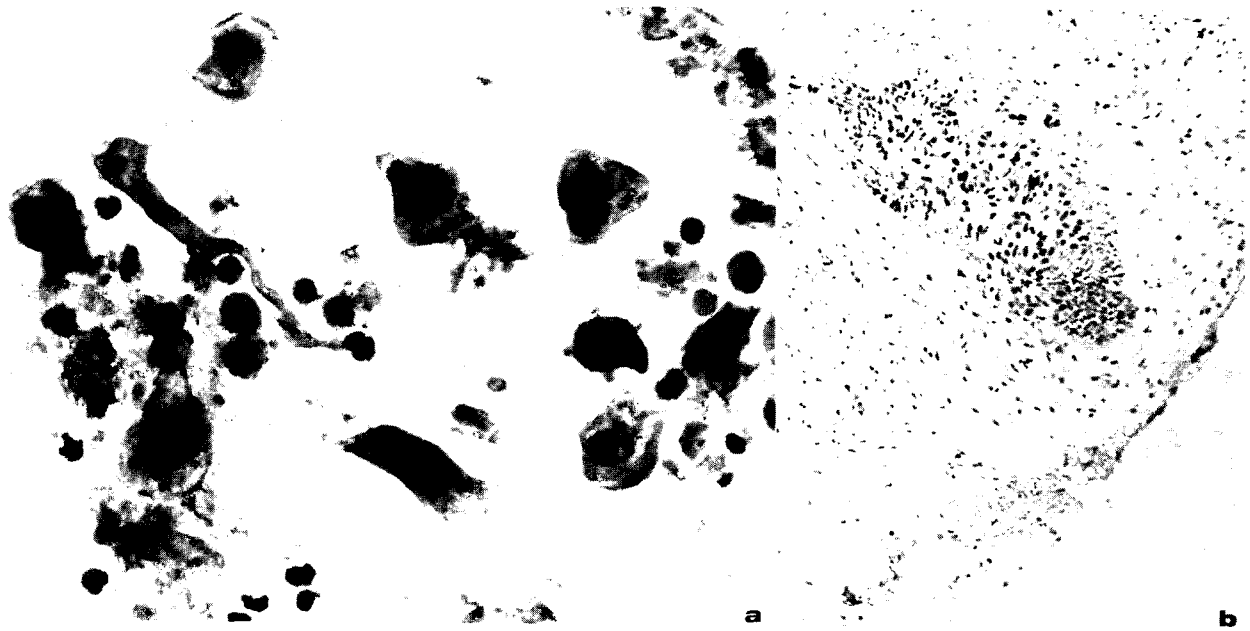

Fig. 5. Fine needle aspirate from an orbital mass. Approximately 3 ml of yellowish, viscid fluid were withdrawn and a diagnosis of metastatic keratinizing squamous cell carcinoma (which had undergone liquefaction) was made. A: Note necrotic background and tadpole cells (Papanicolaou stain, ×400). B: Histologic section of the surgical biopsy performed on the same lesion (Hematoxylin and Eosin, ×63). Subsequently a lung carcinoma was diagnosed in this patient.

lymphoid neoplasms is under debate.[41] Some recent papers and the application of the immunoperoxidase method on aspiration biopsy smear confirm our belief that even these intriguing tumors may be diagnosed with FNAB (Fig. 6).[36,60,69a,97] Some authors have reported negative results in diagnosing sarcomatous neoplasms with FNAB.[61] Electron microscopy may help to improve the cytologic accuracy.[6]

We agree with Kennerdell et al[41] that aspiration biopsy of orbital optic nerve tumors can be proposed in cases where observation is contemplated or the planned surgical procedure is a radical one. Generally, in these cases the tumor has totally or almost

