HAEMANGIOMATOSIS WITH MASSIVE OSTEOLYSIS

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Spontaneous dissolution of bone is a rare occurrence (Coley 1960). The first recorded case was published by Jackson in 1838 and reviewed by him in 1872. Since then a number of cases have been published under a variety of names, some purely descriptive such as phantom bone (Gorham and Stout 1955), massive osteolysis (Johnson and McClure 1958), acute spontaneous resorption of bone (Branch 1945), disappearing bone (Milner and Baker 1958), cryptogenic osteolysis (Baccaglini 1941), spontaneous absorption of bone (Jackman 1939) and progressive atrophy of bone (Thoma 1933), others implying an etiologic or pathogenetic mechanism such as "ostéolyse d'origine nerveuse" (Coste and Gaucher 1943), or implicating trauma in the genesis (King 1946, Jacobs and Kimmelstiel 1953). In 1955 Gorham and Stout reviewed twenty-two cases from the literature and two from their files. From their analysis it became apparent that all cases had clinical and radiological similarities, and all fell into the same specific syndrome. From the review of pathological material in eight of their cases they concluded that progressive lysis of bone was "always associated with an angiomatosis" of
blood or lymphatic vessels which seemingly was responsible for it. The changes in bone have always held the focus of attention of the examiners, and histopathological observations have been limited, by conviction or necessity, to bone and the few millimetres of tissue immediately surrounding it (Milner and Baker 1958). Even in the occasional cases which came to necropsy the emphasis remained on the bone and the site originally occupied by the resorbed bone (Jones, Midgley and Smith 1958). In contrast, the case to be described is one of generalised (skeletal and extraskeletal) angiomatosis with massive osteolysis of segments of the skeleton. In this case amputation of an affected limb afforded an opportunity to examine both bone and soft tissues.

**CASE REPORT**

A man aged fifty-nine had been known to have skin haemangiomata all his life. The small purple to red lesions were distributed on the skin surface of all the limbs and of the head and neck, but none could be identified on the trunk. He had been well and the lesions had not presented a problem in the past. In December 1967 he sustained a pathological fracture of the right femur from a fall. Radiological investigation revealed extensive osteoporosis of the right femur at the fracture site as well as irregular porosity of the long bones of both legs (Figs. 1 to 4). Treatment of the fracture by immobilisation and traction produced radiologically detectable callus within two to three weeks. However, subsequent examinations revealed progression of the bony lysis and no further callus formation. By June 1968, all the callus at the fracture site and most of the shaft of the right femur in the region of the fracture had been resorbed. Intramedullary fixation of the left femur was done to prevent a fracture because of the extensive bone destruction that was apparent radiologically. Later intramedullary fixation of the fractured right femur was done. This precipitated profuse bleeding during, and on several occasions after, the operation which needed many large blood transfusions. Because of the continued bleeding the right leg was amputated through the middle of the thigh. At operation non-union was confirmed: a haematoma of over five litres, which had compressed the soft tissue into an attenuated wall studded with fragments of bone, was evacuated from the fracture site.

All laboratory investigations failed to reveal any underlying primary metabolic or other condition which could have initiated—or explained—the bone resorption.

Gross examination of the amputated limb revealed many very small blue haemangiomatous lesions throughout the skin and subcutaneous tissues (Fig. 5). The muscle and connective tissues were riddled by nodules of diffuse vascular networks, many of which contained phleboliths (Fig. 6). There was much calcification in the walls of both arteries and veins in the leg (Fig. 7). Where the angiomatous masses abutted on bone, extensive bone erosion occurred and vascular tissue often extended through the rarefied cortex to communicate with similar tissue filling the bone marrow (Figs. 8 and 9). New bone formation was evident; the shaft of long bones (Fig. 10) showed irregular widening of their diameter. There was also evidence of increased bone density in the spongiosa, which often was as dense as the adjacent cortex (Fig. 8).
Subcutaneous tissue showing an unusual pattern of vascular spaces encompassing an artery and a nerve (top left). (Haematoxylin and eosin, ×145.)

A section through the calf showing the soleus and gastrocnemius muscles riddled by fibrovascular tissue. The vascular cluster to the right shows a phlebolith.
The microscopic changes were similar in both soft tissue and bone. They consisted of intercommunicating vascular networks sometimes forming distinct vascular masses, sometimes diffusely permeating the tissues and disrupting their integrity. The blood vessels had a monocellular endothelial lining which was often thin and attenuated. The walls varied in thickness from wide fibromuscular bands to a single layer of endothelial cells. There was no organisation of the muscular walls into recognisable layers. Dense meshworks of elastic fibres were seen on the adventitial surface of the blood vessels with occasional extensions into the fibromuscular layers. However, no distinct elastic lamina could be identified. In many areas newly formed capillaries at varying stages of development were present (Fig. 11). The most immature consisted merely of concentric layers of plump endothelial cells; next there were some which were just beginning to form a lumen; and then, more mature, with a lumen filled by blood. In many areas blood vessels contained small organising thrombi. Throughout, the vascular channels were accompanied by an enveloping mass of predominantly loose fibro-fatty tissue which only occasionally became dense and sclerotic. The interweaving of this abnormal tissue as it stretched from one vascular cluster to the next resulted in destruction of the intervening normal tissue which, in some areas, was considerable (Fig. 12). There was little inflammatory infiltrate; the slight cellular population consisted of lymphocytes, plasma cells, macrophages—some of which were laden with iron pigment—and very occasional polymorphs. Large numbers of polymorphs and haemosiderin-laden histiocytes were present in the tissues surrounding the fracture haematoma in the thigh. A search for eosinophils, foamy histiocytes and reticulum cells, which have been occasionally described in cases of
Figure 9—A metatarsal bone encased in abnormal vascular tissue about its neck. There is erosion of the cortex and extension of the vascular tissue into the spongiosa.

