

# Plasma Cell Infiltration on Histopathological Samples of Chronic Bone and Joint Infections due to *Cutibacterium acnes* : *A series of 21 cases*

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Hospices Civils de Lyon

Service de Maladie Infectieuses et Tropicales

Service de Pathologie Multi-Site

Service de Bactériologie

## Introduction

## Objectives

## Methods

## Results

## Discussion & Conclusion

- Histopathological definition of bone and joint infections (BJIs):
  - **Mirra's criterion :  $\geq 5$  neutrophils/field in 5 High power Fields (HPF; x400)**
- This definition is validate for **acute BJIs only**
- This threshold seems **too high** for the diagnosis of **chronic BJIs**
  - Especially due to *Cutibacterium acnes* and coagulase negative staphylococci
- Plasma cell is the prototype of the cell recruited in chronic infections

Parvizi J et al. J Arthroplasty. 2018.  
Bori G et al. Biomed Res Int. 2018.  
Bori G et al. Modern Pathol. 2006.  
Tande AJ et al. Clin Microbiol Rev. 2014.  
Kashima TG et al. Virchows Arch. 2015.



- Primary objective:

- To confirm that **Mirra's criterion is not adequate** for the diagnosis of **chronic *C. acnes* BJIs**

- Secondary objective:

- To determine if **plasma cell inflammation** could be a useful criterion for histopathological diagnosis of **chronic BJIs due to *C. acnes***



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- **25 consecutive patients** from 2009 to 2013 with ***C. acnes* BJI** were selected from Lyon BJI cohort study (CRIOAc Lyon)
- Histological analysis was performed only on **21 patients** with at least 2 *C. acnes* positive monobacterial cultures on separate deep samples

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## Histopathological analysis

- **High neutrophil infiltration** (Mirra's criterion :  $\geq 5$ /field in 5 HPFs)
- **High plasma-cell infiltration** (CRIOAc Lyon's criterion :  $\geq 5$ /field in 5 HPFs)
- Low neutrophil infiltration ( $<2$ , 2-5/field in 5 HPFs)
- Low plasma-cell infiltration ( $<2$ , 2-5/field in 5 HPFs)
- Other criteria : necrosis, granulation tissue, giant cells, fibrin

→ Patients were defined as **infected** if **high infiltration** (neutrophil or plasma-cell) was present

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## Clinical data of patients with *C. acnes* BJI

	Total population, n=25
<b>Gender, n (%)</b>	
Female	11 (44%)
Male	14 (56%)
<b>Median age, years (IQR)</b>	61.5 (40.5-75)
<b>Median delay between previous surgery and current diagnosis, days (IQR)</b>	322 (179-786)
<b>Type of implant</b>	
Prosthetic joint, n (%)	16 (64%)
Osteosynthesis, n (%)	9 (36%)
<b>Type of surgery</b>	
Debridement and implant removal, n (%)	22 (88%)
Debridement and implant retention, n (%)	3 (12%)

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Conclusion**Criteria****% of patient**Mirra's criterion ( $\geq 5$  neutrophils/field in 5 HPFs)**57.1%** (12/21)CRIOAc Lyon's criterion ( $\geq 5$  Plasma cells/field in 5 HPFs)**71.4%** (15/21)

Mirra's and/or CRIOAc Lyon's criteria

**81%** (17/21)**Neutrophil inflammation**

2-5/field in 5 HPFs

4.8% (1/21)

&lt;2/field in 5 HPFs

14.3% (3/21)

No PMN infiltration

23.9% (5/21)

**Plasma cell inflammation**

2-5/field in 5 HPFs

23.9% (5/21)

&lt;2/field in 5 HPFs

4.8% (1/21)

No plasma-cell inflammation

0% (0/21)

Fibrine

76.2% (16/21)