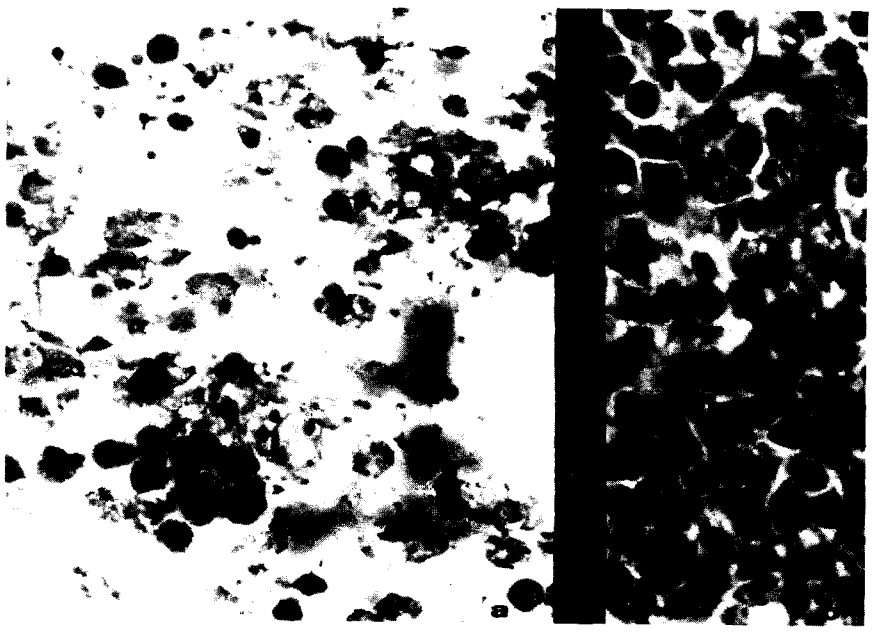

Fig. 6. A: Fine needle aspirate from an orbital mass. The collected material was judged to be consistent with a malignant, non-Hodgkins lymphoma, possible centrocytic diffuse (MGG, ×240). B: Histologic section of a small lymph node removed from the cervical region: centrocytic nonHodgkins lymphoma, diffuse (Hematoxylin and Eosin, ×240).

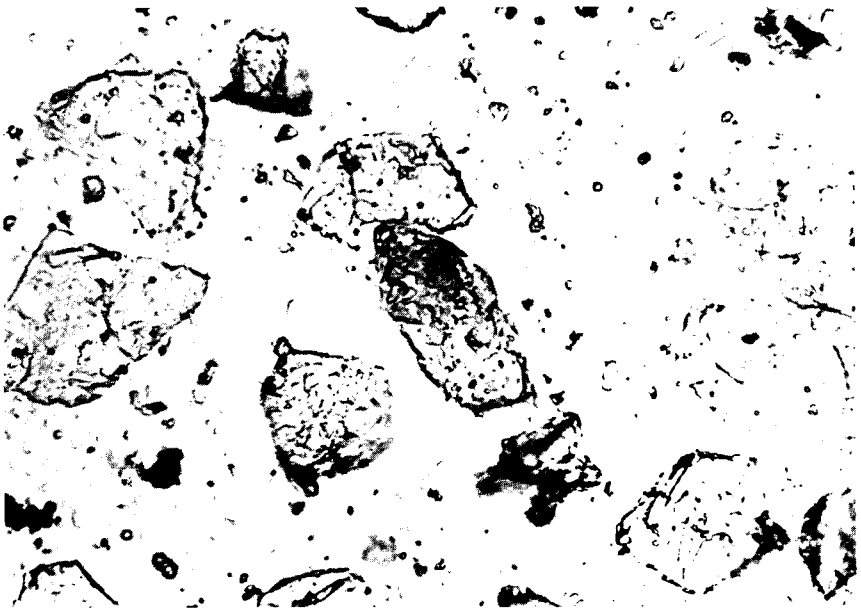

Fig. 7. Fine needle aspirate from a lacrimal fossa gland mass: anucleated cells of sebaceous type on an amorphous background: A histologically confirmed diagnosis of epidermoidal cyst was made (MGG, ×240).

totally blinded the eye. A morphologic confirmation may help the clinician in making a decision.

