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Salivary Gland and Soft Tissue Ultrasound-Guided Fine-Needle Aspiration: Two Case Reports on the Clinical Utility of Ultrasound for the Biopsy of Masses in the Deep Parotid Gland and Shoulder

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Key Words: ultrasound guided FNA, salivary gland, shoulder, pleomorphic adenoma, elastofibroma

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CASE 1

A 68-year-old woman presented to the emergency department with neck pain after a motor vehicle accident. Physical examination revealed no palpable nodule or lymphadenopathy in the head and neck area or elsewhere. A head and neck computed tomographic scan was ordered and revealed no evidence of acute injury or fracture to the cervical spine. However, an incidental 1.5-cm mass was noted in the right parotid gland. The follow-up magnetic resonance imaging (MRI) showed a contrast-enhancing, well-defined homogeneous mass confined within the deep lobe of the right parotid gland and measuring 1.5 × 1.4 × 1.0 cm (Fig. 1A). No other masses or enlarged lymph nodes were noted. The patient was referred to the fine-needle aspiration (FNA) clinic for an ultrasound-guided (USFNA) of this right parotid mass.

Ultrasound Findings

In FNA clinic, the patient reported a vague tingling in the right side of her face. On physical examination, no palpable mass was identified. Ultrasound examination with the probe placed medially along the mandible pointing toward the base of skull revealed a hypoechoic, rounded, well-circumscribed 1.8 × 1.4 × 1.2-cm mass with associated distal acoustic enhancement. The mass was located deep to the retromandibular vein and hence in the deep lobe. No heterogeneity, calcification, or cystic changes were noted (Fig. 1B).

Aspiration Biopsy Procedure and Technique

In preparation for FNA, the patient was placed in the supine position with a soft pillow placed behind her hyperextended neck. Coupling gel was applied to the transducer face, and the transducer was then enclosed in a clean sheath to avoid contamination with blood. The area was prepped with alcohol. A small amount of sterile coupling gel was applied to the covered transducer (Figs. 1B and C inset). After application of lidocaine with a 30-gauge needle along the planned route of the sampling needle, under ultrasound visualization, a 1.5-in. 23-gauge standard long-beveled needle was placed in the mass by tangential approach with good visualization of the tip of the needle inside the target (Fig. 1C). Suction was applied with a 3-mL Slip-Tip syringe without an aspiration gun. An FNA sample was collected by repeated back and forward movement of the needle inside the target area, and one of several direct smears was examined for adequacy. The immediate microscopic examination for adequacy, done on an alcohol-fixed smear stained with toluidine blue, showed moderately cellular material with features consistent with a pleomorphic adenoma.[1] No further samples were collected, and no complications were observed in the patient. The smear initially used for immediate evaluation for adequacy was replaced in alcohol fixative after microscopic review, allowing the toluidine stain to dissolve. The smear was subsequently stained with Papanicolaou (Pap) stain and kept as a permanent part of the specimen.

Cytological and Histological Findings

The preliminary diagnosis of a pleomorphic adenoma was confirmed on final examination of smears stained with Pap and May Grunewald Giemsa (MGG) stains. The smears were moderately cellular, consisting of clusters of epithelial cells in a background of singly dispersed myoepithelial cells admixed with chondromyxoid stroma on Pap-stained direct smear (Fig. 1D). The stroma showed the characteristic magenta colored "metachromatic" stroma of pleomorphic adenoma on MGG stain (Fig. 1E). The patient underwent a parotidectomy. On histological examination, the tumor was composed of a well-delineated epithelial component with myxochondromatous stroma (Fig 1F).

Discussion and Teaching Points

Pleomorphic adenoma is the most common tumor overall in the salivary glands and is by far the most common tumor in the parotid gland. It is a benign slow-growing tumor and usually forms a single mobile, well-defined mass that is hypoechoic on US imaging. An isolated well-defined mass with lobulation and delayed enhancement is characteristic for a pleomorphic adenoma on MRI.[2] The most common location is the lower pole of superficial lobe of the parotid gland. Rarely, the mass is located in the deep lobe of parotid. Small tumors in the deep lobe are typically nonpalpable, found incidentally and impossible to perform biopsy on without image guidance. Because these tumors enlarge over time, they may become clinically apparent, causing a sensation of fullness in the neck, and may be visible and accessible to FNA without image guidance as a bulging parapharyngeal mass on oral examination.