Necrosis

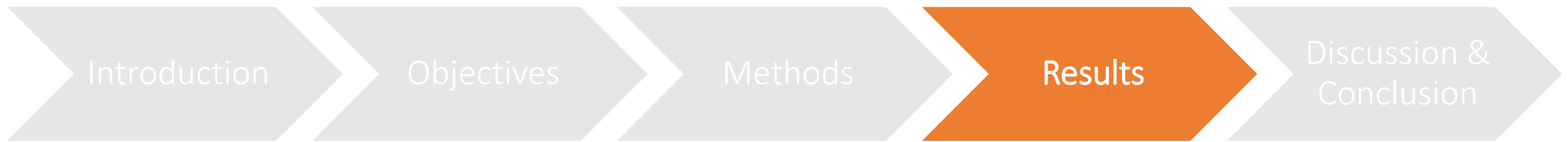
9.5% (2/21)

Granulation tissue

62% (13/21)

Giant cells

33.3% (7/21)



Criteria	% of patient
Mirra's criterion ( $\geq 5$ neutrophils/field in 5 HPFs)	57.1% (12/21)
CRIOAc Lyon's criterion ( $\geq 5$ Plasma cells/field in 5 HPFs)	71.4% (15/21)
Mirra's and/or CRIOAc Lyon's criteria	81% (17/21)
<b>Neutrophil inflammation</b>	
2-5/field in 5 HPFs	4.8% (1/21)
<2/field in 5 HPFs	14.3% (3/21)
No PMN infiltration	23.9% (5/21)
<b>Plasma cell inflammation</b>	
2-5/field in 5 HPFs	23.9% (5/21)
<2/field in 5 HPFs	4.8% (1/21)
No plasma-cell inflammation	0% (0/21)
Fibrine	76.2% (16/21)
Necrosis	9.5% (2/21)
Granulation tissue	62% (13/21)
Giant cells	33.3% (7/21)

→ Adding CRIOAc Lyon's criterion had restored 5/21 histopathological diagnosis of BJIs (23.9%)