Jakobiec et al[38] reported interesting data about the combined clinical and CAT-scan diagnosis of primary lacrimal fossa lesions.[38] Excluding acute dacryoadenitis where corticosteroid therapy is highly effective, the authors state that any mass localized in the lacrimal fossa must undergo histologic confirmation before surgery, except when a benign mixed tumor of the lacrimal gland is suspected. In this case an en-bloc resection is generally recommended, because biopsy may allow a spreading of benign mixed tumor elements favoring recurrence or malignant degeneration of the neoplasia, even after subsequent radical surgery.[38,94]

Since a preoperative clinical and radiographic approach is often elusive — if not inconclusive — we stress that FNAB, which was not considered by Jakobiec et al,[38] is extremely important and useful in the evaluation of any kind of lacrimal gland fossa mass (Fig. 7). Moreover, we emphasize that in previous reports of recurrence of lacrimal gland benign mixed tumors after biopsy, not FNAB, but more traumatizing and aggressive surgical biopsy was used.[106] We do not have extensive personal experience with FNAB of benign mixed tumors of the lacrimal gland, but the behavior of this neoplasm appears to be similar to that of benign mixed tumor of the salivary glands. The experience of one of us (PB) in the investigation of the latter tumors and the reported data reveal that there is not a serious danger of dissemination or recurrence in FNAB of this kind of neoplasm, particularly if a 22–23 gauge needle is used.[24,60]

The reported data confirm that FNAB is a useful and safe cytologic technique for obtaining a correct diagnosis of orbital tumors. Although some pitfalls may be present in our aspiration procedures or cytologic interpretation, continuous work will provide the needed experience.

Only a few authors have reported the application of FNAB in the diagnosis of lid lesions.[35,36,80] We recommend an aspiration biopsy before operating on any suspect lid tumor to avoid mistaking a lesion such as sebaceous carcinoma for a chalazion (masquerade syndrome) (Figs. 8 and 9).[11,59,90]

INTRAOCULAR TUMORS

The accuracy of diagnosis of intraocular tumors — particularly choroidal malignant melanoma — has notably improved in recent years. The percentage of eyes removed because of a clinical, but histologically unproven diagnosis of malignant melanoma has decreased from 20% to 2–6% in the major institutions.[70] Shields et al[86] reported an incidence of 0.75% of erroneous enucleations among 400 cases of pseudomelanoma lesions in eyes with clear media; however, this very low incidence is achieved only in highly specialized centers. Thus, realistically, a small but significant number of eyes without malignant neoplasms are still needlessly enucleated.[14,82] Moreover, the recent low incidence may be due not only to improvement in diagnostic techniques, but also to a more conservative surgical approach.[14,85] Enucleation is now usually performed only when a significant growth is clinically documented,[106] although not all ophthalmologists agree with this approach.[51]

Although the problem of erroneous diagnosis of posterior uveal melanoma may never be completely eliminated,[86] the use of a safe method of intraocular biopsy might help to reduce the percentage toward zero.

A number of techniques of probing intraocular tumors have been reported. Transscleral aspiration and excision (trephination, wedge resection) biopsy have been used.[2,16,40,48,52,55,65,68,83,84,100] These techniques are considered to be at high risk for extrascleral spreading of tumor because the sclerectomy in these cases is always complete, and choroidal (suspected malignant) tissue is allowed to reach the external surface of the eye.[39,75,76] To avoid the direct approach to the tumor (i.e., sclerectomy and biopsy performed directly over the neoplasm), a transvitreal approach was suggested. The most recent such technique is complicated and it is doubtful that it should be used in an eye with good visual acuity.[31] Moreover, when investigating an eye with a suspected malignant tumor, our diagnostic method must be as delicate as possible.

