

Knee Infection Is Associated with Lower Synovial Fluid pH Regardless of Prosthesis Joint Status or Antibiotic Exposure

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1 Introduction & Aim

- Synovial fluid pH is a potential simple and rapid diagnostic parameter for periprosthetic joint infection (PJI) after total knee arthroplasty.^{1,2}
- Metal prosthesis dissolution and antibiotic administration could confound synovial fluid pH as a diagnostic signal.^{3,4}
- Aim:** Evaluate whether infection, presence of a prosthetic joint, and antibiotic exposure affect synovial fluid pH.

3 Results: Synovial Fluid pH by Cohort

- All patients with knee infections received antibiotics prior to aspirate.
- Synovial fluid pH from infected native knees (6.77±0.19) was significantly lower than the pH of non-infected native knees with (7.57±0.18, $p=0.016$) or without (7.59±0.17, $p=0.004$) antibiotics.
- Synovial fluid pH from infected prosthetic knees (7.33±0.47) trended lower than non-infected prosthetic knees with (7.48±0.24, $p=0.526$) or without (7.45±0.11, $p=0.606$) antibiotics.
- Prosthesis presence and antibiotic exposure alone did not significantly alter synovial fluid pH (all $p>0.05$).

Table 1. Synovial fluid pH across cohorts stratified by infection status, joint type, and antibiotic exposure.

Cohort	N	Mean pH
Total	112	7.52±0.24
1 - Non-infected native knees without antibiotics	7	7.59±0.17
2 - Non-infected native knees with antibiotics	80	7.57±0.18
3 - Infected native knees with antibiotics	3	6.77±0.19
4 - Non-infected prosthetic knees without antibiotics	4	7.45±0.11
5 - Non-infected prosthetic knees with antibiotics	13	7.48±0.24
6 - Infected prosthetic knees with antibiotics	5	7.33±0.47

2 Materials & Methods

- Synovial fluid collected from 112 patients (mean age 65.3±10.8 yrs; 50 M / 62 F) at a tertiary center, April 2025 to April 2026.
- Aspirated superolaterally through skin (outpatient; no antibiotics) or through the capsule after skin incision (operative; antibiotics).
- pH measured in triplicate per sample and averaged (mean ± standard deviation).
- Patients stratified into 6 cohorts by infection status (yes/no), joint type (native/prosthetic), and antibiotic exposure (yes/no).

	Cohort 1	Cohort 2	Cohort 3	Cohort 4	Cohort 5
Cohort 2	0.689				
Cohort 3	0.004	0.016			
Cohort 4	0.117	0.110	0.012		
Cohort 5	0.228	0.225	0.007	0.730	
Cohort 6	0.280	0.319	0.060	0.606	0.526

Figure 1. Pairwise comparisons of synovial fluid pH between cohorts. Statistical significance is defined as $p\leq0.05$, and significant p -values are bolded in red.

Cohort

- 1 - Non-infected native knees without antibiotics
- 2 - Non-infected native knees with antibiotics
- 3 - Infected native knees with antibiotics
- 4 - Non-infected prosthetic knees without antibiotics
- 5 - Non-infected prosthetic knees with antibiotics
- 6 - Infected prosthetic knees with antibiotics

4 Conclusions

- Synovial fluid pH from human knees is slightly alkaline and above blood pH (7.4) in all cohorts except for infection.
- Infection is associated with decreased synovial fluid pH, albeit only infected native knees move into an acidic pH range (<7.0).
- This association persists in the presence of prosthesis and with prior antibiotic administration, neither of which appears to significantly influence synovial fluid pH.
- These findings support reevaluation of the predictive value of synovial fluid pH for PJI diagnosis and its potential role in guiding antibiotic treatment choice.

KEY FINDING

6.77 vs 7.57/7.59

Synovial fluid pH from infected native knees versus non-infected native knees with ($p=0.016$) or without ($p=0.004$) antibiotics

References

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