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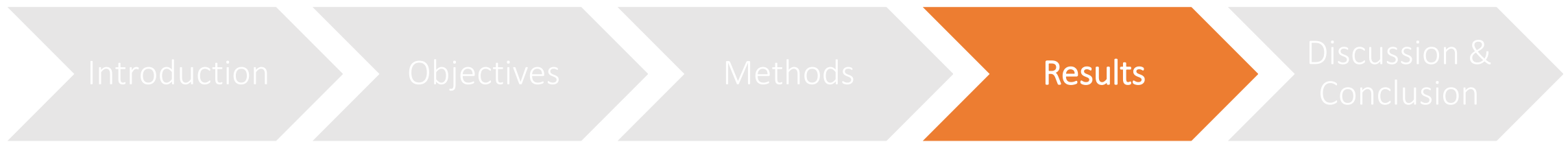
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Criteria	% of patient
Mirra's criterion ( $\geq 5$ neutrophils/field in 5 HPFs)	<b>57.1%</b> (12/21)
CRIOAc Lyon's criterion ( $\geq 5$ Plasma cells/field in 5 HPFs)	71.4% (15/21)
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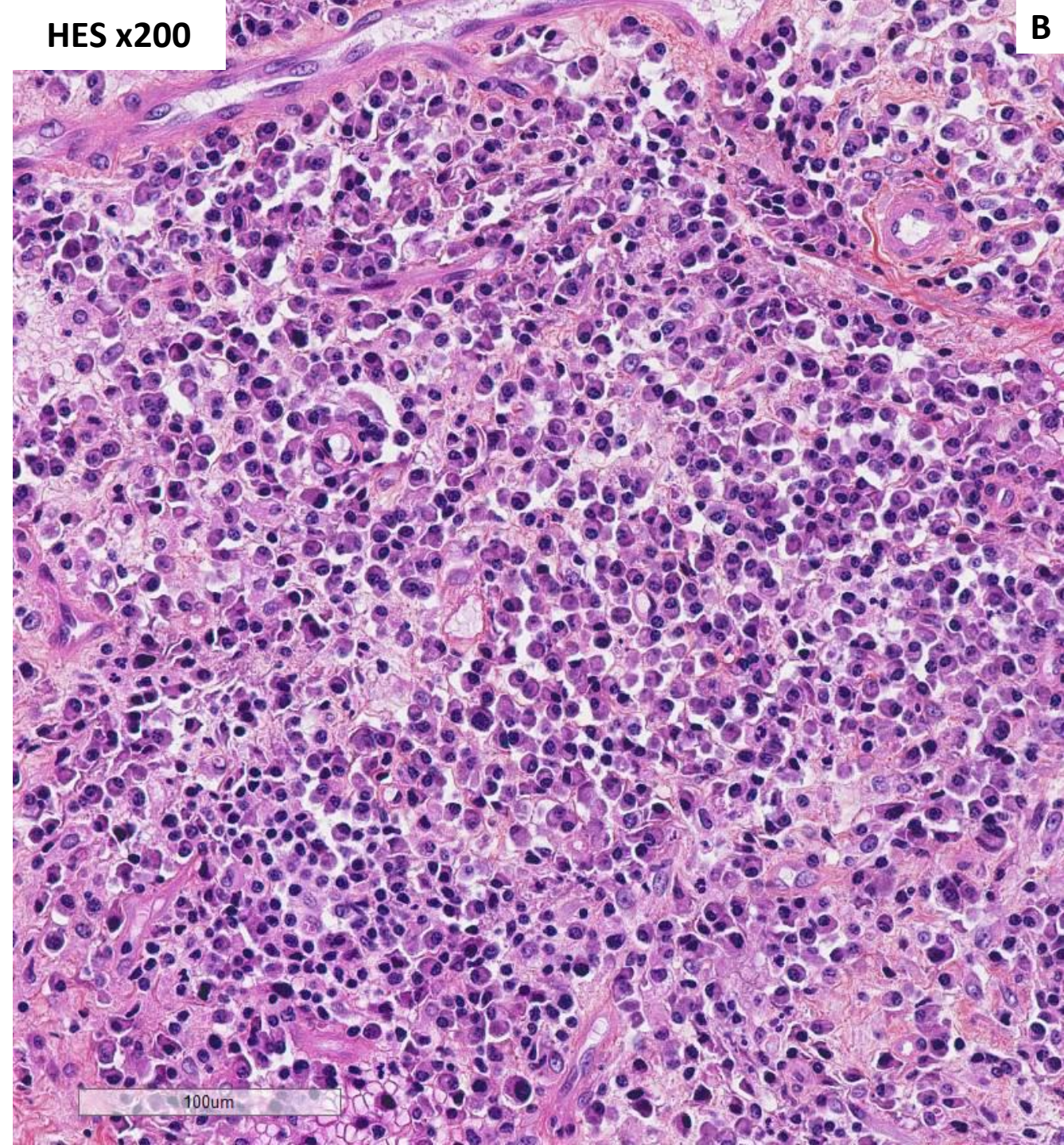
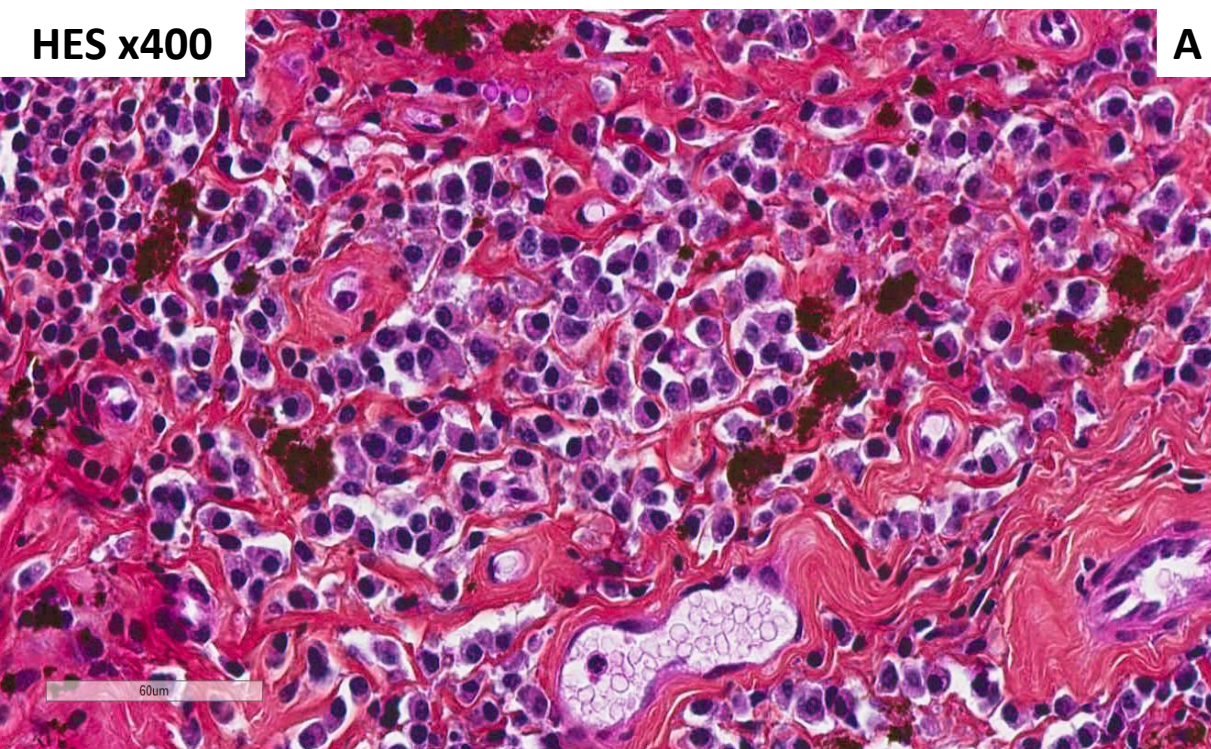
→ In 9/21 cases with negative Mirra's criterion (42.9%):