Given the risks of surgical biopsy and the ability of modern noninvasive techniques to aid in the diagnosis of intraocular tumors, it appeared to some that biopsy would play a very limited diagnostic role in the future.[85] This was only partly true.

Fig. 8. Nodular mass of the inner third of the inferior lid of the left eye (arrow). A similar lesion in the same place had been removed four months earlier and classified as a chalazion.

In 1979, Jakobiec et al[37] proposed the use of FNAB in the diagnostic evaluation of intraocular tumors, elaborating some ideas for a correct transvitreal or transaqueous approach to the lesion using a fine needle. They reported six cases of intraocular biopsies carried out with their method and discussed the technique and the complications of their

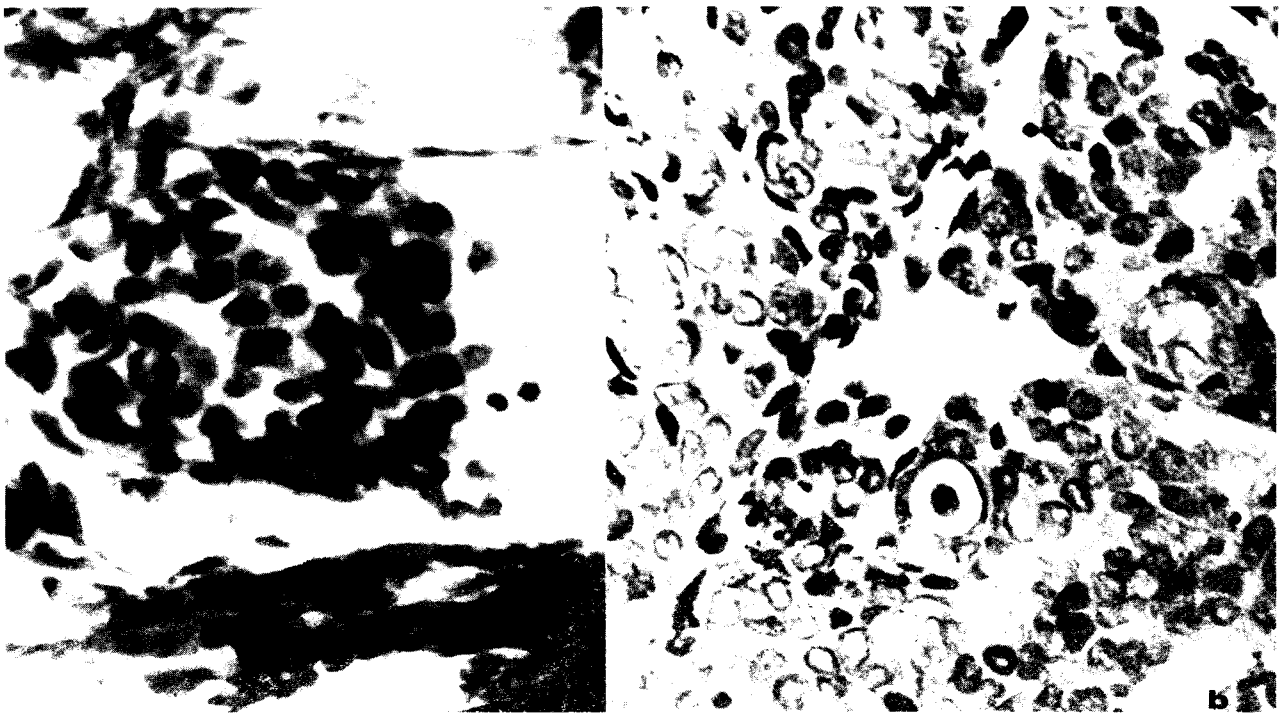

Fig. 9. Fine needle aspirate from the nodular lesion depicted in Fig. 8. A: Note a cluster of epithelial, malignant squamous cells, suggesting a moderately differentiated squamous cell carcinoma (Papanicolaou stain, ×63). B: corresponding histologic section (Hematoxylin and Eosin, ×63).

approach. In 1983, Czerniak et al reported their experience with FNAB in the diagnosis of choroidal melanoma.[17] These authors did not use a transvitreal route to posterior tumors; nevertheless, they did not observe any local recurrence (follow-up 2–24 months). Recently, Char and Miller[14a] described three cases of retinoblastoma, one intraocular and two metastatic, diagnosed by FNAB, and Augsburger and Shields[2a] reported on their use of FNAB in the diagnosis of solid intraocular tumors.