On cytological examination, a pleomorphic adenoma shows 3 distinct components as follows: epithelial polygonal cells, myoepithelial spindly cells, and chondromyxoid matrix. Epithelial cells are often present as clusters in a honeycomb pattern. Myoepithelial cells are usually singly dispersed and show a variety of appearances including spindled-shaped, clear, epithelioid and plasmacytoid.

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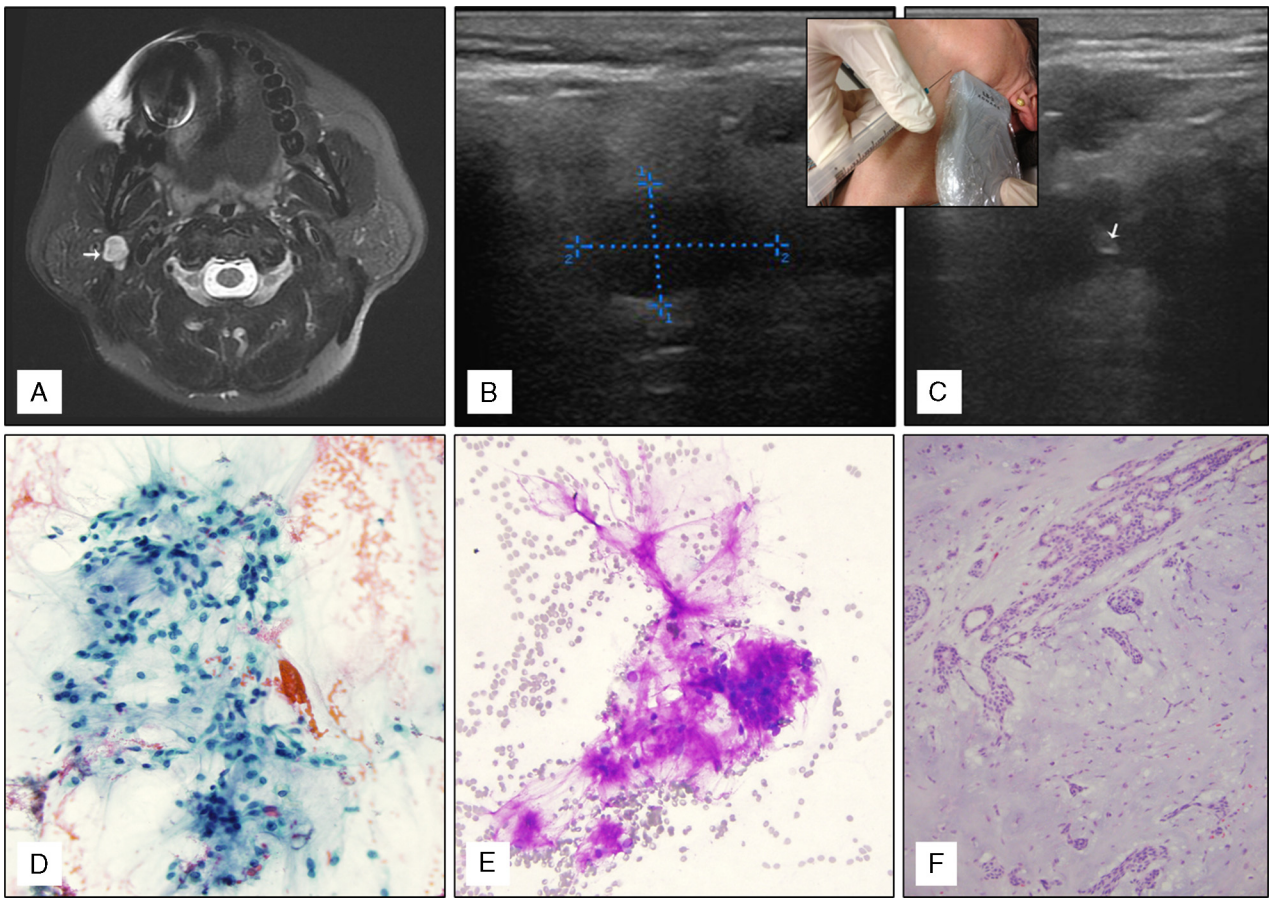

FIGURE 1. A, Pleomorphic adenoma, contrast-enhanced MRI. A well-demarcated mass (arrow) is present in the deep lobe of the right parotid gland that shows enhancement with contrast. B, Pleomorphic adenoma, ultrasound of parotid gland. The rounded and hypoechoic mass is located in the deep lobe of parotid gland. C, Pleomorphic adenoma, USFNA. The needle was placed in the parotid mass by tangential approach (inset image). The needle tip (arrow) is visualized within the mass. D, Pleomorphic adenoma, cytomorphology. Pale staining stroma with myoepithelial cells and epithelial cells (Pap stain). E, Pleomorphic adenoma, cytomorphology magenta matrix is highlighted in air-dried preparation (MGG stain). F, Pleomorphic adenoma, histology, Myxochondroid zone with variable prominence of epithelial structures (hematoxylin and eosin).