- **CRIOAc Lyon criterion +: 55.6% (5/9)**
- **2-5 plasma cells/field +: 44.4% (4/9)**
- Fibrine +: 66.7% (6/9)
- Granulation tissue +: 44.4% (4/9)
- Necrosis +: 11.1% (1/9)
- Giant cells +: 33.3% (3/9)



	Osteosynthesis implant (n=9)	Prosthetic implant (n=12)
<b>Mirra's criterion</b> (≥ 5 PMNs/field in 5 HPFs)	44.4 % (4/9)	<b>66.7%</b> (8/12)
<b>CRIOAc Lyon's criterion</b> (≥ 5 Plasma cells/field in 5 HPFs)	<b>88.9%</b> (8/9)	58.3% (7/12)





**HES = Hematoxylin-eosin-saffron**





- This is the first study to describe **plasma cell inflammation in chronic BJIs**
- In our study:
  - **CRIOAc Lyon's criterion** appeared to be a **better diagnostic criterion** than Mirra's criterion (71.4% *versus* 57.1%)
  - adding CRIOAc Lyon's criterion have **restored histopathological diagnosis in 23.9%** (5/21 cases)
- However, it is a **small series** and **plasma-cells are not specific of chronic BJIs**

→ Plasma cells could evoke an infection due to *C. acnes*, but must be part of a **multidisciplinary approach (biological and clinical criteria)**.

Bori G et al. Biomed Res Int. 2018.  
Kashima TG et al. Virchows Arch. 2015.  
Bori G et al. Modern Pathol. 2006.  
Pace T et al. J Arthroplasty. 1997.

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## *Lyon BJI Study group*

Thank you for your  
attention

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