Over the past few years, we have studied and applied FNAB in the investigation of intraocular masses.[30] We have evaluated 16 intraocular neoplasms, finding two cases of retinoblastoma, one of breast carcinoma choroidal metastasis and 13 of malignant melanoma. Fifteen eyes were enucleated immediately after the diagnosis; the eye with the metastasis was enucleated three months later because the radiation therapy was unsuccessful. All patients were alive at a mean follow-up of 26 months (range 10–43) for melanoma cases and 21, 15 and 10 months respectively for the retinoblastoma and metastasic cases.

We agree with Jakobiec et al[37] that the fine needle should be introduced opposite the lesion. Although unproved, it seems that the mechanical surface washing of the needle into the vitreous body or aqueous humor is prophylactic against the risk of tumor spreading. In a previous section we discussed the possibility of local (and general) tumor seeding; we emphasize again that the transvitreal and transaqueous approach decreases the possible risk.

GUIDELINES

Based on our experience, we offer the following guidelines for performing intraocular FNAB.

We prefer to use a spinal needle (3.5–9 cm, 22–25 gauge) because we can insert it into the eye without the syringe and no fluid can escape through the needle. Either local or general anesthesia may be employed.

For anterior segment lesions, the needle is inserted through the limbus opposite the mass. When the tumor is entered, the obturator is removed the syringe equipment is attached to the needle and the aspiration is carried out. Then the needle is withdrawn and the smear is prepared (Fig. 10A). For posterior segment masses, the conjunctiva is opened in the quadrant opposite the lesion. Then the sclera is coagulated with diathermy at the level of the pars plana in a small area just opposite the tumor. Here, a small sclerotomy (length = 1.5 mm) involving two-thirds of the scleral thickness is performed. Only the fine needle pierces the whole scleral thickness, so the hole is as small as possible. A scleral suture is placed in the lips of the wound. Then the needle is inserted and continuously guided by means of indirect binocular ophthalmoscopy (clear media) or ultrasonography (hazy media or large retinal detachment). When it enters the lesion it is blocked with a clamp and the obturator is removed. The syringe equipment is attached to the needle and the aspiration is carried out. After the pressure has been equalized, the needle is withdrawn, then the sclera is sealed with the preplaced suture and a vigorous lavage of the scleral surface is performed (Fig. 10B). If the tumor is in the ciliary body and the patient is aphakic, the cornea may be used as the

