NON-OSTEOGENIC FIBROMA OF BONE *

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Not infrequently, one encounters in bone a lesion which we conceive as a benign marrow-connective-tissue tumor and which, because the basic tissue does not undergo osseous metaplasia in the course of the lesion's development, we are calling "non-osteogenic fibroma of bone." Its usual site is the shaft of some long bone (generally one of a lower limb) not far from an epiphyseal cartilage plate, and the lesion does not necessarily traverse the entire diameter of the bone in the affected area. Grossly, the lesion appears as a single focus or a group of smaller adjacent foci of yellowish or brownish fibrous tissue. Histologically, its essential pattern is composed of whorled bundles of spindle-shaped, connective-tissue cells loosely interspersed with small multinuclear giant cells, but in many places within a lesion collections of foam cells may be seen, along with other variations in histologic detail.

The lesion in question has previously been interpreted in a good many different ways; for instance, as "giant-cell variant of bone cyst or osteitis fibrosa," "healing variant of giant-cell tumor," "xanthic variant of giant-cell tumor," "solitary xanthoma or xanthogranuloma of bone" (usually implying a limited expression of Hand-Schiüler-Christian's disease), and "fibrous osteomyelitis." It is the purpose of this presentation (founded on the observation of ten cases) to define and interpret "non-osteogenic fibroma of bone" as a clear-cut entity deserving recognition as such on the basis not only of its pathology but also of its clinical and roentgenographic manifestations. Although the term "fibroma of bone" does appear here and there in the literature, the case reports under that heading which we have studied have consistently been found to relate to a lesion having, as basic elements, both osseous and connective tissue, instead of to a connective-tissue lesion specifically not containing osseous elements. These fibro-osseous lesions most often represent the so-called "ossifying fibroma" or "fibrous osteoma" of bone, though some of them apparently represent solitary expressions of a dysplastic connective-tissue lesion of bone which we would call "fibrous dysplasia"—a lesion likewise not corresponding to "non-osteogenic fibroma."

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CLINICAL ASPECTS

Age and Sex Incidence and Localization

In respect to age, our ten subjects ranged between 6 and 21 years, and all but two were between 8 and 16 years. As to sex, there was an even distribution of the cases. In regard to localization, in all ten the lesion was in a long tubular bone. Specifically, it was in a tibia in four patients, a fibula in four, a femur in one and an ulna in one, thus involving a long bone of a lower limb in all but one case. Within the particular bone affected, the lesion was always in the shaft, and almost always limited to the upper or lower third. However, there was always an inch or two, though seldom much more, of unaffected shaft between the lesion and the nearer epiphyseal cartilage plate (Figs. 1 to 6).

It is difficult to make a direct comparison, in respect to incidence and localization, between the findings in our cases of non-osteogenic fibroma of bone and the findings in apparently similar cases from the literature as reported under other names. This is so because the data supplied often do not permit one to sort out confidently all the pertinent cases from among others that are usually described along with them. Nevertheless, even against the obscure background of the general literature and the confusion of classification, the predilection of the lesion in the apparently relevant cases for older children and adolescents and for the shafts of long bones near but not at the epiphyses stands out. Though our records do not include any instances of non-osteogenic fibroma of bone in other than long tubular bones, there is reason to suspect that the lesion does occasionally appear also in other bones.

