

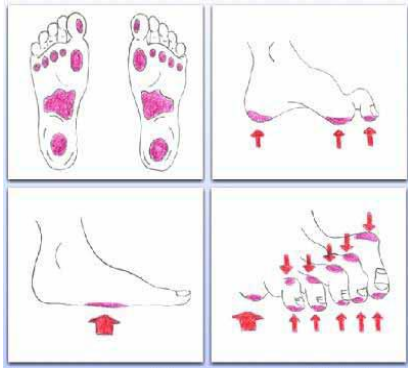


Pied diabétique et prélèvements : Où ? Quand ? Comment ?

Pr O. Lesens (Clermont Ferrand)



Neuropathie



Hyperkératose + Insensibilité

Mal perforant

Trauma

Artériopathie

Plaie ischémique



Dans la très grande majorité des cas, l'IOA du diabétique a pour origine une plaie avec infection par contiguïté

Plaies neuropathiques



Plaies artérielles



Brûlures



- Autres situations:
 - ✓ post chir (amputation..)
 - ✓ Post trauma

Situations hétérogènes



Diagnostic

Plaie ne cicatrisant pas malgré soins
locaux et décharge
Plaie > 2cm²

Biologie

VS++, CRP

Imagerie



Clinique

Signes infectieux locaux

Rx simples, à répéter

IRM, scintigraphie LM

Ostéite

Biopsie osseuse

Expérience du clinicien

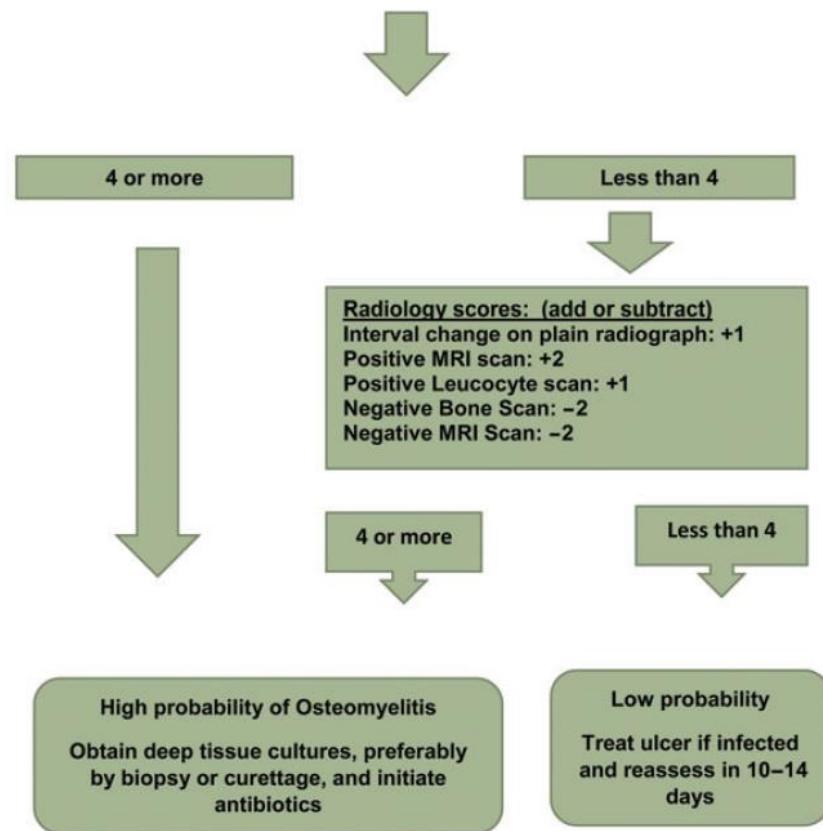
Contact/expo
sition osseuse

Orteil en
saucisse



Initial assessment

Visible cancellous bone in ulcer: +2
Positive PTB test or visible cortical bone in ulcer: +1
ESR >70 with no other plausible explanation: +1
Cortical destruction on initial plain radiograph: +1
Ulcer size more than 2 square cm: +1
Clinical gestalt: +1