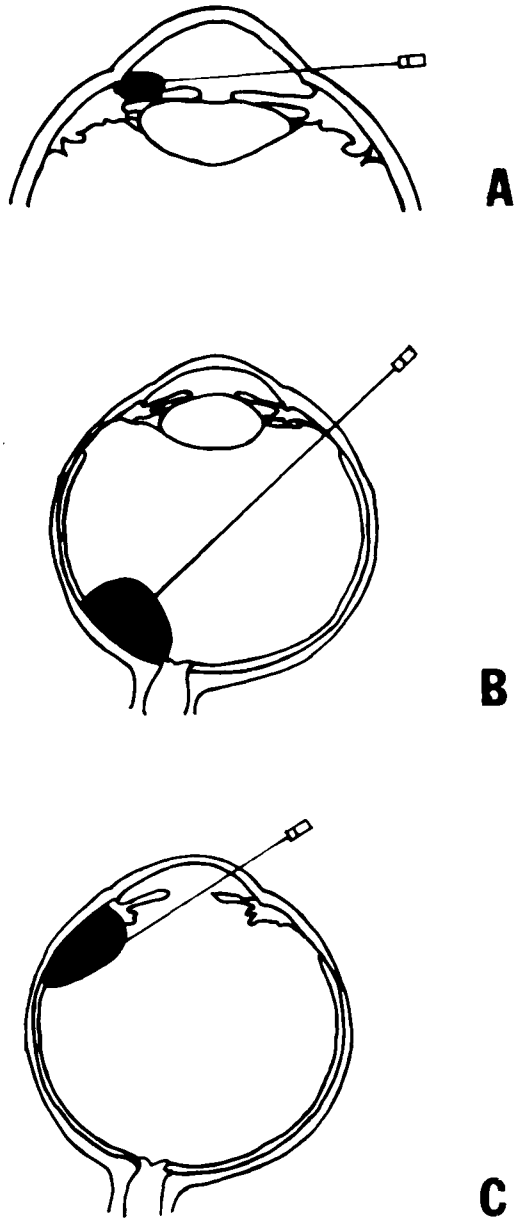

Fig. 10. Schematic drawing of FNAB of intraocular masses. The needle approach is from the opposite side of the lesion.

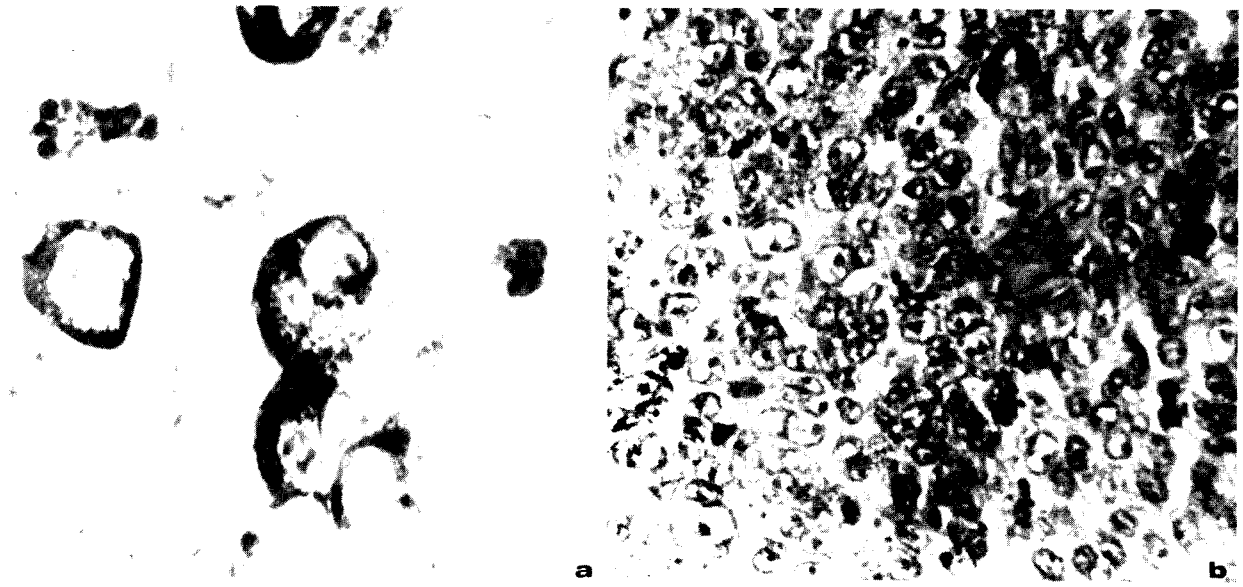

Fig. 11. A: Fine needle aspirate from an intraocular mass: a diagnosis of malignant epithelioid melanoma was made (Papanicolaou stain, ×400). B: Diagnosis was histologically confirmed on the removed eye (Hematoxylin and Eosin, ×240).

insertion point (Fig. 10C).