Clinical Findings

In most of our cases, the complaints were of only a few weeks' or months' duration before admission to the hospital, although this does not mean that the lesion itself was not of longer standing. It is probable that the lesion is one which progresses very inconspicuously and may lie dormant for some time before attention is drawn to it. About half of the patients reported their difficulty as beginning with some trauma of moderate severity to the general region in which the bone lesion was subsequently discovered. Thus, after a sprain, kick, or fall these patients suffered from pain and swelling of an ankle, knee, or wrist. In these cases, palpation revealed a point of bone tenderness and sometimes even of bone swelling, and when a roentgenogram was made the lesion was discovered. Most of the other patients, while giving
no history of trauma, likewise had pain and swelling of a joint, not of long standing, as their chief complaint. In these cases, too, it was only the roentgenogram that directed attention to the lesion in one of the bones entering into the formation of the joint which was the focus of complaint. In one of the cases in which the lesion was in the tibia, this lesion was discovered incidentally to roentgenographic examination of the femur for an osteogenic sarcoma. Altogether, there is nothing distinctive or characteristic about the clinical findings in cases of non-osteogenic fibroma of bone, so that one is dependent upon the roentgenogram for even a presumptive diagnosis.

Roentgenographic Findings

The usual location of the lesion in the upper or lower third of a long bone shaft at some distance from the nearer epiphyseal cartilage plate has already been emphasized. In this connection, it should also be noted that often the lesion does not extend across the entire diameter of the affected shaft area. It failed to do this in the four cases in which it was in a tibia and the one in which it was in a femur. It did do so in the four cases in which it was in a fibula and the one in which it was in an ulna. Thus, whether it does or does not extend all the way across the diameter of the bone depends upon the width of the shaft in the affected area, the lesion tending to be rather small and consistently being longer than it is wide. When it extended all the way across the shaft, the latter was found bulged out, uniformly or at least on one side. Even without reaching all the way across, it also occasionally bulged out the shaft in one place. Furthermore, when this was not the case, the lesion was still eccentric, that is, it hugged the cortex on one side (Figs. 1 to 6).

In the fibula and ulna (that is, in the cases in which the fibroma extended across the width of the shaft and expanded it somewhat) the lesion was usually about 3.8 cm. in length. It appeared as a more or less subdivided area of rarefaction, showing confluent or distinct locules. Some of the thin dividing "partitions" which it presented cast rather dense shadows. The cortex delimiting the area as a whole tended to be thinned and expanded over much of its scope, but still cast a clear-cut shadow. In a case showing a transverse infraction line, the cortex on the side of the infraction was found thickened by new bone apposition. Like the lesions extending across the width of the shaft, the eccentric lesions (those in the tibia and femur) were usually also not more than 3.8 cm. in length and less than this in width. When they did not expand the cortex upon which they abutted, this cortex was sometimes found sclerosed. Toward the medullary side, the lesion
was outlined by an encapsulating shell, usually rather thin but casting a dense shadow, and, as a rule, one or more "partitioning" shadows traversed the lesion irregularly.

Even from the roentgenogram alone one can often make the correct diagnosis. Certainly a small, eccentric, loculated lesion found abutting on the cortex of the shaft of a long bone, outlined by an encapsulating shell of bone on the medullary side, and not associated with notable thickening of the cortex, is most probably a non-osteogenic fibroma. So also (though a little less surely) is a small lesion located in, and expanding, the shaft of a fibula or ulna and appearing as a loculated area of rarefaction, although it should be borne in mind that such an area occasionally represents a solitary unicameral bone cyst. However, in any event, the definitive diagnosis must rest upon pathologic examination of the tissue occupying the affected shaft region.

**Treatment**

Non-osteogenic fibroma of bone is readily amenable to treatment. The cases discussed in this paper were all treated surgically, the procedure in most cases being thorough curettement of the lesion. In three cases in which the lesion was in the fibula, subperiosteal resection of the affected part of the bone was done. This seemed the easiest way of completely eradicating the focus of the disease in these particular cases, though, even in slender long bones, resection may not always be necessary. There were no recurrences. None of the patients received postoperative radiation therapy. Whether the lesion would be amenable to radiation therapy alone (that is, without surgical intervention) we cannot say. Of course, without the histologic examination of tissue made possible by such intervention it would be difficult to know whether the lesion being so treated actually represented a non-osteogenic fibroma of bone.

