Fine-Needle Aspiration Biopsy of Chondromyxoid Fibroma
An Investigation of Four Cases
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Abstract

We describe the cytologic features of chondromyxoid fibroma in fine-needle aspiration biopsy specimens in 4 patients. We analyzed rapid Romanowsky- and Papanicolaou-stained slides with a respect to overall cellularity, the presence of hypercellular chondromyxoid fragments (HCFs), nuclear atypia, cytoplasmic features, and the presence of giant cells.

The most consistent and diagnostically useful feature was the presence of HCFs, which were present in all 4 cases. Mild to moderate nuclear atypia was additionally present in all 4 cases. Most cases were hypocellular (3/4). Giant cells were present in 2 cases, with 1 case exhibiting a hypercellular smear with numerous giant cells. All 4 cases were confirmed in subsequent histologic biopsy material. Strict attention to clinical, radiographic, and cytologic features, especially the presence of HCFs, can aid in the specific diagnosis of chondromyxoid fibroma on FNAB.

Materials and Methods

Rapid Romanowsky- and Papanicolaou-stained smears from 4 cases of CMF on FNAB specimens were selected from a review of our files. The cases were analyzed with respect to overall cellularity, presence of hypercellular chondromyxoid fragments (HCFs), nuclear atypia, cytoplasmic features, and the presence of giant cells. We define HCFs as small chondromyxoid mesenchymal masses in which variable numbers of benign-appearing, elongated, and stellate contoured stromal cells are present. In addition, clinical and radiographic features were reviewed.

Results

Table II shows the clinical, radiographic, and cytologic features of the 4 cases.
Clinical Features

The patients ranged in age from 15 to 56 years (mean age, 38.5 years) with an equal sex distribution. The involved sites were the metaphysis of the left proximal fibula, left distal humerus, left proximal fibula, and left proximal ischium.

Radiographic Features

In all 4 patients, radiographic studies revealed a well-delineated, expansile, lytic bone lesion that ranged in maximal size from 1.5 to 6.0 cm (mean, 3.7 cm).

Cytologic Features

The majority of cases exhibited low smear cellularity (3/4), mild to moderate degrees of nuclear atypia (4/4), and moderate volumes of foamy cytoplasm (4/4). Diagnostic HCFs were present in all 4 cases. Giant cells were present in 2 of 4 cases) and were numerous in 1 specimen Image 11, Image 21, and Image 31. The most reliable and consistent diagnostic cytomorphic feature was the presence of HCFs. HCFs consisted of stellate to spindle-shaped cells embedded in a metachromatic chondromyxoid stroma that was brightly stained with rapid Romanowsky. With the Papanicolaou stain, this appeared as a rather pale green substance. No true hyaline cartilaginous fragments with cells in lacunae were observed. All 4 cases were confirmed on subsequent histologic biopsy material that showed a lobulated architecture consisting of an admixture of immature cartilage, fibrous tissue, and stellate cells in a chondromyxoid stroma (Images 1-3). We believe the HCFs are derived from this last tissue component.

Discussion

Although a number of studies of FNAB specimens from malignant bone neoplasms have been published, only a few reports have described in detail the cytologic features of benign chondroid neoplasms. Our study confirms the FNAB findings of CMF previously reported but, in addition, provides a comparison of the cytologic attributes in a series of 4 cases. As only 1 case showed high smear cellularity, most exhibited low cellularity, representing a potential pitfall in underdiagnosis. HCFs were the most reliable cytologic feature present for the diagnosis of CMF in FNAB specimens compared with other studies. Careful attention to the clinical, radiographic, and cytologic features, especially the presence of HCFs, permitted the diagnosis of CMF in all 4 cases, which was subsequently confirmed on histologic material.

The differential diagnosis of CMF in FNAB specimens includes chondroblastoma, giant cell tumor, enchondroma, and low-grade chondrosarcoma. True lacunar spaces with chondrocytes are present in enchondroma and chondrosarcoma; however, they are much less often found in CMF. Chondroblastomas contain a more uniform population of mononuclear cells with round to ovoid nuclei and nuclear grooves compared with a more polymorphous population of stellate, ovoid, and spindle cells (HCFs) found in CMF. Chondromyxoid matrix is also more commonly found in CMF compared with chondroblastomas. Nevertheless, there can be considerable overlapping cytomorphic features, which may make it difficult to distinguish between these 2 entities. While nuclear pleomorphism can occur in CMF, the pleomorphic cells are more apt to have a more smudged,
condensed chromatin lacking the more primitive nuclear chromatin with prominent nucleoli and nuclear irregularity characteristic of high-grade chondrosarcoma. Although giant cells may commonly occur in CMF, they were numerous in only 1 of 4 cases in our series. Furthermore, giant cells are found in both neoplasms and are generally not helpful in distinguishing them. The epiphyseal location of chondroblastoma is usually not the case for CMF, showing the importance of totally incorporating the clinical and radiologic data into final diagnoses. The epiphyseal location of chondroblastoma is not the case for CMF. The potential pitfall of chondrosarcoma mistaken for CMF on cytologic examination, as well as on histologic examination, has been reported.\textsuperscript{12,13}

Immunohistochemical analysis is generally not useful in distinguishing CMF from these other entities; however, recent studies have demonstrated a chromosomal abnormality [inv(6)(p25q13) pericentromeric inversion] that is a useful marker for chondromyxoid fibroma.\textsuperscript{14}

**Image 1** (Case 1) **A**, Fine-needle aspiration biopsy (FNAB) specimen in chondromyxoid fibroma (CMF). Hypercellular chondromyxoid fragments containing ovoid cells with smudged nuclear features in a chondromyxoid stroma (rapid Romanowsky, ×40). **B**, FNAB specimen in CMF. Highly cellular smear containing many mononuclear cells with smudged condensed chromatin and associated cytoplasm having a stellate, polygonal, or spindle shape (Papanicolaou, ×20). Note the multinucleated giant cells (inset, Papanicolaou, ×20). **C**, Low-power view of corresponding biopsy specimen showing characteristic histologic features of CMF with a distinctive lobular configuration. There are extensive myxomatous and chondroid areas with condensation of the stromal cells toward the periphery (H&E, ×4). **D**, High-power view of biopsy specimen showing the central chondromyxoid portions of the lobules containing spindle-shaped or stellate cells with bland nuclear features (H&E, ×40).
In the proper clinical and radiographic setting, the finding in hypocellular aspiration smears of HCFs may lead to the current diagnostic interpretation of CMF. This will permit an orthopedic surgeon to proceed to the operating room with confidence that a benign lesion with a low tendency for recurrence will be excised.

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References