Markanday A. Diagnosing diabetic foot osteomyelitis: narrative review and a suggested 2-step score-based diagnostic pathway for clinicians. Open Forum Infect Dis. 2014

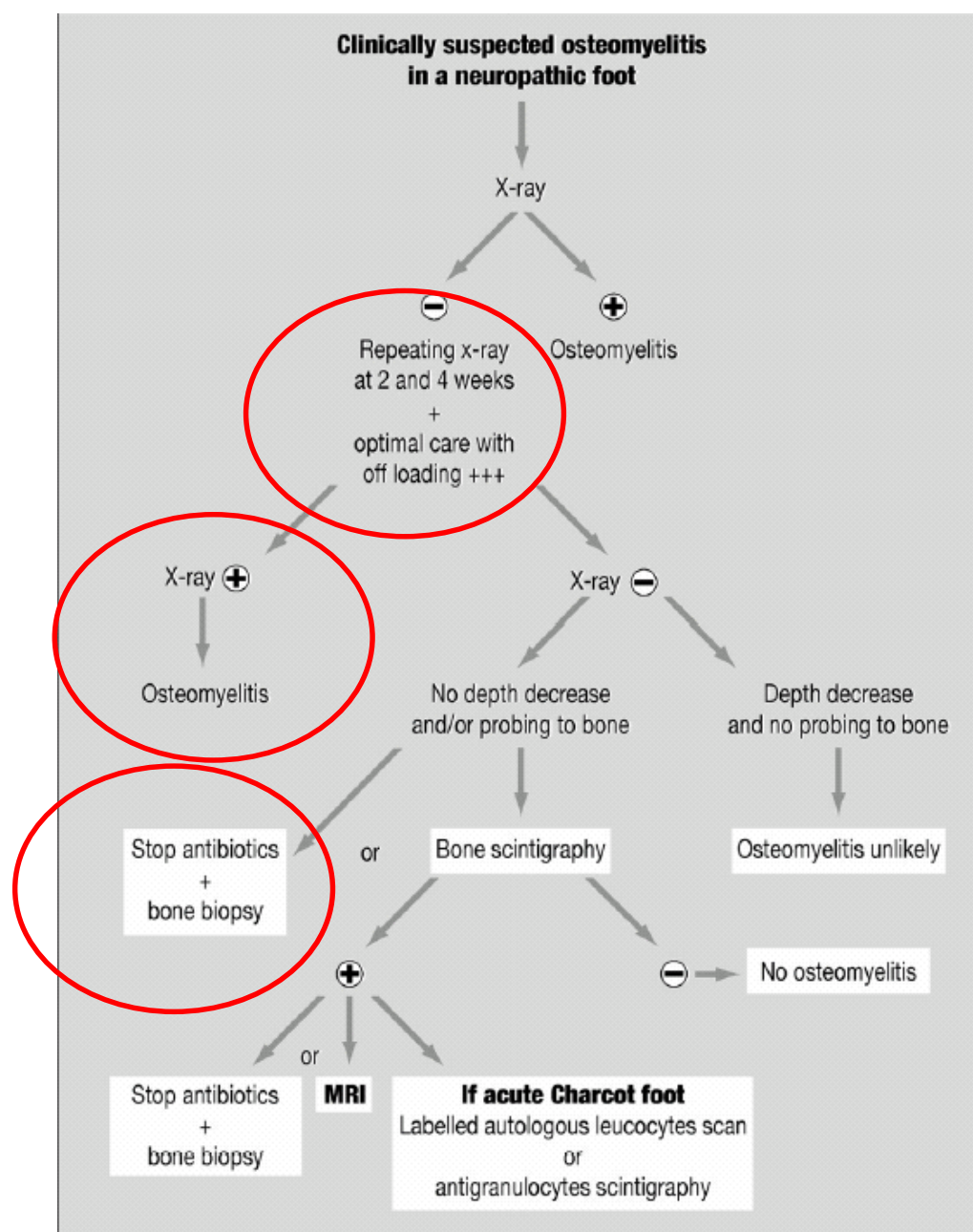


Fig. 1. Positive diagnosis algorithm for osteomyelitis in the diabetic foot.