**Pathology**

The periosteum of the affected portion of the shaft is not particularly thickened, except at the site of an infraction undergoing repair. On exposure of the medullary activity, the lesion, as already noted, is likely to be found to be eccentric and abutting upon the cortex on one side only if the long bone affected is a thick one, or, on the other hand, extending across the entire diameter of the shaft if it is a slender one. The lesion usually consists of several more or less discrete but adjacent foci of tough tissue having a fibrous character (Figs. 7 and 8). The color of this tissue is brownish or yellowish, and, though some lesions may be more or less uniform in color throughout, others present a more mottled appearance, created by a mixture of yellowish and
brownish foci. As to the cortex of the shaft neighboring upon the brown-yellow tissue of the lesion, this may be found eroded and thinned in some places and abnormally thickened in others. Furthermore, each focus may be outlined in part by a thin shell of sclerotic bone, and some of the individual foci may also be separated from each other by bits of sclerotic spongiosa.

On microscopic examination, it appears that the general pattern of the stroma of the lesion consists of whorled bundles of connective-tissue cells (Figs. 9 and 10). However, the cellularity of the stroma varies from one lesion to another or from one focus to another within the same lesion. In accordance with the relative gross brownness or yellowness of the tissue, there is also variation in regard to the lesion's vascularity, although, on the whole, the latter is not great.

Thus, in a distinctly brownish lesion or focus, the stromal connective-tissue cells are spindle-shaped and closely compacted, being interspersed with but little collagenous intercellular material. Many of the stromal cells are likely to contain granules of hemosiderin in their cytoplasm, and it is mainly this that accounts for the brownish color of the lesion or focus as a whole, although some scattered capillary hemorrhages may also contribute to it. Irregularly dispersed among the stromal cells are small, often elongated multinuclear giant cells. These cells, sparse on the whole, may be more numerous and clustered together in some fields and especially about areas of recent capillary hemorrhage. The giant cells seem to be formed through fusion of the spindle-shaped stromal cells, and, like the latter, many of them contain granules of hemosiderin in their cytoplasm (Fig. 11).

In a distinctly yellowish lesion or focus, large and small nests of lipoid-containing foam cells are seen, admixed with and encircled by the stromal tissue (Fig. 12). The latter then consists of rather collagenous, spindle-shaped connective-tissue cells in winding thick strands or whorled bundles, honeycombed by the lipoid cells. It can be shown that the lipoid cells arise through conversion of the spindle cells into lipophages, and that the lipoids contained within the latter are, to a large extent, of the nature of cholesterol esters. On the whole, the more yellow the lesion or focus, the more lipophages does it contain and the more collagenous does the intervening stromal tissue appear; and, furthermore, the less does it show of hemosiderin pigment in the stromal cells, or of multinuclear giant cells among them. Why the disappearance of the hemosiderin pigment and giant cells should parallel the appearance of foam cells in the lesion we do not know, but the fact that it does so is clear from the findings in areas representing intermediary stages of yellowness or brownness.

Thus, in an individual lesion, one may see fields in which the stromal
connective-tissue cells are rich in hemosiderin and interspersed with giant cells, and other fields in which pigment-bearing cells and giant cells are sparse or absent and foam cells are numerous. However, in about half of our cases, the entire lesion failed to show any lipoid at all, although the latter was sought for in frozen sections of material stained for fat, and foam cells were looked for in paraffin sections prepared from many areas of each lesion. Hence, as will be shown more fully later on, it seems clearly unjustifiable to lay emphasis upon the inconstant lipoid element by calling the condition a xanthoma or xanthofibroma of bone.

Furthermore, none of the lesions, of course, showed evidence of osteogenesis as a feature of the cytology, and indeed the lack of bone formation within these lesions is a consistent and striking finding. It is true that individual foci may be walled off or delimited at their periphery by a narrow zone of bone. Also, abutting upon the cortex of the shaft, the lesion may even provoke the former to thicken in some places, just as, in other places, it may erode it. However, in either case, such bone formation represents a response of the neighboring tissue to the lesion, and is not a feature of the lesion itself.

