Fine-Needle Aspiration Cytology of Ganglion Cysts
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Ganglion cyst is a relatively common lesion resulting from mucoid, cystic degeneration of soft tissues adjacent to a joint space. Aspiration of cyst contents has been increasingly advocated as a diagnostic and, in some instances, therapeutic modality. We report the fine-needle aspiration cytologic (FNAC) findings from seven cases of ganglion cyst. These include the aspiration of thick, gelatinous fluid and a smear comprised of rare histiocytes embedded in a mucoid matrix. Although these findings are nonspecific, we believe that in the appropriate clinical setting, the diagnosis of ganglion cyst can be made with confidence by FNA. Diagn Cytopathol 1996;15:377-381. © 1996 Wiley-Liss, Inc.

Key Words: Fine-needle aspiration; Ganglion cyst; Synovial cyst

Ganglion cyst, also known as synovial cyst or ganglion, is a thick-walled cyst characteristically filled with gelatinous fluid. They occur most frequently in the soft tissues in the region of the wrist, dorsum of foot, or knee. Although typically associated with joint spaces, they can occasionally erode adjacent bone to become intraosseus lesions4-10 or develop within a nerve.4 Ganglia produce firm, circumscribed masses which in themselves are harmless. However, patients often request their removal because they can be unsightly or occasionally painful due to compression of an adjacent nerve.5,6

Previously, surgery has been the mainstay of therapy for ganglion cyst. However, aspiration has been increasingly advocated as a diagnostic and, in some instances, therapeutic procedure.7,8 Despite the gaining popularity of aspiration, little has been reported of the cytologic characteristics of ganglia. Thus far, the fine-needle aspiration (FNA) findings have been described only briefly.9 In the following, we report and illustrate the FNA findings from seven cases of ganglion cyst. We also discuss the differential diagnosis of myxoid lesions which may simulate this entity either clinically or cytologically.

Materials and Methods
Between 1993 and 1994 seven cases of ganglion cyst were diagnosed by FNA at Duke University Medical Center (DUMC). All cases but one were from previously undiagnosed lesions. The patients in this series were followed at DUMC after treatment for evidence of recurrence. After identifying the patients to be included in the study, the pathology archives were checked for previous material relating to the patients' current lesions.

In all instances, the aspiration was performed by a cytopathologist. No anesthesia was required. The skin overlying the mass was cleansed with alcohol. Aspiration was performed with a 22 gauge needle attached to a 10 ml syringe and holder. Material from the cyst was withdrawn into the needle and syringe and expelled onto glass slides. In some instances, material remaining in the needle and syringe was rinsed out in either formalin or a saline solution and a cell block or cytospin was prepared from the rinse. In every case, the aspiration procedure was repeated until a mass was no longer palpable.

Direct smears were prepared by the aspiration cytopathologist immediately after each aspiration or "pass." Material was submitted for both ethanol fixation and air-dried interpretation. Fixed material was stained with either hematoxylin-eosin (H&E) or Papanicolaou stain. Air-dried smears were stained with Diff-Quik® (Baxter, McGaw Park, IL) solution for immediate interpretation.

Results
Clinical information for each patient in this series is summarized in Table I. Follow-up information was available for a minimum period of 3 mo. Follow-up excision of the cyst in one case (patient 2) revealed residual mucin on histopathologic examination, indicating either incomplete aspiration of the cyst or re-accumulation of cyst contents. One patient was subjected to aspiration after a recurrence following surgical resection of the lesion 4 mo previously. Of the seven patients in this series treated by aspiration, one recurred and required subsequent surgical excision of the ganglion.

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Table I. Patient Information

<table>
<thead>
<tr>
<th>Patient no.</th>
<th>Age (yr)/sex</th>
<th>Site</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>76/F</td>
<td>Dorsum of foot</td>
<td>No further treatment</td>
</tr>
<tr>
<td>2</td>
<td>43/M</td>
<td>Posterior calf/knee</td>
<td>Lesion excised surgically</td>
</tr>
<tr>
<td>3</td>
<td>47/F</td>
<td>Antecubital fossa</td>
<td>No further treatment</td>
</tr>
<tr>
<td>4</td>
<td>50/M</td>
<td>Wrist</td>
<td>No further treatment</td>
</tr>
<tr>
<td>5</td>
<td>21/M</td>
<td>Ankle</td>
<td>Had been previously removed, recurrence treated with aspiration, no additional treatment required</td>
</tr>
<tr>
<td>6</td>
<td>36/M</td>
<td>Wrist</td>
<td>No further treatment</td>
</tr>
<tr>
<td>7</td>
<td>33/M</td>
<td>Infrapatellar region/knee</td>
<td>No further treatment</td>
</tr>
</tbody>
</table>

The most characteristic feature of the aspirates was the recovery of a thick, clear, viscous fluid in the aspiration syringe. On all initial aspirations, this fluid was colorless. Occasionally on subsequent “passes” with the needle, a small amount of pink discoloration due to blood contamination was observed. In all instances, the total volume of material recovered from the cyst was 0.5–2.0 cc.

The thick mucoid material stained a bright magenta color on the Diff-Quik stain and a dark green blue on the Papanicolaou stain. Examination of the aspirate under low power magnification revealed mucoid substance which displayed a folding pattern reminiscent of crinkled plastic food wrap (Fig. 1). In the background, visible under higher magnification, was a large amount of fine, granular debris.

