ABSTRACT

Background: Chronic osteomyelitis (COM) is very difficult to cure without proper identification of the bone-infecting organism and it is not clear whether specimens other than bone are appropriate for microbiological diagnosis because results from available studies are conflicting.

Methods: Prospective analysis of 100 patients with COM in a 500-bed University-based hospital, comparing the microbiology from specimens other than bone with that of bone cultures, taking the last as the gold standard.

Results: Time of evolution of COM was 1 to 384 days (median 180 days), 72% of patients were male, mean age was 38±18 years. Femur and tibia accounted for 72% of the infected bones; most had trauma and/or surgery (85%) as predisposing factors. The microbiology of specimens other than bone was identical to that found after simultaneous bone cultures in 30%; concordance for Staphylococcus aureus was 41% and for other microorganisms 18%. These concordance rates correspond to 74% sensibility, 6% specificity, 30% positive predictive value, and 31% negative predictive value. Anaerobic bacteria were isolated from the bone in 13% of patients.

Conclusions: Diagnosis and therapy of chronic osteomyelitis cannot be guided by cultures of non-bone specimens because their microbiology is substantially different to the microbiology of the infected bone.

INTRODUCTION

COM constitutes an important problem for society and modern medicine due to its high morbidity and sequels. Prognosis depends on proper diagnosis and accurate treatment directed against the microorganism(s) infecting the bone [1]. Bone specimens were established as the gold standard for diagnosis by a classic study published 25 years ago [2], but more recent studies are conflictive because they suggest that non-bone specimens such as pus from sinus tracks are as good as the bone to identify the causative agent [3,4,5]. Here we present data from a prospective analysis designed to clarify the level of microbiological concordance between bone and non-bone cultures.

METHODS AND MATERIALS

SETTING AND DESIGN. COM was defined as a bone infection that worsened or failed to improve clinically or microbiologically after one month of evolution, independent of the use and quality of surgical and antimicrobial therapy. One month, 3 times the 10-day period necessary for bone necrosis after acute infection, was chosen to assure chronic infection [6]. Patients with osteomyelitis were screened prospectively for inclusion and exclusion criteria between February 2001 and December 2002.

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METHODS AND MATERIALS (CONT)

INCLUSION AND EXCLUSION CRITERIA. Males and females of any age and social status with COM as defined above must complete at least 48 hours without exposure to antimicrobials before surgical sampling of infected bone, and must have one or more of the following non-bone specimens: pus from sinus tracts, pus swabbed or aspirated from surrounding soft tissues, drainage from orifices left by orthopedic pins, or pus from surgical wounds. Only three operative bone specimens were acceptable: bone biopsies, sequestra, and bone marrow aspirates, and it was required that the surgeon established if the incision was made through intact skin or infected soft tissues. Non-bone specimens were obtained during surgery or in the ward by needle aspiration, sterile swab, or soft tissue biopsy. Patients with COM secondary to diabetic foot and decubitus ulcers were excluded. Bone specimens were processed for aerobic, anaerobic, mycobacterial and fungal cultures.

TYPE OF ANALYSIS. Organisms isolated from bone and non-bone cultures were compared for concordance, first by genera and species, and then by antibiogram. Concordance was defined as the finding of exactly the same bacterial species with identical susceptibility pattern in both specimens. COM caused by *Staphylococcus aureus* was evaluated alone and combined with all other etiologies. Bone specimens were considered the gold standard against which non-bone were compared.

STATISTICS. Variables are presented as means with standard deviations, or percentages. Statistical significance of differences between groups was determined by Chi Square analysis with Yates correction when appropriate. Data analysis was performed with Epi-Info 2002 (CDC, Atlanta, GA), and graphics designed with Microsoft Excel 2002 (Microsoft corporation, Redmond, WA).

RESULTS

Demographic data of 100 patients with chronic osteomyelitis.

Variable	Data			
Mean age in years ± SD	38 ± 16			
% of males	72			
% of females	28			
Evolution range of COM in months (median)	1-384 (6)			
Factor associated with COM (%):				
Trauma	64			
Orthopedic surgery	21			
Hematogenous	7			
Orthopedic devices	4			
Contiguous infection	4			
Surgical access for bone sampling (%):				
Through intact soft tissue	35			
Through infected soft tissue	65			

RESULTS (CONT)

Concordance between bone and nonbone specimens

VARIABLES	SPECIMEN		CONCORDANCE	
	BONE	NON-BONE	# of Patients (%)	
Aerobic negative cultures	10	13	4 of 10 (40%	
Monomicrobial culture	55	63	23 of 55 (42%	
Polimicrobial culture	35	24	3 of 35 (9%	
All Gram Positive	86	76	23 of 86 (27%)	
All Gram negatve	46	34	5 of 46 (11%)	
Anaerobes	13	0	0 of 13 (0%	
Global concordance	141	110	30 of 100 (30%	