**Discussion**

It is realized that calling the lesion under consideration "non-osteogenic fibroma of bone" raises questions of classification and nomenclature. As a matter of fact, the Surgeon General's Catalogue and the Index Medicus list hardly any references to "fibroma of bone" and none to "non-osteogenic fibroma of bone." Furthermore, the various textbook classifications of bone tumors include no such category as "non-osteogenic fibroma." References to "ossifying fibroma," "osteofibroma," or "fibrous osteoma" are considerably more common, but these terms, indicating as they do that one of the inherent elements in the lesions so classified is osseous tissue, distinguish these lesions from the one we are considering here. How, then, is that lesion, which is by no means a rare one, recorded in the literature? Most commonly, cases representing non-osteogenic fibroma of bone are found described as instances or variant forms of so-called localized osteitis fibrosa and as instances or variant forms of giant cell tumor of bone.

There can be no doubt that some, though by no means all, of the lesions which Geschickter and Copeland,¹ for instance, discuss as "giant cell variants of the bone cyst in the metaphyseal ends of the long bones" (p. 268) represent what we are calling "non-osteogenic fibroma of bone." Also, their illustration (p. 300, Fig. 195) of the histology of what they call "the giant cell variant of osteitis fibrosa" would do per-
fectly as an illustration of the lesion we are describing. Altogether, their terminology implies that the lesion in question is related both to solitary bone cyst and to giant cell tumor of bone, and that it actually represents something intermediary between them (p. 269). To follow their reasoning at all, one must bear in mind the opinion of these authors that solitary bone cyst (or osteitis fibrosa) and giant cell tumor are closely related lesions which have a common basis in an abnormal hyperplasia of osteoclasts at sites of endochondral ossification (pp. 289 and 308).

The reasoning of Geschickter and Copeland\(^1\) which has just been outlined contains several fallacies. One is that bone cyst (osteitis fibrosa) and giant cell tumor are pathogenetically related lesions. Indeed, our own findings\(^2\) indicate that solitary bone cyst starts apparently on the basis of a local disorder of development and growth of bone and certainly does not represent a focus of "osteitis fibrosa" which has become cystic. Furthermore, a solitary bone cyst usually has few if any tissue masses adherent to its wall, and such as may be present show clearly that they have their basis in the organization of hemorrhage. Again, our own findings in regard to giant cell tumor of bone\(^3\) indicate that the basic cell of that lesion is not the giant cell but the stromal cell, and that this stromal cell is, of course, not an osteoclast but rather an immature marrow-connective-tissue cell. Finally, though in non-osteogenic fibroma the basic histologic pattern is that of intermingled stromal cells and giant cells, its resemblance to the giant cell tumor is only superficial. In the former as contrasted with the latter, the stromal cells are small and very spindly and show a strong tendency to collagenization and lipoid impregnation; the giant cells are small and sparse; and the lesion as a whole often provokes a perifocal osteosclerosis.

These very characteristics of the cytology of non-osteogenic fibroma have led other observers to regard this lesion as representing either a healing form\(^4\) or a xanthic variant\(^5\) of giant cell tumor. This idea is not valid either. In particular, non-osteogenic fibroma is observed most often in subjects below 20 years of age, while genuine giant cell tumor is rarely observed in subjects below this age. Furthermore, the fibroma nearly always begins in the shaft of a long bone, not far from an epiphyseal plate, but does not tend to extend into the epiphysis, while giant cell tumor usually begins in an epiphysis of a long bone though it tends to extend to the shaft. Again, non-osteogenic fibroma is usually a small lesion in comparison with a giant cell tumor. In addition, the scattered multinuclear giant cells which are often present among the stromal connective-tissue cells do not argue against designation of the lesion in question here as a fibroma, since medullary connective tissue,
even when rather mature, has a strong inherent tendency to form giant cells wherever it is proliferating. On the other hand, giant cells are likely to be absent in a non-osteogenic fibroma, or parts of it, where the lesion has undergone much lipoid transformation and collagenization, apparently in association with a diminution or regression of its growth activity. Finally, none of the giant cell tumors which we have studied showed substantial lipoid transformation or collagenization, or provoked a perilesional osteosclerosis such as would offer even slight justification for linking non-osteogenic fibroma with giant cell tumor or, specifically, for regarding the former as a healing or perhaps xanthic variant of the latter.