The consistent distinction of epithelial and myoepithelial cells, largely an academic exercise without clinical importance in this setting, is generally not feasible without the use of special stains. The matrix material is the most characteristic finding. It has fibrillary/chondromyxoid characteristics and stains pale blue/gray in Pap-stained preparations and magenta in MGG-stained air-dried smears (Figs. 1D–E). Tyrosine crystals are seen in rare cases.[3] Although pleomorphic adenomas are benign tumors, recurrences and rare malignant transformation (carcinoma expleomorphic adenoma) can be seen. The type of carcinoma arising in a pleomorphic adenoma varies and includes mucoepidermoid carcinoma, epithelial-myoepithelial carcinoma, adenoid cystic carcinoma, and poorly differentiated carcinoma.[4–6] The rate of recurrence and malignant transformation appears to increase over time.[7–9] Complete resection of the tumor with negative margins is important and greatly reduces the risk of recurrence.[10,11]

CASE 2

A 77-year-old man presented to an outside clinic for a slowly growing left posterior shoulder mass. The mass was palpable, but the finding was subtle, and the mass not well defined. The patient denied any pain or tenderness. An MRI was performed, which showed an enhancing, ill-defined 4.8 × 4.3 × 2.6-cm mass, deep and medial to the upper subscapularis muscle (Fig. 2A). Owing to the poorly defined nature of the mass on MRI, there was significant concern about a malignant process. The patient was referred to FNA clinic for sampling, and because of the ill-defined nature of the mass and relatively deep location, US guidance was used.

Ultrasound Findings

On ultrasound examination, an ill-defined heterogeneous mass was identified located 1.9 cm from the skin surface (Fig. 2B). The patient was in a sitting position sideways on an examination table, back exposed, with the operator standing behind the patient and with the ultrasound screen mounted on the wall in front of the patient. This arrangement allowed the operator to see the screen without having to turn away from the field of operation. Coupling gel was applied to the transducer face, and the transducer was then enclosed in a clean sheath to avoid contamination with blood. The area was prepped with alcohol. A sparing amount of sterile coupling gel was applied to the covered transducer. After application of lidocaine with a 30-gauge needle subcutaneously and along the planned route