IWGDF guidance on the diagnosis and management of foot infections in persons with diabetes

DIABETES/METABOLISM RESEARCH AND REVIEWS
Diabetes Metab Res Rev 2016; 32(Suppl. 1): 45–74

5. A definite diagnosis of bone infection usually requires positive results on microbiological (and, optimally, histological) examinations of an aseptically obtained bone sample, but this is usually required only when the diagnosis is in doubt or determining the causative pathogen's antibiotic susceptibility is crucial (strong; moderate).
7. Avoid using results of soft tissue or sinus tract specimens for selecting antibiotic therapy for osteomyelitis as they do not accurately reflect bone culture results (strong; moderate).
13. Obtain cultures, preferably of a tissue specimen rather than a swab, of infected wounds to determine the causative microorganisms and their antibiotic sensitivity (strong; high).
14. Do not obtain repeat cultures unless the patient is not clinically responding to treatment, or occasionally for infection control surveillance of resistant pathogens (strong; low).

IWGDF guidance on the diagnosis and management of foot infections in persons with diabetes

DIABETES/METABOLISM RESEARCH AND REVIEWS
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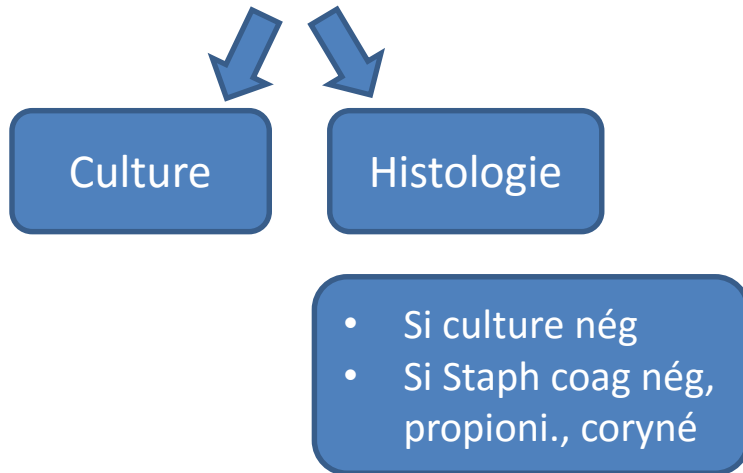


Figure 1. Technique of percutaneous bone biopsy of the foot. This may be carried out at bedside, in a radiology suite or in the operating theatre. If needed, this can be performed using fluoroscopic or computed tomographic guidance. If bone core is obtained, send to microbiology for aseptic division, with one piece for culture and the other sent to histopathology. (Photographs courtesy of Dr E. Beltrand, Orthopedic Surgery Department, Dron Hospital, Tourcoing, France)

[47]. Bone culture is not always needed when DFO is suspected, but clinicians should consider this procedure when the diagnosis of osteomyelitis remains uncertain despite clinical and imaging evaluations, in cases where data from soft tissue cultures are non-informative, when the infection has failed to respond to initial empiric antibiotic therapy or when considering an antibiotic regimen with a higher potential for selecting resistant organisms (e.g. rifampicin, fluoroquinolones, fusidic acid or clindamycin) [51].

11-gauge (or smaller for phalanges) bone-cutting needle, such as Jamshidi, Ostycut or T-lok



Gold standard mais...

- **Contaminations possibles**

- 20 mm de la plaie

- Face dorsale

- **Faux négatifs**

- Prélèvement zone non infectée

- Antibiothérapie préalable

- Germes à culture lente/difficile

- 15 jours sans ab, sous scopie ou scanner si patient stable

Diagnosing Diabetic Foot Osteomyelitis in Patients Without Signs of Soft Tissue Infection by Coupling Hybrid ^{67}Ga SPECT/CT With Bedside Percutaneous Bone Puncture