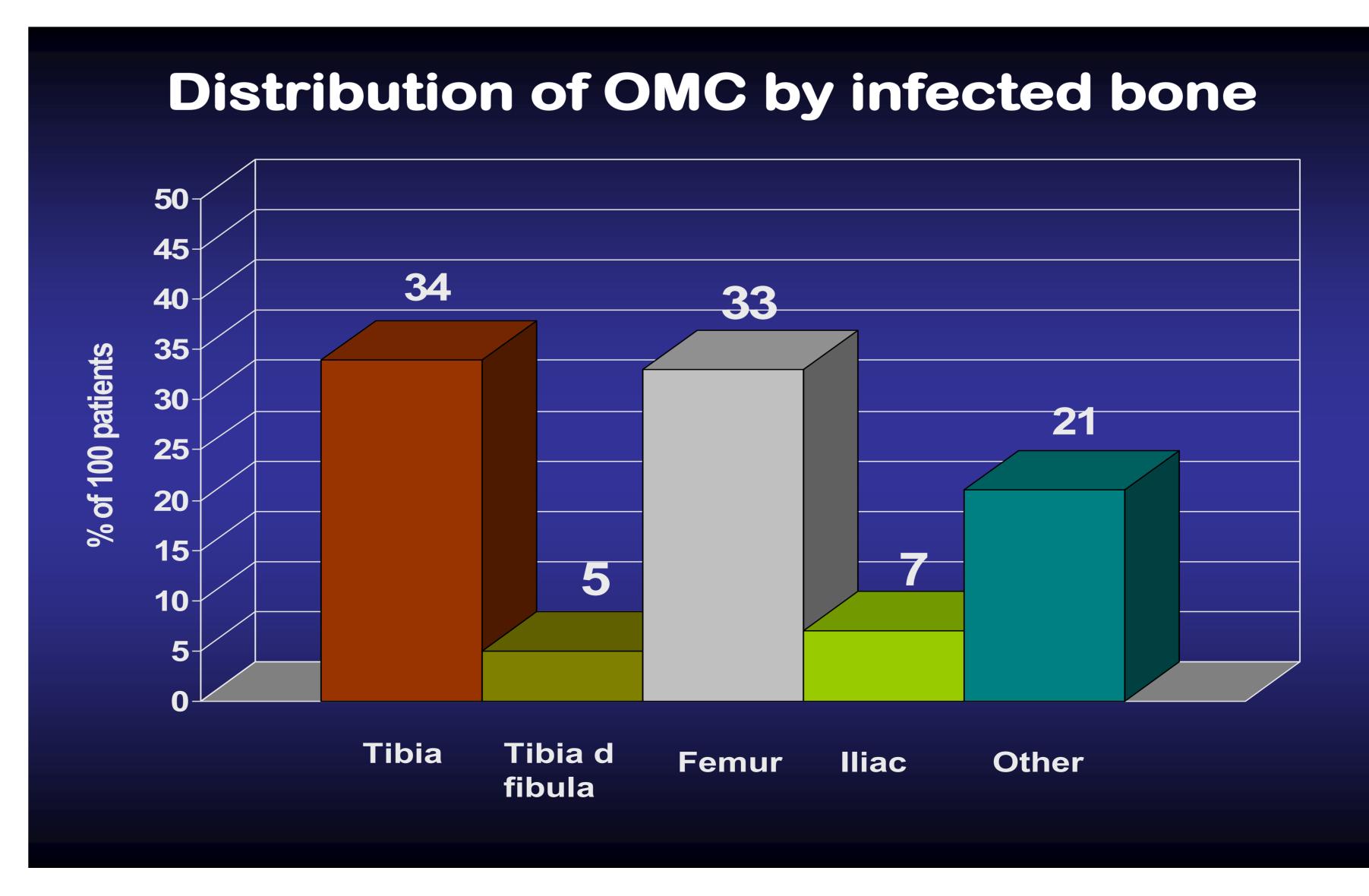
* Two patients had polimicrobial COM polimicrobiana: 1) P aeruginosa and Streptococcus agalactiae; 2) S aureus and Acinetobacter cbc

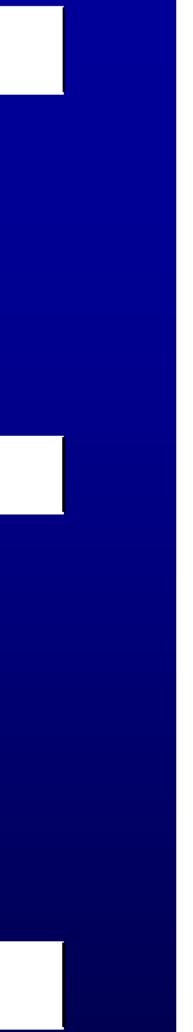
			BONE (Gold Standard)		
			Positive culture	Negative culture	TOTAL
	NON-	Positive culture	26	61	87
	BONE	Negative culture	9	4	13
		TOTAL	35	65	100

NON-BONE SPECIMENS

Sensitivity:	74%
Specificity:	6%

Positive predictive value: 30% Negative predictive value: 31%







CONCLUSIONS

These prospective data confirms that only bone specimens are appropriate for establishing the etiology of COM. Low concordance (30%) makes non-bone specimens misleading, and should not be relied upon to decide the antimicrobial treatment.

Pus from sinus tracts does not accurately represent the etiology of COM, even when Staphylococcus aureus is the causative agent.

Of notice is the frequency of anaerobic bacteria isolated from infected bone (13%), not commonly looked for in COM outside of those associated with diabetic foot and decubitus ulcers.

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