Smears prepared from the aspirates from each patient were consistent in cytologic characteristics. First, they were uniformly paucicellular. The cellular constituents consisted exclusively of rare histiocytes and occasional anucleate squames (Fig. 2). The histiocytes were characterized by abundant bubbly cytoplasm and oval- or bean-shaped nuclei. The occasional squamous cells noted had orangophylic cytoplasm (on Papanicolaou stain) and small pyknotic nuclei. The squames were felt to be best regarded as a probable skin contaminant which appeared prominent because of the hypocellularity of the aspirates.

Histologic examination of the ganglion cyst from a patient who underwent previous resection revealed empty, well-formed cystic spaces within a dense fibrous tissue (Fig. 3). The spaces were partially filled with blue staining myxoid material. A cyst lining was not apparent.

Discussion

The origin of ganglion cysts is somewhat obscure and numerous theories as to their pathogenesis have been proposed including degenerative, metaplastic, and neoplastic etiologies. The current most widely held belief is that a ganglion cyst develops as a degenerative phenomenon of either fibrous joint or synovial tissue. Occasionally there is a history of antecedent trauma, but there do not appear to be any other causative or predisposing factors. Histologically, the le-

![Fig. 1. Low power photomicrograph illustrating bending and folding of the thick mucoid background material. Embedded in the mucoid matrix are scattered, isolated macrophages (Diff-Quik, x40).](image-url)
Fig. 2. High power photomicrograph of a smear prepared from an aspirate of a ganglion cyst showing cellular constituents: single macrophages and pyknotic squames (Diff-Quik, x400).

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A ganglion cyst appears most characteristically as a fibrous walled cyst, lacking a distinct cell lining. Demonstration of cyst communication with the adjacent joint space in some ganglia supports the theory that they are degenerative rather than neoplastic lesions.

Treatment options for ganglia are variable and include both surgical and nonsurgical alternatives. Methods of nonsurgical treatment range from bursting of the ganglion with a sharp blow by a book to aspiration and instillation of the site with steroid. Recurrence rates of 50% have been reported with nonsurgical treatment of ganglia, including aspiration. Surgical excision under general anesthesia has been advocated by some as the best option because a complete operative excision is the best means of preventing recurrence. However, a significant rate of recurrence, up to 34%, is associated with surgery as well. Recurrences are most likely to occur soon after treatment, within the first 3 mo.

Aspiration of the ganglion cyst contents is becoming increasingly popular and accepted as both a diagnostic and therapeutic modality. Even deep-seated, nonpalpable lesions can be subjected to FNA with appropriate radiographic assistance. The advantages of aspiration over surgical alternatives for treatment include decreased cost and morbidity and elimination of the disability and time loss associated with recovery from surgery. The benefits so far outweigh the risks of surgical intervention that FNA has been proposed by some as the primary therapeutic modality, with surgery reserved only for recurrent or persistent lesions.

On clinical examination and FNA, the differential diagnosis of this lesion should be limited. Myxoid material is associated with the myxoid variant of liposarcoma, myxoid malignant fibrous histiocytoma (myxofibrosarcoma), and myxoma. Any of these entities could potentially be a source of confusion as they may be located in soft tissue, occasionally in proximity to a joint space. However, they are less likely to present as firm, circumscribed masses and more likely to be deep seated as opposed to the usually superficial location of ganglia.

On FNA, both of these neoplasms characteristically show modestly cellular smears comprised of spindle or stellate cells in a myxoid matrix. The myxoid variant of liposarcoma (Fig. 4) will additionally show delicate branching vessels and fragments of loose stroma. Lipoblasts, helpful in the cytologic diagnosis of myxoid liposarcoma, need not necessarily be present in FNA smears. Aspirates of low grade malignant fibrous histiocytoma (myxofibrosarcoma) are similarly characterized by vascular elements as well as atypical ovoid or spindled cells. Aspirates from myxomas, like ganglion aspirates, are paucicellular and are characterized by abundant myxoid substance. Unlike the latter, the myxoma smears contain rare spindled or stellate cells.

Another lesion which enters into the differential of a mass lesion of the distal extremity (finger) is the digital mucinous cyst. Histologically, these consist of clefts or cystic spaces filled with mucin. In the distal interphalangeal joint, these occur due to herniation of joint lining. Although they are clinically a separate lesion, the proposed etiology of the digital mucous cyst has led some to believe that a portion of these lesions, at least those associated with joint spaces, represent ganglia. We are unaware of any reports of the FNAC findings from this lesion.

In the popliteal region, Baker's cyst, also known as synovial cyst, enters in the differential diagnosis of a soft-tissue mass. This lesion differs from ganglion cyst in that it contains an inner cell lining layer derived from synovium. Again, we are unaware of published reports describing the FNA findings of Baker's cyst.

The FNA findings reported here and previously support the concept of ganglion cyst as a benign, degenerative phenomenon. We found a consistent set of features that, while distinctive, are in themselves relatively nonspecific. These include the recovery of a large amount of clear, gelatinous fluid.
and the cytologic findings of rare macrophages in a thick, mucoid matrix.

We have found that the FNAC findings of ganglion cyst, while nonspecific, are nevertheless very reliable in confirming this diagnosis. The clinical findings of a superficial, circumscribed firm lesion in proximity to a joint and the recovery of clear, gelatinous fluid are characteristic of ganglion cyst. In this setting, the diagnosis of ganglion cyst can be made with confidence despite the lack of specific FNAC findings.
FNAC OF GANGLION CYSTS


![Fig. 5. FNA of myxoma showing abundant myxoid background material similar to that seen in aspirates of ganglion. However, myxomas contain small stellate or spindled cells (Diff-Quik, x100).](image)

References


