

## An attempt to evaluate the criteria for diagnosing nonspecific inflammatory diseases observed on ancient skeletons

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### Abstract

The study presents the criteria for diagnosing nonspecific inflammatory diseases observed on ancient bones. It is very important to remember about two forms of osteitis – acute and chronic, and about diseases causing similar changes, e.g. tuberculosis, lues, brucellosis, cysts, osteoid-osteoma.

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Inflammatory diseases belong to the oldest ones, as the traces of inflammatory processes were found on the plants from the Carboniferous period. Changes such as necrosis and fistulas were noticed on bones of fossil animals from different periods [MOODIE 1967] as well as on bones of pre-human beings, e.g. the man from Rhodesia [HRDLIČKA 1930]. There are many descriptions of osteomyelitis in man dating back to the period from pre-historic times to present. We would like to mention here some of the authors writing about osteitis, to show how common the disease has been – it has been found all over the world: WOOD-JONES [1910], HOOTON [1935], HRDLIČKA [1930], FRANKENBERGER [1935], CRESMAN, LARSELL [1945], JELINEK [1963],

ROCHLIN [1965], MILES [1966], RONEY JR. [1966], ERY [1967–1968, 1970, 1981], STLOUKAL, VYHNANEK [1976], STEINBOCK [1976], THURZO [1969], MALLEGNI, FORNACIARI [1980], GLADYKOWSKA-RZECZYCKA [1980, 1981, 1984, 1989, 1993], ORTNER, PUTSCHAR [1981], HANAKOVA [1983], CAPASSO [1985], CZARNETZKY [1985], WINKLER [1988–1889], BLAJEROVA [1975], JAKAB [1997], LALLO, BLANK [1977], ĆWIRKOGODYCKI, SWEDBORG [1978], DERMUS [1978], MARCSIK, OLAH [1991], KRAMAR et al. [1990], TAKAO [1991].

The above-mentioned authors described few cases of osteitis usually found in large skeletal series. In Poland 12 skeletons among 1192 ones had changes characteristic for osteitis.

Differentiation of macro- and microscopic picture of osteitis makes it difficult to diagnose, especially in paleopathology. Therefore, it is important to give basic information about that disease, its

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forms and differential diagnosis.

Bacteria causing otitis may originate from a urinary infection, bacterial endocarditis, a soft tissue infection and other.

Depending on the spreading route otitis may be divided into:

1. hematogenous or primary otitis;
2. secondary otitis (posttraumatic otitis and otitis from a contiguous infection).

In secondary otitis the source of the infection is known, whereas in the primary one it is usually unapparent and infection spreads by the circulatory system.

The most common clinical and pathological classification of otitis is that based on time of duration and clinical manifestation (acute, subacute and chronic otitis) is. There are also other classifications of the hematogenous otitis, for example those considering etiology or age [TRUETA 1959].

Otitis is most often caused by *Staphylococcus aureus* (61%), and streptococci (9%) according to DICH et al. [1975], and affects mostly such bones as: the femur and tibia (80%) according to ORTNER and PUTSCHAR [1981], humerus (10%) according to BOREJKO AND DZIAK [1988]. Otitis may afflict all bones, but is rarely seen in the ribs, clavicle and vertebrae [WALDVOGEL, VASEX 1980, DONOVAN, SMAM 1982]. Otitis of vertebrae may cause a hump. In 9 % of otitis cases more than two bones are affected [DICH et al. 1975]. Pathologic findings during the acute phase include inflammation, and bone necrosis. In the subacute phase a new bone formation may occur around necrosis and formation of fistulas. The chronic phase may manifest itself as smouldering infection in postinflammatory sites and infection may

recur after months or years of quiescence [COHEN 1990, TUMEH 1987].

In the acute phase of otitis bacteria reach the bone and cause inflammation: vascular congestion and purulent exudate. Because of the bone rigidity, increased intramedullary pressure develops, compressing the blood supply and causing ischemia and necrosis. The pus spreads via the Volkmann canals to reach periosteum, beneath which abscesses may form. The suppurative and ischemic injuries may cause fragmentation of bones into devitalized segments called sequestra. After 4–6 weeks the new bone formation and proliferation begin. Osteogenesis from the periosteum may surround the inflammation to form the bone envelope or involucrum. After many years, distension, diffuse sclerosis of the bone and sequestra in different phase of sequestration may occur [ŁAKOMSKI 1976, ŻAK 1983].

