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Successful treatment of *Pseudomonas aeruginosa* osteomyelitis with limited duration of antibiotic monotherapy

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Background

Osteomyelitis : a major therapeutic challenge

Relapse or failure ?

→ **prolonged** antibiotherapy

Prolonged antibiotherapy ?

→ selection of **resistance** (MDR),
adverse effects, etc...



What about *Pseudomonas aeruginosa*?

- *P. aeruginosa* : Gram negative aerobic bacteria
 - Under-reported pathogen in osteomyelitis
 - Particular concern: natural antibiotic resistance and ability to develop resistance and **biofilm**
 - Recurrences, difficult to treat
- antibiotic **combination**



Objective: What about Hôpital européen Georges Pompidou experience?

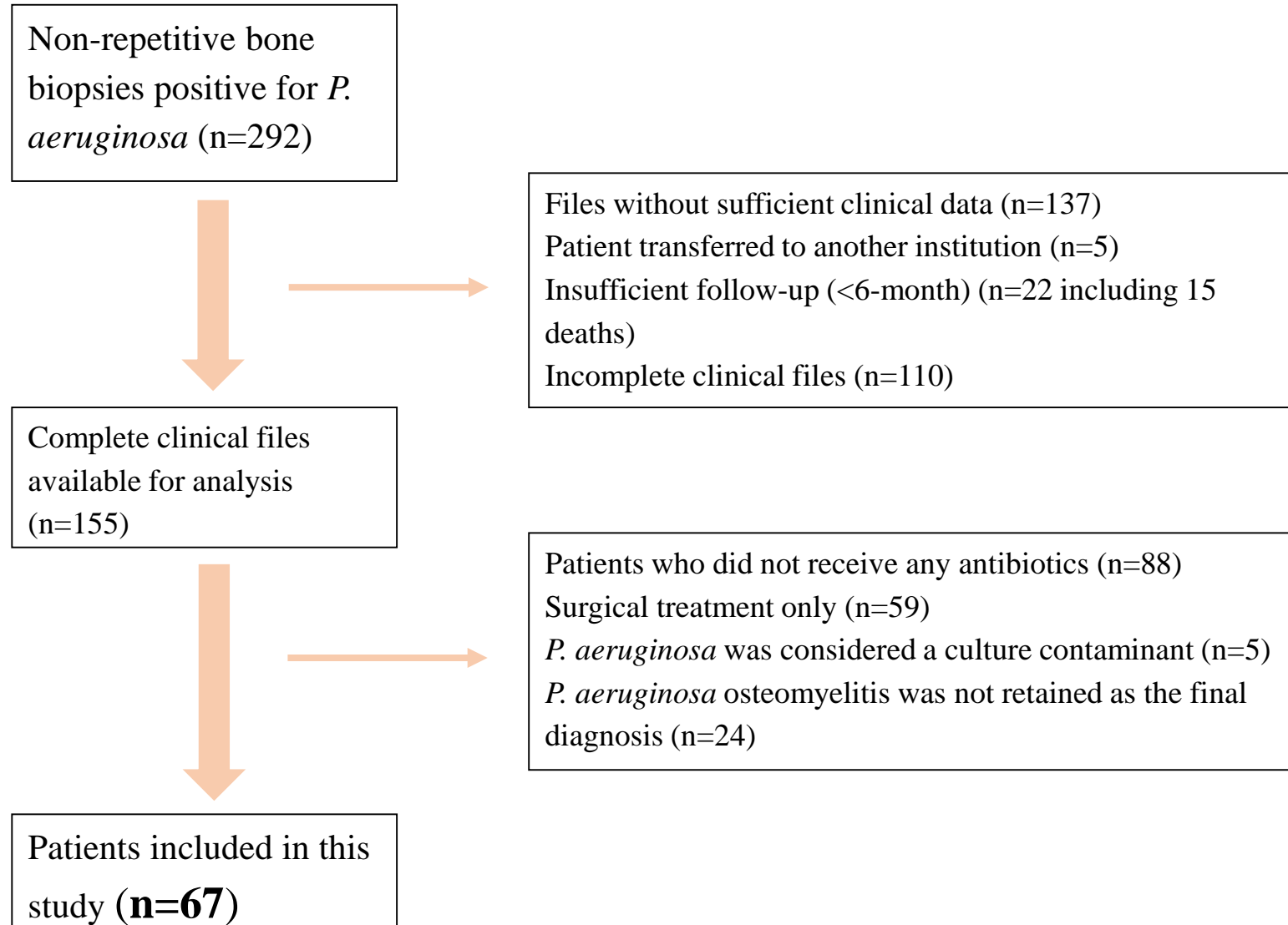
Is antibiotic combination necessary?