Diabetes Care 36:2203–2210, 2013

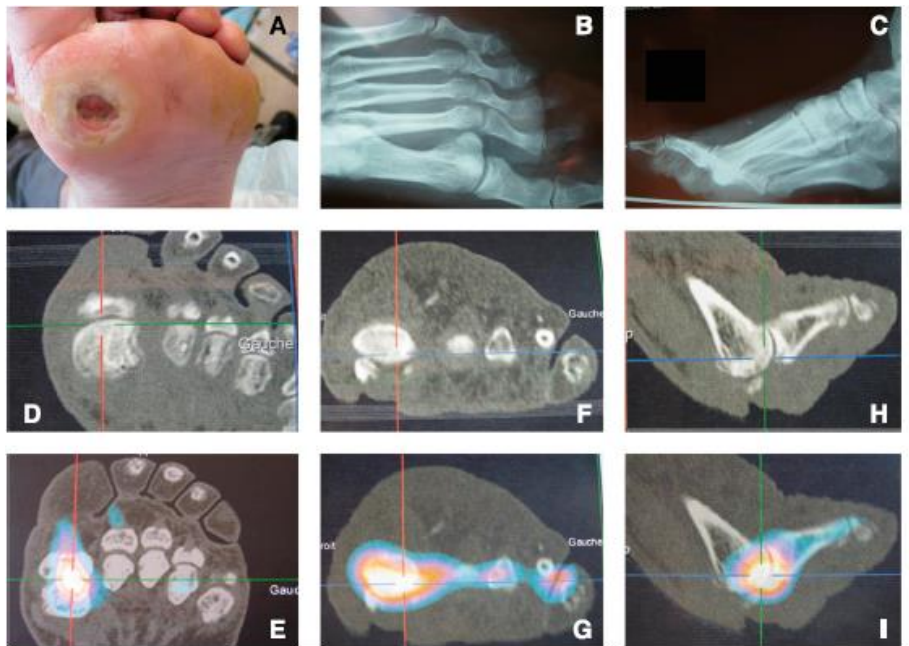
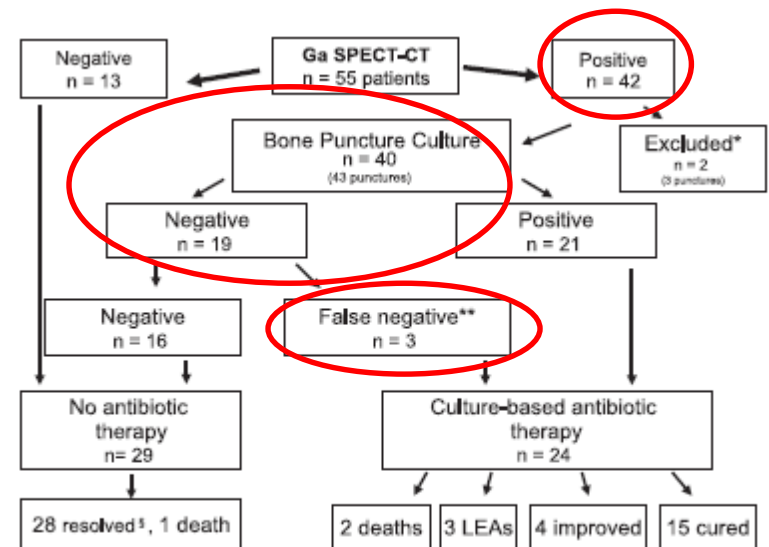


Figure 2—Chronic ulcer of the first metatarsal head. A: Photograph. B and C: Plain radiographs. D, F, and H: Three-dimensional X-ray tomographic images. E, G, and I: Corresponding ^{67}Ga SPECT/CT images. The gallium accumulation marks the best puncture place.



*Received antibiotic within previous 14 days ** Re-punctured within a month

[‡]No signs of osteomyelitis after one year without antibiotics LEA= lower extremity amputation

- Faisabilité , faux positifs

Les questions

- A-t-on vraiment le temps d'organiser une biopsie osseuse dans de bonnes conditions?
- Valeur du prélèvement profond après débridement?
- Faut-il complètement écarter les autres types de prélèvements?
 - Ecouvillon
 - Tissus profonds par la plaie dont os
 - Hémocultures

La « vraie » vie

- 2007-9, 51 hôpitaux
- 10 patients consécutifs, >18 ans, hospitalisés pour une infection du pied grade 2-4
- 304 patients inclus
- Microbiologie
 - Cultures were positive in 213 of the 251 patients (85%) from whom specimens were collected.
 - **Ecouvillonnage de la plaie (60%).**
 - Curettage was done in 49 patients (19%), as was bone biopsy.