There can be no doubt that examples of non-osteogenic fibroma of bone have, in the past, been described as solitary xanthoma, xantho-fibroma, or xanthogranuloma of bone and such have usually been conceived in this connection as solitary expressions of lipoid granulomatosis or Hand-Schiiller-Christian's disease. Pertinent cases have been described by Phélip,6 Bohls 7 and Burman and Sinberg.8* This interpretation is likewise invalid, in our opinion. It is tempting because, in a non-osteogenic fibroma, many of the stromal cells may become converted into lipoid-containing foam cells. However, it should be borne in mind that in about half of our cases the entire fibroma failed to show any foam cells at all, although a careful and systematic search for them was made. Furthermore, even in those few lesions in which foam cells were abundant in some areas they were still absent in others, and in any case their presence was not associated with an inflammatory reaction. Altogether, when lipoid-containing fibromas of bone are compared histologically with genuine lesions of Hand-Schüller-Christian's disease, it becomes clear that there is no proper basis for regarding them as identical lesions.

In fact, we regard as very lax the current tendency to label lesions in bone as expressions of Hand-Schüller-Christian's disease merely because they contain some foam cells. For instance, Farber,9 who observed foam cells in the lesions of eosinophilic granuloma of bone,10 interpreted the latter condition as a variant of Hand-Schüller-Christian's disease. Other examples are provided by Snapper11 and Landoff,12 who, likewise observing a few foam cells in a lesion of fibrous dysplasia,13 labelled that condition, too, as a variant of xanthomatosis or lipoid granulomatosis. If one used this line of reasoning, he would

* The article by Burman and Sinberg relates to one of the cases included in the present discussion and quotes one of us (H.L.J.) as having made an anatomic diagnosis of "lipoid granulomatosis (xanthoma) of bone" in that case. Aside from the interpretation given to the report we originally made in this case, we wish to record that we would not make that diagnosis now.
also have to say that certain cases of suppurative osteomyelitis, for instance, represent a variant of Hand-Schüller-Christian's disease, merely because in chronic stages they may reveal some foam cells in the inflammatory granulation tissue.

On attacking the question of nomenclature and classification from the opposite angle, it appears that though the term "fibroma of bone" has sometimes been used,\(^4\) it seems not to have been applied to the lesion in question here. The term has most often been applied to lesions (particularly in the jaw bones) of the same character as those which have also been denoted as ossifying fibroma or fibrous osteoma. It has likewise been applied (again particularly in relation to the jaw) to lesions of the nature of solitary foci of fibrous dysplasia. In relation to other skeletal regions, lesions designated as fibroma of bone nearly always represent foci of fibrous dysplasia. Thus, for instance, the lesion described by Levinthal and Kirshbaum\(^5\) as "fibroma of the metacarpal bone" is a clear-cut example, in respect to both gross and microscopic appearance, of fibrous dysplasia of the bone in question. As they stated, the expanded and otherwise modified metacarpal bone was substantially occupied by grayish white connective tissue showing some bony metaplasia and some giant cells, occasionally collected around bony trabeculae. The lesion which Mustakallio\(^6\) referred to as "central bone fibroma" likewise represents fibrous dysplasia. This author stated that at the site of a central fibroma of bone the interior of the bone is filled, at least to a major extent, by a mass of connective tissue which is loose and reticular in some places and compact and collagenous in others. It is precisely this composition (usually with the addition of metaplastically formed bony trabeculae) that gives distinctive character to the lesion which we have denoted as fibrous dysplasia of bone—a lesion which affects only one bone or part of a bone in some cases and several or even many bones in others.