Brodie's abscess and otitis chronica scleroticans typus Garré are considered as chronic osteomyelitis [MALAWSKI 1976].

Brodie's abscess is usually located in the tibia, rarely in the femur. It is placed intramedullary, close to epiphysis. It is usually a single cyst, cherry-size, and no periosteum changes are observed.

Garré's sclerosing otitis affects mainly children and young adults and is located in the proximal part of tibia. This form of otitis is characterized by regular fusiform distension and thickening of the proximal part of the bone without leading to suppuration, sequestration and fistulization. The radiological picture shows pronounced sclerosis and distention of the affected bone and no medullary cavity [COLLERT, ISACSON 1980].

The bone changes observed in active osteomyelitis (with sequestrum and fistulas) are very characteristic and do not cause problems with diagnosis. However, the bone changes at the beginning of osteitis are not typical thus creating many diagnosing troubles [MURCZYŃSKI 1952]. The bone changes in the chronic form of osteitis may resemble the bone changes caused by tuberculosis, brucellosis or syphilis. Brodie's abscess may cause confusion with cyst or osteoid-osteoma (Tab. 1).

Tuberculosis – in comparison to osteitis – is an infectious disease, in which usually more than one bone is affected and most often the process is located in vertebrae and joints. Tuberculosis does not affect medullary cavity. Because tuberculosis affects the spongy part of the bone it may cause great destruction, sometimes changing the bone's shape. Osteitis usually affects shafts of long bones and abscesses very rarely penetrates to the joint. In tuberculosis neither periostitis nor destruction of the bone is found. Tuberculous sequestra are more round – shaped, smaller and with smoother surfaces than sequestra in osteitis. Tuberculous sequestra are located in the spongy bone, whereas osteitis' ones are found mainly in the compact bone.

As regards tertiary syphilis, it usually affects many bones at the same time; very often the skull is affected, whereas in osteitis the skull is very rarely affected and in that case the process is limited to the maxilla and the jaw. The lesions caused by syphilis are wide-spread and found in the spongy and compact bone, where many osteolytic foci occur. The medullary cavity also may be affected by the syphilitic process. There is irregular

shape of the bone with periostitis, sequestra are not found or are found very rarely. If they are present – they are very small, disc-shaped and located in spongy bone. No fistulas are present.

Brucellosis is a disease which is transmitted to humans from domestic animals. Human infection results from ingestion of affected animal tissue or milk products. Many bones may be affected, but most commonly the vertebrae, jaw, and ribs. The lesions with osteolytic foci are found in the spongy bone. The medullary cavity is not affected. No sequestra and fistulas are found.

Benign cysts may imitate Brodie's abscess. They may be single or rarely several in the bone. They are larger in comparison to Brodie's abscess. They may be found in spongy as well as in compact bone, whereas Brodie's abscess is located in spongy bone alone. They may cause deformation of the medullary cavity or of the shaft of the bone. There is no sclerotic capsule in the X-ray picture, which differs benign cysts from Brodie's abscess. Fistulas and sequestra have been never found.

Osteoid-osteoma is very similar to Brodie's abscess as well as to osteitis scleroticans. It is a benign carcinoma, most often located in the compact bone of the tibia or in the femur. This lesion is usually single, small (ca. 1 cm in diameter), oval-shaped, composed of osteolytic focus and sclerotic capsule. It is similar to osteitis scleroticans or when only osteolytic focus is present, it resembles Brodie's abscess. The medullary cavity is not involved, but localized thickening shaft of the bone may be found.

Two typical lesions for osteomyelitis are shown on fig. 1 and 2.