**Prise en charge des patients
hospitalisés pour pied diabétique
infecté : résultats de l'étude
française OPIDIA J.-L. Richard et al**

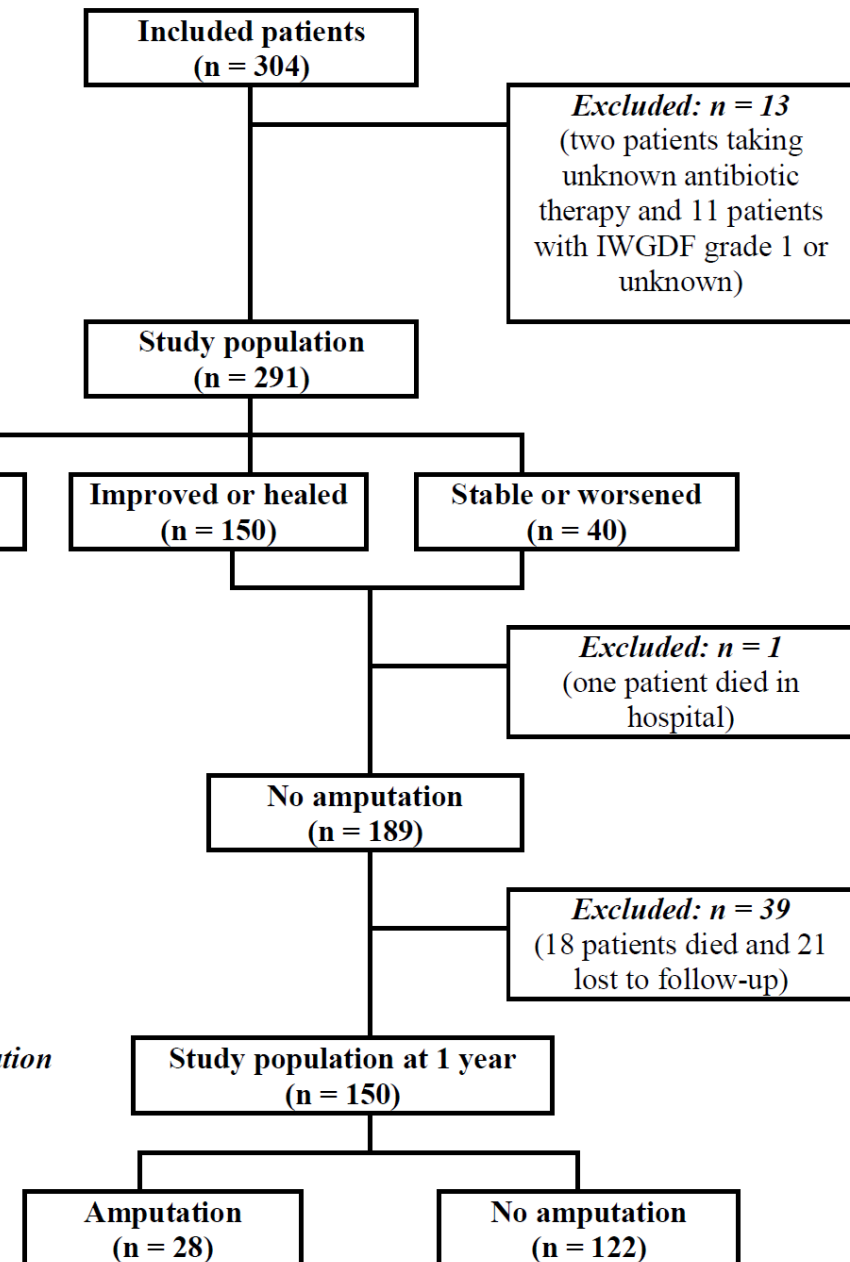
Hospitalization

Hospital discharge

*One-year post-hospitalization
visit*

Management of diabetic foot wound infections in study patients

Procedure	Total (n = 291)
Off-loading	270 (92.8%)
Bedside debridement ^a	195 (67.5%)
V.A.C. [®] therapy ^b	26 (9.0%)
Vascular reconstruction:	
bypass ^b	11 (3.8%)
angioplasty ^b	14 (4.9%)
Conservative surgery ^b :	
soft-tissue debridement ^c	45 (65.2%)
bone resection ^c	24 (34.8%)
Lower-limb amputation:	
minor	92
toes	82
transmetatarsal	10
major	9



Urgence ou pas?

- Risques:
 - ✓ Infection sévère des parties molles
 - ✓ Bactériémie/endocardite
(pas forcément sur les infections les plus sévères)
 - ✓ Amputation



Corrélation prél. profond/superficiel

Références	N° pts	Méthodes	% équivalence
Lavery, 1995	36	tissus profonds / biopsie osseuse	36
Slater, 2004	60	écouvillons / tissus profonds	62
Kessler, 2006	21	écouvillons / tissus profonds	19
Senneville, 2006	76	écouvillons / biopsie osseuse	17 (43)
Senneville, 2009	31	aspiration aiguille/ biopsie osseuse	24 (47)
Elamurugan, 2010	144	écouvillons / biopsie osseuse	38 (47)

Faut-il bannir l'écouvillon?

- Oui à l'hôpital
- En ville, peut être utile
 - ✓ Si écoulement pur et franc, après débridement
 - ✓ Fait par l'IDE avant ou sous antibiotique
 - ✓ Stt si *S. aureus*
- Pas d'écouvillon sur un ulcère, pas d'écouvillonnages répétés