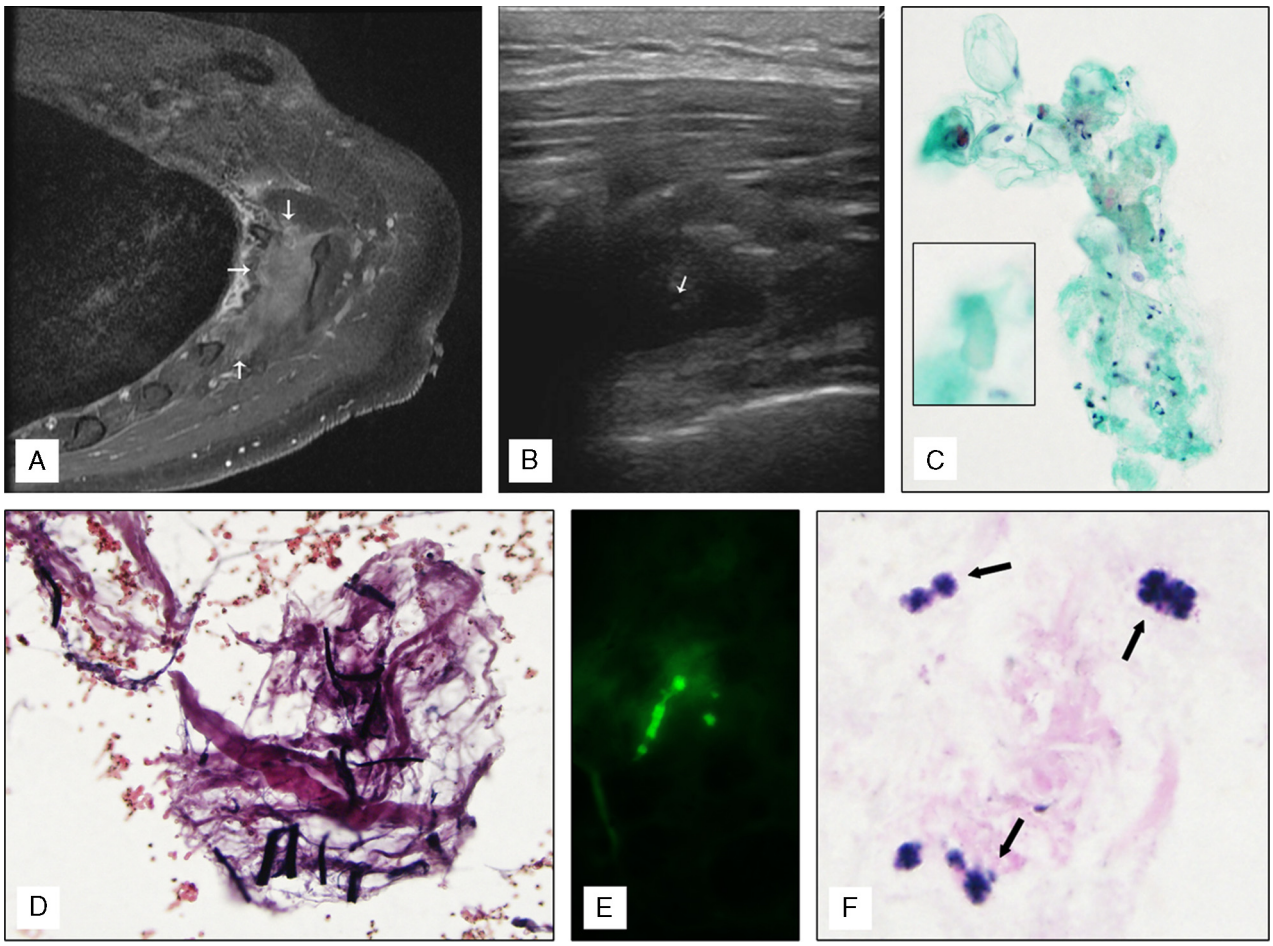

FIGURE 2. A, Elastofibroma, MRI. An ill-defined enhancing mass (arrows) is located deep to the upper subscapularis muscle. B, Elastofibroma, ultrasound. An ill-defined hypoechoic mass located 1.9 cm deep to the surface of skin. The needle tip, placed using the perpendicular approach, is visualized within the lesion (arrow). C, Elastofibroma, cytomorphology. Cohesive tissue fragments dominated by prominent dense, wavy connective tissue with widely spaced small bland spindle-shaped cells (Pap stain). Some rod-like structures are present (inset). D, Elastofibroma, aspirate smear. Elastin Verhoff Van Gieson stain shows black wavy elastic fibers. E, Elastofibroma, aspirate smear. Green autofluorescence of elastic fibers is seen. F, Elastofibroma, aspirate smear. Elastin Verhoff Van Gieson stain highlights the elastic microfibrils with serrated borders (petaloid globules) (arrows).

of the sampling needle, a 1.5-in. 23-gauge long beveled needle was placed in the mass by perpendicular approach with visualization of the needle tip within the target area (Fig 2B). Suction was applied with a 3-mL Slip-Tip syringe without a syringe holder. The FNA samples were procured with standard back-and-forth motion of the needle inside the target, and direct smears were prepared, and material for cell block was submitted. A representative smear from the initial sample was stained with toluidine blue and examined for adequacy. The sample used for adequacy evaluation showed clusters of small, bland-appearing spindle cells associated with scant stromal material. The smear used for adequacy evaluation was subsequently replaced in an alcohol solution and used for Pap stain. Two samples were collected in toto with most of the second sample allocated for cell block.

Cytological Findings

On microscopic examination, the smears showed scant to focally moderate cellularity, and the material consisted of cohesive tissue fragments dominated by prominent dense, wavy and focally nodular connective tissue with widely spaced small bland spindle-shaped nuclei (Fig. 2C). Because the cell block was hypocellular and the working diagnosis was that of an elastofibroma, based on the morphological findings on the smears combined with the clinical/imaging presentation of a poorly defined soft tissue mass near the scapula, Elastin Verhoff Van Gieson (EVG) staining, was performed on the smear with the most abundant material. The EVG stain was applied directly onto the previously Pap stained slide and revealed fragments of tissue with many prominent elastin fibers, showing the characteristic and striking black appearance (Fig. 2D). Based on these findings, the diagnosis of elastofibroma was made. The patient opted for clinical follow-up, and no surgery was necessary.