Is long course of antibiotic necessary?

Patients and methods

- Retrospective monocentric study
- 15 years
- All bone biopsies positive to *P. aeruginosa* (mono or polymicrobial)
- Exclusion criteria:
 - < 18 yo,
 - pregnancy,
 - uncertain diagnosis of persistent osteomyelitis after surgical excision,
 - files without sufficient clinical information,
 - absence of antibiotic treatment and follow-up less than 6 months.
- Treatment failure was defined as:
 - the persistence or recurrence of osteomyelitis with the initial *P. aeruginosa* strain,
 - or the reinfection with another pathogen,
 - or a re-operation for any cause,
 - or the necessity to introduce a new antibiotic therapy for a local recurrence.

Results: flowchart



Results

Table 1. Main variables of the patient population

Variable/category	No. patients (%), n=67
Age (yr)	
≤ 40	11 (16)
> 40-60	24 (36)
> 60-80	24 (36)
> 80	8 (12)
Gender, male sex	45 (67)
Comorbidity	
Diabetes	27 (40)
Smoking history	17 (25)
Immunosuppression ^a	9 (13)
Characteristics of osteomyelitis	
Chronic (> 1 month)	38 (57)
Surgical device	
Prosthesis	5 (7)
Osteosynthesis	21 (31)
Polymicrobial infection	42 (63)
Infection location	
Foot ^b	23 (34)
Lower limbs	29 (43)
Upper limbs	9 (13)
Other ^c	6 (9)
Initial surgical procedure	
Debridement	37 (55)
Removal of devices	12 (18)
Amputation	10 (15)
Revascularization	7 (10)
None	1 (1)

^a Including: cases of systemic malignancy, organ transplantation, chronic renal insufficiency, scleroderma

^b Including 20 (87%) cases of diabetic feet

^c Other infection sites including: spine, hip, knee, shoulder, ankle

Table 2. Antibiotic treatment of *P. aeruginosa* osteomyelitis

Treatment	Median duration, days (range)	Patients n (%)
All antibiotic treatments		67 (100)
Long-term treatment (> 6 weeks)	90 (56-90)	12 (18)
Short-term treatment (≤ 6 weeks)	45 (21-45)	55 (82)
Administration modalities		
Full-course IV treatment (no oral follow-on) ^a		15 (22)
Full-course oral treatment		6 (9)
Early IV and oral follow-on treatment		46 (69)
Time to oral treatment ^b	15 (4-56)	
Initial IV treatment		61 (91)
Monotherapy		23 (34)
Antipseudomonal penicillin		10
Cephalosporin		9
Carbapenem		3
Colimycin		1
Bitherapy (second drug ≤ 5 days)		34 (51)
Antipseudomonal penicillin + aminoglycoside		13
Cephalosporin + aminoglycoside		14
Carbapenem + aminoglycoside		1
β-lactam + ciprofloxacin		5
Ciprofloxacin + gentamicin		1
Full-course bitherapy ^c		4 (6)
Treatment comprising a fluoroquinolone		54 (81)

IV, intravenous

^a Oral fluoroquinolone was associated to the IV treatment in two cases

^b Initial IV treatment duration was unknown for three patients

^c Ceftazidime + levofloxacin, meropenem + piperacillin, piperacillin + ciprofloxacin, meropenem + ceftazidime, meropenem + colimycin.

Results: success and failures

- Treatment success = 79.1%
- Treatment failure:
 - 14 patients
 - 4/14 due to persistence of *P. aeruginosa* (2 out of the 4 received a combination therapy from the start).

Results

Antibiotic duration?

→ 82% of patients received antibiotherapy for 6 weeks or less : no difference

Mono or bitherapy against *P. aeruginosa* ?

→ 94% of patients received monotherapy : no difference

Maintening surgical devices ?

→ 14 out of 26 patients : no difference

Mono or polymicrobial : poorer outcome?

→ No: failures rates were similar : no difference

Discussion

- *P. aeruginosa* osteomyelitis : rare
- Success rate (79.1%): not inferior to the literature.
- No European guidelines covering bone and joint infections:

→ Quid of antibiotic duration with or without implant removal?
→ Quid of combination therapy?

Limitations

Monocentric

Retrospective design

Lack of power to conclude

Conclusion

- We advocate antibiotic **monotherapy** over the full course of the treatment
- Treatment duration should not exceed **six weeks**.