Culture of Percutaneous Bone Biopsy Specimens for Diagnosis of Diabetic Foot Osteomyelitis: Concordance with Ulcer Swab Cultures

Eric Senneville,¹ Hugues Melliez,¹ Eric Beltrand,² Laurence Legout,¹ Michel Valette,¹ Marie Cazaubiel,¹ Muriel Cordonnier,¹ Michèle Caillaux,¹ Yazdan Yazdanpanah,¹ and Yves Mouton¹

¹Diabetic Foot Clinic and ²Department of Orthopedic Surgery, Dron Hospital, Tourcoing, France

Table 1. Distribution of pathogens cultured from 69 swab samples and 81 percutaneous bone biopsy samples obtained from 76 patients with diabetes with suspected foot osteomyelitis.

Variable	Swab samples	Bone biopsy samples
No. of samples	69	76
No. of isolates	109	125
<i>S aureus</i>	33%	26,4%
MRSA	10,1%	9,6%
Staph cog nég	4,6%	25,6%
Enterococci	5 (4.6)	10 (8.0)
Streptococci	22 (20.2)	15 (12.0)
Group A	1 (0.9)	1 (0.8)
Group B	12 (11.0)	10 (8.0)
Group C	2 (1.8)	1 (0.8)
Group D	1 (0.9)	0
<i>Streptococcus viridans</i>	4 (3.6)	1 (0.8)
<i>Streptococcus pneumoniae</i>	2 (1.8)	2 (1.6)
Other gram-positive cocci	2 (1.8)	3 (2.4)
Corynebacteria	8 (7.3)	3 (2.4)
Gram-negative bacilli	28 (25.7)	23 (18.4)
<i>Escherichia coli</i>	4 (3.6)	4 (3.2)
Cross species	1 (0.9)	2 (1.6)
Other species	4 (3.6)	7 (5.6)
<i>Staphylococcus aureus</i>	2 (1.8)	3 (2.4)
<i>Staphylococcus epidermidis</i>	4 (3.6)	2 (1.6)
<i>Staphylococcus saprophyticus</i>	7 (6.4)	3 (2.4)
<i>Staphylococcus sciuri</i>	6 (5.6)	2 (1.6)
<i>Staphylococcus carnosus</i>	3 (2.8)	6 (4.8)
<i>Staphylococcus lentus</i>	1 (0.9)	2 (1.6)
<i>Staphylococcus pasteuri</i>	1 (0.9)	2 (1.6)
<i>Staphylococcus carnosus</i>	1 (0.9)	1 (0.8)
<i>Staphylococcus aureus</i>	0	1 (0.8)