In choosing the term "non-osteogenic fibroma of bone" for the lesion under discussion we have meant to imply, as already noted, that the lesion represents a benign tumor, that it arises from the connective tissue of the marrow, and that in the course of the tumor's development the proliferating connective tissue does not undergo osseous metaplasia. We are aware that there are many who would question the propriety of calling the lesion a tumor at all. Indeed, some would argue that it represents merely an inflammatory condition and specifically something like a "fibrous osteomyelitis." However, its conception as an osteomyelitis (even in burnt-out form) is not made plausible by the addition of the modifying term "fibrous." This is merely an evasion, for there is certainly nothing in the histology of the lesion to indicate that it has, or
has ever had, a basis in inflammation. Nor is there anything in its histology to indicate that it may have a basis in reparative processes taking place after local trauma. On the other hand, a lesion which thus presents no vestiges of inflammation or reparative response, but which shows a cytologic pattern interpretable as having developed through the apparently unprovoked proliferation of autochthonous connective tissue must, on the basis of oncological usage, be classified as a tumor. However, it is a tumor of rather limited growth capacity. The absence from it of striking cellularity, mitotic division figures and nuclear atypism militates (like the clinical course) against calling it a fibrosarcoma, even of low grade, as is probably sometimes done.

**SUMMARY**

The lesion which is the subject of this paper is being called “non-osteogenic fibroma of bone” because we hold it to be a benign tumor formed from matured marrow connective tissue and not containing osseous trabeculae as an integral feature. In regard to the clinical findings, we noted that most of the subjects are older children or adolescents and pointed out the lack of characteristic clinical manifestations in connection with the disorder. We also noted that the usual site of the lesion is the shaft of a long tubular bone (most commonly of a lower limb), not far from the nearer epiphyseal cartilage plate. It was observed that the lesion tends to be a small one and may not traverse the entire diameter of the affected bone, especially if the latter is not slender. Accordingly, it was remarked that the lesion may show up roentgenographically as a sharply delimited, eccentric, somewhat loculated area of rarefaction, hugging and even bulging out the cortex on one side or, on the other hand, as a multilocular area of rarefaction traversing the bone and even bulging it out on both sides. As to its pathology, the lesion was described as consisting grossly of several discrete but contiguous yellow-brown fibrous foci whose basic microscopic pattern was found to be made up of whorled bundles of spindle-shaped connective-tissue cells loosely interspersed with small multinuclear giant cells, though, in some lesions, areas containing foam cells may also be present and even prominent. As to treatment, it was pointed out that thorough curettage or block resection of the affected area is all that is needed to abolish the disorder. Finally, we have tried to show why “non-osteogenic fibroma of bone” does not represent bone cyst (osteitis fibrosa) or giant cell tumor even in variant form, nor lipoid granulomatosis (Hand-Schüller-Christian’s disease) in the form of a solitary lesion, nor a focus of “fibrous osteomyelitis.”

**Note:** We are indebted to Drs. Henry Milch and Isaac Reitzfeld for permission to reproduce the roentgenograms shown in Figures 4 and 5 respectively.
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DESCRIPTION OF PLATES

PLATE 31

Fig. 1. Roentgenograph showing a lesion of small size, located in the tibia, about 4.5 cm. below the site where the upper epiphyseal cartilage plate had been, and hugging the cortex posteriorly. A delimiting shell of bone is seen, especially on the medullary side of the lesion. The patient was a young man, 21 years of age, in whom the lesion was asymptomatic and was discovered in connection with examination of the femur on the same side for an osteogenic sarcoma.

