

Open Biopsy as a Safe Procedure for Suspected PJI Following Double-Negative Joint Aspiration of the Hip or Knee

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Introduction

Diagnosis of periprosthetic joint infection (PJI) is complex, especially in complex cases with **double culture-negative joint aspirations**. Open biopsies can be performed during the diagnostic work-up to identify the underlying microorganism profile and increase the chance of treatment success. The aim of this study was to report the **reinfection and rerevision rates** of patients who underwent one- or two-stage septic exchange and had an open biopsy following double-negative joint aspirations.

Methods

- **Study Design:** A retrospective single-center review of an institutional database from 2015 to 2018.
- **Participants:** 62 patients (37 knees, 25 hips) with a mean age of 66 years. All patients had a suspected PJI, a double-negative joint aspiration, and a subsequent open biopsy.
- **Intervention:** Patients with positive open biopsy cultures underwent a **one-stage exchange (n=44)**, while those with negative cultures underwent a **two-stage exchange (n=18)**.
- **Outcomes Measured:** Rerevision, reinfection, complications, survivorship of implants, and the pathogens involved at a mean follow-up of 83.2 months.

Results

- **Pathogen Detection:** The open biopsies successfully identified a causative pathogen in **70.9% of cases** (44 out of 62), allowing for an indication for one-stage exchange.
- **Pathogen Profile:** The most frequently detected microorganisms were low-virulent bacteria, namely *Staphylococcus epidermidis* (29.5%) and *Propionibacterium acnes* (20.5%).
- **Overall Success:** Treatment was **successful in 75.8% of cases**. Reinfection was the most frequent cause of failure (14.5%).
- **Revision Rates:** There was **no significant difference** found in rerevision ($P = 0.38$) and reinfection ($P = 0.63$) rates between patients who underwent one-stage exchange versus two-stage exchange. Similarly, there was no difference between hip and knee patients regarding rerevision ($P = 0.53$) or reinfection ($P = 0.21$).

Variable		Hips	Knees	P-value
Age, mean $\pm$ SD		66 $\pm$ 10.7	66 $\pm$ 10.2	0.96
Time from biopsy to exchange, mean $\pm$ SD (w)		5.5 $\pm$ 3.9	7.1 $\pm$ 4.7	0.20
Type of exchange	One-stage, n (%)	21 (33.9)	23 (37.1)	0.63
	Two-stage, n (%)	4 (6.5)	14 (22.6)	
Number of re-revisions (%)		5 (20)	10 (27)	0.53
Number of re-infections (%)		3 (12)	6 (16.2)	0.21
Follow-up in months, mean $\pm$ SD		84.6 $\pm$ 12.1	82.3 $\pm$ 10.3	0.43

Pathogen	Overall number of cases (%)	Hips, n (%)	Knees, n (%)
<i>Staphylococcus Epidermidis</i>	13 (29.5)	6 (13.6)	7 (15.9)
<i>Staphylococcus Aureus</i>	5 (11.4)	-	5 (11.4)
<i>Staphylococcus Cohnii</i>	1(2.3)	1(2.3)	.
<i>Staphylococcus Saccharolyticus</i>	1(2.3)	1(2.3)	-
<i>Propionibacterium Acnes</i>	9 (20.5)	5 (11.4)	4 (9.1)
<i>Enterococcus Faecalis</i>	1(2.3)	1(2.3)	
<i>Streptococcus Oralis</i>	2 (4.5)	-	2 (4.5)
<i>Streptococcus Parasanguinis</i>	1(2.3)	-	1(2.3)
Polymicrobial infections	11(25)	6 (13.6)	5 (11.4)

Conclusion

Incorporating open biopsy into the diagnostic work-up allowed the detection of causative pathogens in **70.9% of cases** of suspected hip or knee PJI that had double-negative joint aspirations. This crucial step successfully allowed patients to undergo a **one-stage exchange without increasing the risk of reinfection or rerevision**, demonstrating it is a safe and highly effective diagnostic procedure.

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