Sue E. Gardner,¹ Ambar Haleem,² Ying-Ling Jao,¹ Stephen L. Hillis,^{3,4,5} John E. Femino,⁶ Phinit Phisitkul,⁶ Kristopher P. Heilmann,² Shannon M. Lehman,¹ and Carrie L. Franciscus⁵

Cultures of Diabetic Foot Ulcers Without Clinical Signs of Infection Do Not Predict Outcomes

Culture of per-wound bone specimens: a simplified approach for the medical management of diabetic foot osteomyelitis

O. Lesens^{1,2}, F. Desbiez^{2,3}, M. Vidal^{1,2}, F. Robin^{2,4}, S. Descamps⁵, J. Beytout^{1,2}, H. Laurichesse^{1,2} and I. Tauveron^{2,3}

Clin Microbiol Infect 2011; **17**: 285–291

Patient characteristics				Frequency
Variables	Present study	Senneville et al. [14]	Aragon-Sanchez et al. [11]	
Number of samples	80	76	176	99%
Number of isolates	129	125	204	60%
Mean number of isolates per sample	1.6 ± 1	1.54	–	26%
Number of culture negative samples (%)	2 (2.5%)	2 ^a	20 (11%)	5%
Number (%) of isolates, by pathogen				50%
Gram-positive				37.5%
Staphylococci	61 (47%)	65 (52%)	117 (57%)	6% (5)
<i>Staphylococcus aureus</i>	43 (33%)	33 (26%)	95 (47%)	5% (4)
MRSA	24 (19%)	12 (10%)	35 (17%)	14% (11)
Coagulase-negative staphylococci	18 (14%)	32 (26%)	22 (11%)	
Streptococci	12 (9%)	15 (12%)	7 (3%)	7.5% (6)
Enterococci	15 (12%)	10 (8%)	2 (1%)	19% (15)
Corynebacteriae	5 (4%)	3 (2%)	–	35% (28)
Gram-negative bacilli	26 (20%)	23 (18%)	59 (29%)	9% (7)
<i>Pseudomonas aeruginosa</i>	10 (8%)	3 (2%)	18 (9%)	5% (4)
Anaerobes	5 (4%)	6 (5%)	–	
^a Not included in the present study.				45%
Within 3 months				53%
				72%

80 patients

6 décès

2 amputations pour
ischémie aigue

2 rechutes

5 stables: 4 ostéites
calcanéennes, 1

amputation

transméta

6 mois

Guérison 65 (81%)

1 an

100% guérison des
54 évaluables

Hémocultures?

17% d'HC +

Table 2. Bacteriological characteristics of positive blood culture group

	Bone culture	Blood culture
Patient 1	<i>S.agalactiae</i>	<i>S.agalactiae</i>
Patient 2	<i>Streptococcus sp</i>	<i>S.mitis</i>
Patient 3	<i>S. pyogenes</i> <i>P.mirabilis</i>	<i>S.pyogenes</i>
Patient 4	MSSA <i>S.pyogenes</i>	<i>S.pyogenes</i>
Patient 5	<i>S.mitis</i> <i>Haemophilus influenzae</i>	MSSA
Patient 6	MRSA	MRSA
Patient 7	MRSA <i>S.marcesens</i> <i>C.freundii</i>	MRSA
Patient 8	MRSA	MRSA
Patient 9	MRSA <i>E.faecalis</i> <i>Corynebacterium striatum</i>	<i>E.faecalis</i>
Patient 10	<i>E.faecalis</i> <i>Bacteroidesovatus</i>	<i>E.faecalis</i>

Table 1. Comparison between diabetic patients with positive versus negative blood cultures performed after bone debridement