The aspirated material is immediately fixed, stained and evaluated by the cytopathologist. The staining method is generally a rapid one.[8] If the cytologic diagnosis is for a malignant tumor where enucleation is contemplated, the enucleation is immediately performed. The specificity is 100% and the cytohistologic correlation is good in all reported cases (Figs. 11–14). The most frequent complication is a vitreous hemorrhage (we observed 13 cases), which generally clears spontaneously. When biopsying a choroidal mass, we perforate the retina over the lesion (transvitreal approach). This complication is treated, if necessary, with the most appropriate retina surgical technique, after the best therapy for the diagnosed lesion has been decided. We are currently evaluating the possibility of preventing the consequences of retinal perforation by performing, if possible, light coagulation in the site where FNAB is planned.

Of course, FNAB of intraocular tumors is not undertaken simply to satisfy our curiosity. Its purpose is to confirm or rule out the clinical suspicion of a malignant tumor where noninvasive techniques

Fig. 12. Fine needle aspirate from an intraocular mass: a diagnosis of malignant melanoma (mixed-type) was made (Papanicolaou stain, ×400).

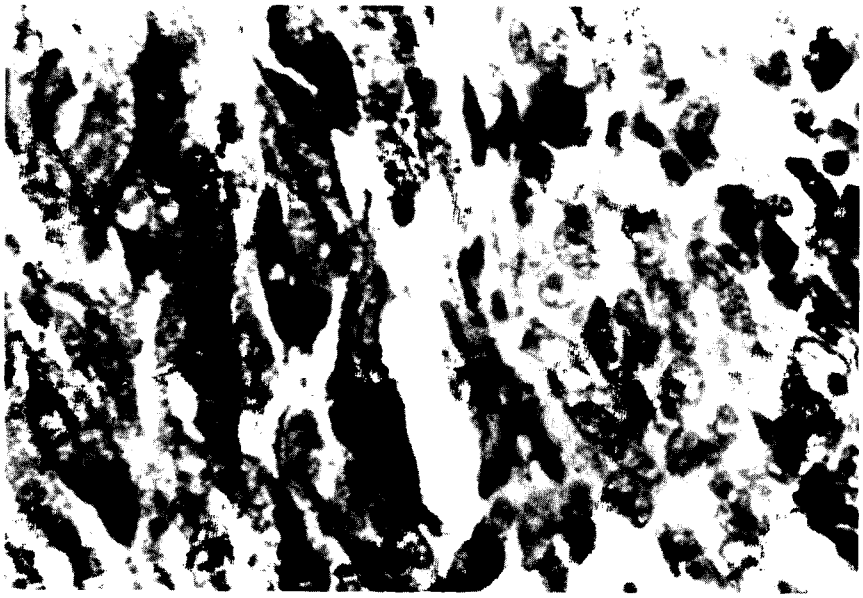

Fig. 13. The same case as shown in Fig. 12. The cytologic diagnosis of mixed-type (fusocellular and epithelioid) malignant melanoma was confirmed on the surgical specimen (Hematoxylin and Eosin, ×400).

Fig. 14. Fine needle aspirate from an intraocular mass in a subject previously surgically treated because of an infiltrating breast cancer and without any present detectable metastasis. A: The collected material corresponds to a three-dimension aggregate of malignant epithelial cells consistent with a breast origin. In this case the cytologic diagnosis allowed conservative treatment, but the radiation therapy was unsuccessful and the eye was subsequently removed because of severe pain and blindness. (Papanicolaou stain, ×240). B: Histologic section of the removed eye showing carcinomatous involvement of the choroid. (Hematoxylin and Eosin, ×24).

fail.[87] It is the last step in a diagnostic plan when doubt still remains. The procedure is quite difficult and it requires great skill. We suggest practicing it on enucleated eyes.

There are many pseudomelanomatous lesions whose diagnosis may be obtained by means of FNAB cytology. We believe that in selected, difficult cases, particularly if morphologic information can modify the therapeutic approach to the lesion, FNAB must be performed.

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