

# Is preoperative joint fluid aspiration useful for the diagnosis of periprosthetic joint infection?



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## OBJECTIVES

The management of arthroplasty failure differs depending on infection or not. So, the accuracy of preoperative diagnosis is fundamental. There is no single reference diagnostic test. Preoperative joint aspiration (PJA) plays a pivotal role but concordance with intraoperative cultures are inconsistent and reflect very different situations. Sensitivities among studies vary from 12 to 100%. The aim of our study was to evaluate the usefulness of periprosthetic fluid analysis in patients with suspected periprosthetic joint infection (PJI).

## METHODS

We included retrospectively the last 50 aspirations performed before surgery for hip and knee arthroplasty revision in patients with suspected PJI (over a 18 months period). Puncture was performed at different times of the revision : before the first surgery for prosthesis replacement, in case of 2 stage revision after the first stage and the antibiotic cure, or within months after prosthesis replacement for washing and surgical debridement in case of persistent or recurrent infection. Joint aspirations were realized in a dedicated room, performed by a radiologist under echography control.

We measured synovial fluid red and white blood cell count (WBC), synovial fluid polymorph nuclear neutrophil percentage (PMN%). After direct microscopic examination, joint fluids were incubated on habitual agar media and with enrichment broths on aerobic and anaerobic blood culture bottles. All the media were incubated for 15 days. In average, 5 intraoperative specimens were sampled during surgery. These samples were incubated on agar media and on liquid media (BHI and Schaedler) and checked daily for 15 days.

Suspicion of PJI was based on clinical history, physical signs, biological parameters (including CRP) and radiological data. Results of preoperative aspiration were compared with preoperative data and results of intraoperative samples.

## RESULTS

Fifty aspirations from 44 patients were studied, 18 for hip and 32 for knee suspicion arthroplasty infections. Planned surgery was one stage in 21 cases, 2 stages in 23 cases. Sex ratio was 0.92. Mean age was 70. The median time from first prosthesis implantation to PJA was 48 months (1 to 336), and from first clinical signs to PJA 9 months (1 to 240). Average delay between puncture and surgery was 22 days (1 to 90). Aspirations were performed 35 times before the initial surgery, 2 times before the second stage and 13 times after the revision.

Overall consistency between microbiological results of PJA and results from intra-operative samples was 64%. False-negative results for PJA occurred in 32% of cases and false-positive results in 4%. In 2 patients with confirmed infection (due to *P. acnes* and *Candida spp.*), microorganisms were found in the PJA but not in intraoperative samples. In 9 cases with polymicrobial PJI, PJA was unable to find it. Overall sensitivity is 61%, specificity is 80%, PPV is 93% and NPV is 33%.

Accuracy of PJA was significantly higher when : delay since the last surgery was less than 18 months (80% versus 40%), clinical signs were related to acute infections (fever, inflammation) and present since less than 12 months, aspiration volume was > 5 ml, WBC in articular fluid was > 5000/mm<sup>3</sup> with PMN ≥ 90%, fluid aspect was turbid, value of CRP in serum was > 60 mg/l.

We did not find any significant difference between hip and knee.

Table 1 :

Relation between microbiological results and accuracy of the preoperative aspirations.

Samples were infected with 1 bacteria species in 32 cases, with 2 bacteria species in 9 cases and with 3 bacteria species in 2 cases.

Cst : consistent

Fpos : False positive

Fneg : False negative.

Sterile : 9	Cst : 8, Fpos : 1
CoNS : 21	Cst : 5, Fneg : 7, Fpos : 1
<i>S. aureus</i> : 11	Cst : 5, Fneg : 5
<i>Enterobact.</i> : 6	Cst : 5, Fneg : 1
<i>S. lugdunensis</i> : 5	Cst : 3, Fneg : 1
<i>Streptococcus</i> : 3	Cst : 2, Fneg : 1
<i>P. acnes</i> : 2	Cst : 1, Fneg : 1
<i>Candida spp</i> : 1	Cst : 1
<i>P. aeruginosa</i> : 1	Cst : 1
<i>E. faecalis</i> : 1	Fneg : 1

## CONCLUSION

In our study, microbiological results from PJA in patients with suspected PJI gave false results in 36% of cases. PJA seems to be not useful especially when the arthroplasty is performed more than 18 months before PJA, if there are no clinical signs of acute infection or if serum CRP value is lower than 60 mg/l. Moreover, polymicrobial infection was not detected by PJA. Although, the false negative results could conduct to delay antibiotherapy, we did not found any significant difference in the infectious or functional evolution (median follow-up of 12 months).