	Total (n=57)	Positive blood culture (n=10)	Negative blood culture (n=47)	P
Age (years), mean $\pm$ sd	67 $\pm$ 12	69.3 $\pm$ 11.7	66.5 $\pm$ 12.1	0.54
Gender male, n (%)	43 (75.4)	10 (100.0)	33 (70.2)	0.05
Classification of Texas University, n (%)				
Grade 3 Stade D (vs. Grade 3 Stade B)	15 (26,3)	3 (30.0)	12 (25,5)	0.71
BMI (kg/m2), mean $\pm$ sd	29.1 $\pm$ 5.6	29.3 $\pm$ 4.9	29.0 $\pm$ 5.7	0.85
Diabetes type 2, n (%)	49 (86.0)	9 (90.0)	40 (85.1)	1.00
Diabetes time duration (years), median [IQR]	13 [8 – 25]	15 [8 – 25]	13 [8 – 25]	0.86
HbA1C at the time of diagnosis, mean $\pm$ sd	7.8 $\pm$ 1.8	6.8 $\pm$ 0.8	8.0 $\pm$ 1.9	0.02
Smoking, n (%)				
No	24 (43.6)	2 (20.0)	22 (48.9)	0.19
Weaned	12 (21.8)	4 (40.0)	8 (17.8)	0.72 ¹
Active	19 (34.6)	4 (40.0)	15 (33.3)	0.10 ²
Valvular impairment exposing to infective endocarditis, n (%)	10 (17.5)	4 (40.0)	6 (12.8)	0.04
CRP (mg/L), median [IQR]	20.8 [9.9 – 76]	53.5 [33 – 118]	17.3 [9 – 46.9]	0.02
Albuminemia (g/L), mean $\pm$ sd	34.1 $\pm$ 4.7	31.9 $\pm$ 3.7	34.6 $\pm$ 4.8	0.05
Antibiotics intake within last 7 days, n (%)	25 (44.6)	1 (11.1)	24 (51.1)	0.03
<i>S.aureus</i> carriage, n (%)	33 (57.9)	28 (59.6)	5 (50.0)	0.58
Hallux osteomyelitis, n (%)	21 (36.8)	5 (50.0)	16 (34.0)	0.47
Bone culture positive for <i>S.aureus</i> or <i>S.lugdunensis</i> , n (%)	34 (59,6)	5 (50)	29 (61,7)	0,49
Bone culture positive for <i>Streptococcus</i> sp, n (%)	11 (19,3)	5 (50)	6 (12,7)	0,007

¹No + Weaned vs Active

²No vs Weaned + Active

Cs pluridisciplinaire Clt-Fd

■ Débridement

Tableau 3 : Répartition des bactéries isolées des cultures obtenues des biopsies osseuses par peau saine et par le mal perforant plantaire chez les 20 patients inclus.

laie
u saine

Bactéries	Total	Nombre de cas où les cultures étaient positives au germe donné			Concordance ^a %
		BO par l'ulcère uniquement	BO par peau saine uniquement	Les 2 à la fois (BO par peau saine et par l'ulcère)	
<i>Staphylococcus aureus</i>	9	2	0	7	78
SCN	10	1	6	3	30
Entérocoques	5	3	0	2	40
Streptocoques	9	4	0	5	56
Corynébactéries	7	2	1	4	57
Bacilles gram positif	1	1	0	0	0
Bacilles gram négatif	10	5	0	5	50
Anaérobies	1	0	0	1	100
Total	52	18	7	27	52



Iconographie de la plaie le jour de la consultation



Historique de la plaie

[illegible]

Conclusion

Où?

- En ville
- Au lit du patient (cs, HdJ, hospitalisation)
- Au bloc opératoire

Comment?

- Ecouvillon?
- Prélèvement profond par la plaie (tissus, os)?
- Prélèvement osseux par peau saine
- A l'occasion d'une résection chirurgicale partielle ou d'une amputation
- Hémocultures?

Quand?

- Forte suspicion **clinique** ou radiologique d'IOA
- A-t-on le temps pour organiser le prélèvement dans les meilleures conditions?