Table 1. Differentiation

Features	Ostitis acute	Ostitis chronic	Ostitis Garré	Brodies abscess	Tuberculosis	Syphilis III	Brucellosis	Osteoid - osteoma	Bening bone cysts
Age	0 - 20	adults	adolescence	6 - 30	0 - senilis	0 - senilis	0 - senilis	10 - adults	0 - adults
Sex	M : W = 3 : 1								
	PERIODS IN WEEKS								
	1-2								
Number of bones	1 (80%) 4-5 1 (80%)	one or more	one	one	more than one	many	many	one	one or some
Localization	metaphysis	diaphysis joints	diaphysis	metaphysis or diaphysis	joints verte-bra	various	mandibule verteb., ribs	various	various mainly metaphysis
Size	limited	extensive	2/3 metaphysis	small	limited	extensive		small	large
Changed bone tissue	spongy	all	all	spongy	spongy	both	spongy	both	both
Structure	changed	changed	changed	changed	destroyed	osteolytic foci	osteolytic irreg. foci	destruct.	destroyed
Medullary cavity	changed	narrow	lack	normal	normal	lack	normal	normal	local deformation
Shape of the bone	distension of metaph.	irregular	fusi - form	local thicken.	destruc. thicken.	lesion irreg. thick.	various	local thicken	distension
Periosteum (changes)	discreet	untypical	rough	local	rather normal	extensive or local thick	discreet	rather discreet	thin
Sequestrum	very rare	latent or active	small, many well defined	lack	small, smooth bad defined	lack or small, resorb	lack	lack	lack
Fistulas	lack	remains	lack	lack	present	lack	lack	lack	lack
Regeneration									
Cavity of the abscess/ sequestrum	small	great	great	great	small	varying	lack	no inflammatory process	lack
Gibbus	lack	surrounded by sclerotic layer	surrounded by sclerotic layer	surrounded by sclerotic layer	-	-	-	lithic focus thick wall	very thin wall
Calcification	discreet	lack	lack	lack	present	rare	rare	-	-
		extensive	extensive	extensive	low	local	lack	local	-

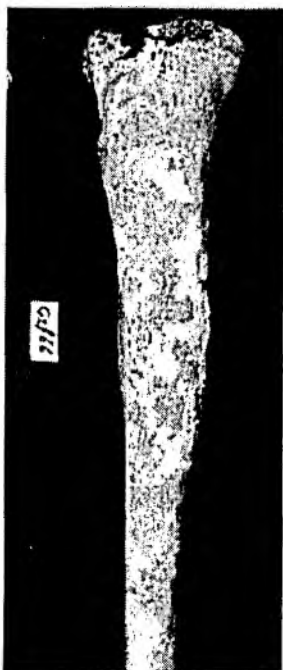


Fig. 1. Tibia of a *matusus* man, with characteristic changes of ostitis chronica scleroticans Garrei (Czersk, Warsaw province)

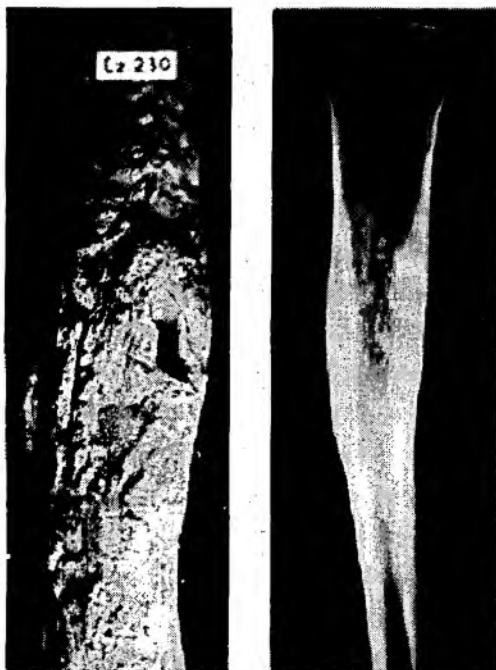


Fig. 2. Bones of an *adultus* man with well marked traces of healed ostitis (Czersk, district Warsaw)

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## Streszczenie

Przedstawiono krótki rys historyczny chorób zapalnych nieswoistych znanych z piśmiennictwa, genezę, postacie, fazy, przebieg, obraz makroskopowy i radiologiczny oraz różnicowanie z innymi chorobami pozostawiającymi na kościach podobny obraz.