Discussion and Teaching Points

Elastofibroma is a tumor-like process that usually occurs in the soft tissues of the shoulder. The primary location of this lesion

is most commonly in the soft tissue between the lower scapula and chest wall, deep to the rhomboid major and latissimus dorsi muscles.[12] However, other locations, including the location seen in this patient, have been reported as well. Elastofibroma originally was considered a rare entity; however, several autopsy studies have reported a prevalence of approximately 17%.[13] It primarily affects individuals older than 50 years with a peak incidence during the sixth and seventh decades of life.[14] There is a female predominance, and elastofibroma is only very rarely is seen in children.[15]

Different theories about the etiology of this entity have been suggested. Some researchers suggest that elastofibroma is derived from elastic degeneration of collagen fibers; others believe they arise from degeneration of preexisting elastic fibers.[16,17] There are also reports of a genetic predisposition.[18]

Computed tomography and MRI usually show a poorly circumscribed heterogeneous mass, approximately isodense with skeletal muscle, but which in addition contains areas with signal intensity similar to that of fat.[15] On ultrasound, the tumor usually shows an ill-defined heterogeneous mass similar to muscular tissue but with a slightly more disorganized pattern. The areas with fibrotic stroma are hyperechoic, whereas the areas of fat show hypoechoic linear striae.[19]

On cytological examination, characteristic gray linear, fairly coarse elastic fibers with associated spherical globules (approximately 12 nm in diameter) are seen. By ultraviolet microscopy, these elastic fibers show autofluorescence (Fig. 2E).[20,21] EVG stain highlights the compactly and randomly arranged elastic microfibrils with serrated borders (petaloid globules) (Fig. 2F).

These lesions can be mistaken clinically as well as by cytological examination for a deep-seated lipoma or an elastofibrolipoma. Imaging studies can be helpful in the differential diagnosis because lipomas show a well-circumscribed border in contrast with the ill-defined outline of elastofibroma. Elastofibroma is a benign lesion. The treatment of choice historically has been conservative excision, and local recurrence is very rare. There are no reports of malignant transformation. With FNA diagnosis, particularly when confirmed with EVG staining or autofluorescence, patients can be followed up clinically. Radical excision should be avoided owing to frequent symptomatic postresection hematoma.[22]

Summary

Both of these cases illustrate how USFNA, with minimal morbidity limited to transient mild, local tenderness associated with limited bleeding, can provide very useful, timely, and cost-effective information, guiding clinical management. In case 1, a computed tomographic scan revealed a relatively small, subclinical, incidental mass in the deep lobe of the parotid gland. This finding in a very elderly patient or a patient with serious comorbidities significantly impacts surgical risk and may lead to a decision to forgo surgery. In a younger patient with low surgical risk, as in our case, surgery can be planned without urgency at a convenient time for all parties. However, this type of decision requires excluding a malignant process that would require urgent surgery, even if significant comorbidities exist.

In case 2, an elderly patient presented with minimal clinical symptoms consisting of a barely palpable mass in the shoulder area. An MRI scan was obtained, and because of the imaging characteristics, serious concerns about a malignant process were raised. The patient and his family became very anxious as a result of being told about the differential diagnosis of sarcoma versus metastatic carcinoma based on imaging findings. Notably, the patient had no history of malignancy. Being able to provide a timely USFNA evaluation of this mass greatly relieved the anxiety. Based on the initial evaluation for adequacy, the patient was assured that this mass did not appear to represent a metastatic cancer or a high-grade sarcoma. Subsequently, after EVG staining confirmed the diagnosis of a benign elastofibroma, the patient was able to opt for clinical follow-up rather than surgical resection. It was judged in our institution that surgical resection in this case would have required the involvement of a general surgeon well versed in soft tissue resections as well as a thoracic surgeon owing to the close association of the lesion with the chest wall. Surgery would have required significant recovery time. As a result of the benign USFNA diagnosis, this patient was able to go on a planned, much-looked-forward-to vacation trip, instead of a trip to the operating room. In addition, unnecessary pain and possible morbidity associated with surgical resection for diagnostic purposes were avoided. The use of USFNA also allowed significant cost savings in this case.

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