MICROBIOLOGY, RISK FACTORS AND OUTCOME OF LOW-GRADE INDOLENT INFECTION OF LONG BONE NON UNIONS AFTER OPEN FRACTURE

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LA FOLLE JOURNÉE DU CRIOGO NANTES LE 30 JANVIER 2026

DISCLOSURES OF CONFLICTS OF INTEREST

- **Nothing to declare**

INTRODUCTION

- **The management of fracture non union remains complex**
  - **difficult to treat**
  - **not rare —— up to 10%** *Zimmermann, Eur Instruct Lect, 2010, DiSilvio, JBJS Open Access, 2018*

- **One of the difficulties is to distinguish infected non union (FRI) from aseptic non union**

- **Positive cultures reported in 10 to 40% cases of presumably aseptic non unions**

  Hackl et al, Injury, 2021, Wagner et al, Arch Orthop Trauma Surg, 2024, Trenkwalder et al, Injury, 2025

- **Most studies include both open and closed injuries, various anatomical sites**

  Wagner et al, Arch Orthop Trauma Surg, 2024

INTRODUCTION

THE AIMS OF THIS RETROSPECTIVE STUDY WERE TO....

1 - investigate the microbiology of long bone non union after open fracture

2 - identify risk factors for infection

3 - Analyze the outcome of patients with infected long bone non unions

MATERIALS AND METHODS

- **A planned primary surgical treatment of long bone shaft non union (*index surgery*) after an open fracture**
- **> 6 months FU**

Age < 18

Pregnancy

Previous treatment for FRI

Purulent drainage

Pathologic fracture

Non union was defined as the lack of any progressive healing on conventional biplanar radiographs 6 months after the initial injury

MATERIALS AND METHODS

- From 2005 to 2021
- 85 patients (64 males, 21 females)
- Age 38.5 ± 15 yrs (18-75 yrs)
- BMI 24.6 ± 4.7 kg/m^2 (16 - 38 kg/m^2)

n=58

n=21

n=6

Data: demographics, initial trauma, wound (Cauchoix-Duparc), characteristics of the non union, surgery,..

Infection: growth of the same microorganism from at least 2 bone/tissue samples

MATERIALS AND METHODS

SURGICAL PROCEDURES

Single stage surgery +++ / > 4 deep tissue samples

- Exchange nailing —- 46 cases (54%)
- Non union debridement + osteoperiosteal decortication —— 24 cases (28%)
- Non union debridement + Intertibiofibular autograft —— 9 cases (11%)
- Masquelet technique ——- 6 cases (7%)
- Flap —— 4 cases (5%)

Postoperatively, wide spectrum ATB therapy until analysis completed

RESULTS

INFECTED NON UNIONS

85 cases → **29 (34%)**

CoNS	*S aureus*	*C acnes*	*P aeruginosa*	Others
10	9	4	2	12

58 tibia → **21 (36%)**

6	4	4	2	6

21 femur → **7 (33%)**

4	5	0	0	5

6 humerus → **1 (17%)**

0	0	0	0	1

INDEPENDENT RISK FACTORS FOR INFECTED NON UNIONS

- **Diabetes mellitus (p=0.0017), presence of a fistula (p=0.001), Cauchoix-Duparc >= stage II (p=0.03), lower limb (NS)**

(= IIIB Gustilo-Anderson)

- **NS: Age, sex, BMI, ASA score, tobacco, alcohol, anatomical site, non union type (atrophic/hypertrophic)**

RESULTS

OUTCOME AFTER 3 YRS (6 MTHS-13 YRS)

		Infected non unions (n=29)	*Aseptic non unions (n=56)*	*p*
Union Rate	**64 (75%)**	16 (55%)	47 (84%)	0.004
Time to union	**11 mths**	12	11	0.36
Complication rate	**33 (39%)**	18 (62%)	15 (27%)	0.001
Revision surgery	**29 (34%)**	16 (55%) Amputation 10%	13 (23%)	0.003

DISCUSSION AND CONCLUSION

- Infection with no/almost no preoperative sign was present **in a 1/3 cases**
    - 10 % (5 to 16 %) in a recent meta analysis

Wagner et al, Arch Orthop Trauma Surg, 2024

- ***CoNS*, *Staph aureus* and *C acnes*** were the most prevalent germs
    - multiple deep samples
    - prolonged cultures

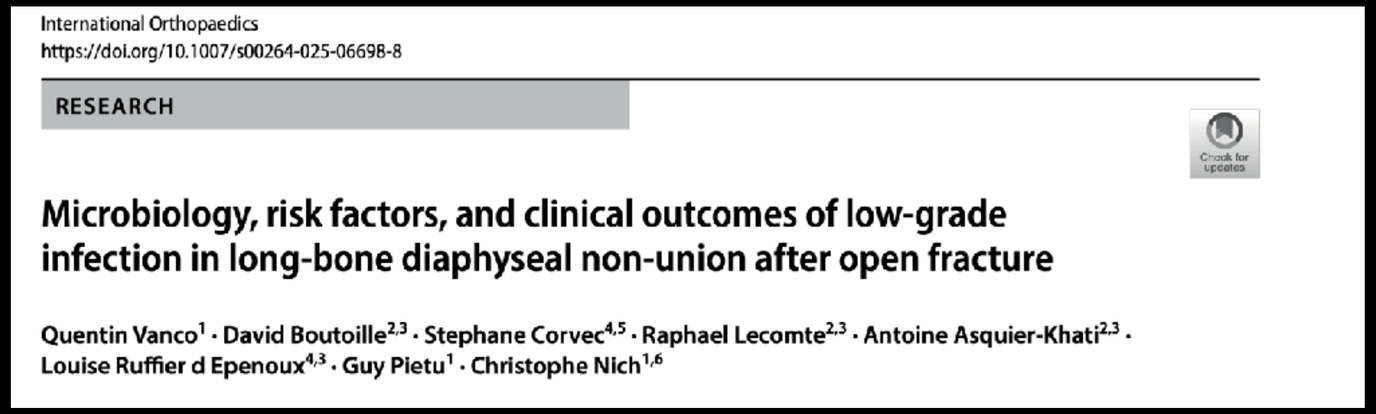
Aggarwal et al, CORR, 2013, Schäfer et al, Clin Inf Dis, 2008

DISCUSSION AND CONCLUSION

- Patients with a **fistula** (6%), **diabetes mellitus**, or **Initial Cauchoix-Duparc wound >= stage II**
    - Should be considered infected *a priori* and treated accordingly

- Patients should be informed that non unions with low grade infection have a **worst outcome** compared to aseptic non union (persistent non union, complications, multiple revisions and ultimately amputation (10%))

- Therapeutic strategy ? **2/3 cases received a wide spectrum ATB** while infection was ultimately ruled out



International Orthopaedics
https://doi.org/10.1007/s00264-025-06698-8

RESEARCH

Check for updates

Microbiology, risk factors, and clinical outcomes of low-grade infection in long-bone diaphyseal non-union after open fracture

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