Fig. 2. Roentgenograph showing a lesion of about the same size and location as that shown in Figure 1. The cortex of the tibia toward the distal end of the lesion is somewhat thickened. The patient was a boy, 16 years old, who complained of pain in the knee of only 2 weeks' duration, starting after a football game.

Fig. 3. Roentgenograph showing a somewhat larger and longer lesion also abutting on the posterior wall of the cortex of a tibia. The upper limit of the lesion was 6.3 cm. below the upper plate of the tibia. The lesion appears multilocular with a delimiting shell of bone about it. The patient was a boy, 15 years of age, who went to the hospital because of pain and disability of the knee, of one month's standing, without antecedent trauma.

Fig. 4. Roentgenograph showing a lesion in the lower portion of the shaft of a fibula. The lower end of the lesion is about 2.5 cm. above the corresponding epiphyseal cartilage plate. The lesion appears multilocular with expansion of the diameter of the bone in a large part of the affected area. From the roentgenogram alone one might suspect, quite plausibly, that he was dealing with a solitary unicameral bone cyst, for instance, but actually the entire affected area was found filled by yellow-brown fibrous tissue (see Figs. 8 and 9). The patient was a girl, 10 years of age, who complained of pain of about 4 months' standing, in an ankle, and dated her difficulty from a kick in that area.

Fig. 5. Roentgenograph showing a lesion resembling that shown in Figure 4 but located in the lower portion of the shaft of an ulna. The patient was a boy, 8 years old, who complained of mild local pain, of 2 months' standing, said to have appeared first after a fall.

Fig. 6. Roentgenograph of a lesion in the upper portion of the shaft of a fibula. The upper end of the lesion is about 1.3 cm. below the corresponding epiphyseal cartilage plate. Periosteal new-bone apposition, representing a response to a transverse infraction, is seen on the surface of the cortex. (Compare with photograph of the specimen, as shown in Fig. 7). The patient was a girl, 7 years of age, whose history included pain, of about 2 years' standing, in the upper part of the left leg.
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PLATE 32

FIG. 7. Photograph of the resected portion (split longitudinally) of the affected fibula shown in Figure 6. Two adjacent foci of disease are seen which correspond precisely to the areas of rarefaction shown in the pertinent roentgenogram. For cytologic details, see Figures 10 and 11.

FIG. 8. Photomicrograph of a section prepared from the resected portion (split longitudinally) of the affected fibula shown in Figure 4. Although tissue is seen to fill the medullary cavity in the affected area, and the pertinent roentgenogram might suggest a cyst, there is actually no cavity in the region in question. The tissue of the non-osteogenic fibroma is very dark in the picture, not only because it was itself quite brown, but also because the section was rather thick. For some histologic details of the tissue composition in this lesion, as shown in a thinner section, see Figure 9. × 3.

FIG. 9. Photomicrograph showing the general cytologic pattern of the lesion shown in Figure 8. A whorled arrangement of the stromal cells is seen, and scattered, larger dots which are the multinuclear giant cells. There is complete absence of osseous trabeculae within the connective-tissue focus. × 8.
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FIG. 10. Photomicrograph showing the cytologic pattern of the tissue foci in the medullary cavity of the resected portion of the fibula shown in Figure 7. A whorled arrangement of the closely compacted small spindle-shaped connective-tissue cells is seen, with scattered small multinuclear giant cells interspersed among them. Osseous trabeculae are absent. Ｘ 200.

FIG. 11. Photomicrograph showing in greater detail the pattern presented by Figure 10. Both the stromal connective-tissue cells and the giant cells are small. The difference in the stroma-giant cell pattern in non-osteogenic fibroma from that in a giant cell tumor under the same magnification can be seen by comparing this figure with Figure 1 of our article on giant-cell tumor.3 Ｘ 450.

FIG. 12. Photomicrograph showing an area in a non-osteogenic fibroma in which some stromal cells are undergoing, or have undergone, conversion into foam cells. However, in half of the cases discussed in this paper no such foam cell areas were seen. Ｘ 200.
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