Figure 10—Gross photograph of a slab of tibia showing widening of the shaft towards the left. The bone is riddled by vascular channels.

Figure 11
An area showing various stages in the formation of new vascular channels. (Haematoxylin and eosin, ×290.)
disappearing bone disease (Butler, McCance and Barrett 1958; Jones et al. 1958) revealed none. Some of the changes were entirely peculiar to the tissue involved.

In the subcutaneous tissue (Fig. 5) and indeed throughout both soft tissues and bone, the abnormal vascular tissue often encased intact arteries, nerves and, in the skin, dermal appendages. The abnormal vessels were closely applied to the adventitia of the arteries, the epineurium of nerves and the outer limits of Vater-Pacinian corpuscles. In the dermis, sweat glands were split apart by spreading vascular tissue. Thin layers of fibrous tissue rich in elastic fibres were often insinuated between the arteries and nerves, and the outer limits of the wall of the abnormal blood vessels.

In the muscle the extensive vascular permeation and the resulting fibrosis extensively disrupted and replaced muscle fibres; in areas the fibres were spread apart and atrophic with increased concentration of sarcolemmal nuclei. In other sites all the muscle fibres were lost and there was nothing but loose scar tissue with a slight sprinkling of lymphocytes and pigment-laden histiocytes. Where periosteum and bone were involved in spite of the extensive bone resorption, only small numbers of osteoclasts were to be seen. The exception to this was the region of the fracture site in the femur, where much necrotic bone was present in the wall of the haematoma; here there was a brisk osteoclastic activity and much inflammatory cellular infiltration. These were most probably related to the bone necrosis resulting from the fracture and the ensuing haematoma and represented only an indirect result of the angiomatous involvement. In many areas of involved bone the endothelium of the abnormal vessels abutted directly on the surface of the bony trabeculae. Some of the endothelial cells lay in ragged pits, eroded into the bone and interrupted the continuity of bony lamellae.

**Fig. 12**
The gastrocnemius muscle showing degeneration and loss of muscle fibres which are replaced by loose scar tissue with occasional mononuclear cells and dilated blood vessels. (Haematoxylin and eosin, × 145.)
DISCUSSION

This patient had advanced and widespread changes typical of those described in the literature under the heading of “massive osteolysis”. Some of the features are unusual.

The vascular disease almost certainly had a congenital basis. It is interesting that nearly six decades elapsed between the first appearance of angiomatous lesions and clinically overt bone involvement. Congenital angiomatosis has been described before, but in the one case in which an association existed between skin and bone involvement (Jones et al. 1958) the time element was much shorter; the bone changes occurred first and the patient was an infant at the time of the onset. However, regardless of the difference, our case, along with that of Halliday, Dahlin, Pugh and Young (1964), certainly indicates that congenital vascular defects should be added to the list of possible causes of massive osteolysis.

In the cases reviewed by Gorham and Stout (1954, 1955) and in others published since, the osteolysis had been localized to one anatomical region, for instance a shoulder (Jones et al. 1958) or leg (Branco and da Silva Horta 1958). Joints afforded no barrier to the lytic process with destruction of contiguous bones; Gorham, Wright, Schultz and Maxon (1954) reported a case in which disease extended from humerus to vertebral bodies with involvement of the intervening ribs and clavicle. However, in none of the published cases was there recorded such extensive and severe destruction or involvement of two distinct anatomical sites with normal intervening bone as seen in the present case. Involvement of soft tissues adjacent to diseased bone is probably not a new observation. However, as already noted, the paucity of comments about non-osseous tissue may reflect the scantiness of soft tissues included in biopsies and the fact that bone is the focus of interest in these cases.

Some of the features of this case contrast with published reports. Milner and Baker (1958) and Branco and da Silva Horta (1958) regarded the increased vascularity merely as engorgement and dilatation of existing blood vessels in bone which had become enlarged in order to fill the vacant space left by the resorbed bone. Milner and Baker commented that they saw no vascular congestion in that part of the non-osseous tissue in the affected region which they were able to examine. As seen in Figure 11, new blood vessels were indeed being formed in our case and non-neoplastic proliferation of blood vessels was also described by King (1946) when he introduced the term “haemangiomatosis”. The presence of soft tissue as well as the bone involvement in our case merely strengthens the opinion expressed by Gorham and Stout that massive osteolysis is the result of a vascular derangement or “angiomatosis”. It may also be noted that animal studies have shown the importance of blood vessels in bone resorption and remodelling (Anderson and Parker 1966), further supporting the concept that vascular proliferation is responsible for the osteolysis.

Other unusual features of our case are the presence of new bone formation and calcification of blood vessels; other observers (Halliday et al. 1964, Edeiken and Hodes 1967) could find no evidence of osteoblastic activity in their cases. This may well indicate that a variety of features may be expected in massive osteolysis and that the absence or presence of any one or other feature may be the result of observations made on limited biopsies and if more material had been available more of the described abnormalities might have been found.

SUMMARY

1. An unusual case of haemangiomatosis in an adult is presented. The association of angiomatosis with massive osteolysis and with extensive soft-tissue destruction is discussed.
2. The extensive vascular involvement of skin, soft tissues and bone strengthens the idea that massive osteolysis results from vascular proliferation or angiomatosis.

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REFERENCES


