Synovial Fluid Analysis in Acute Post-Operative Total Knee Arthroplasty Patients; What is Normal?

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INTRODUCTION: Synovial fluid analysis (SFA) is a critical diagnostic tool for evaluating acute postoperative complications following total knee arthroplasty (TKA), particularly in the detection of periprosthetic joint infection (PJI). PJI is a significant cause of morbidity and can be challenging to diagnose due to overlapping symptoms with normal postoperative inflammation. Accurate and timely diagnosis is essential for effective management and to prevent further complications. This study aims to establish normative synovial fluid analysis values intraoperatively and at one, three, and five weeks postoperatively.

METHODS: Patients scheduled for primary TKA were prospectively enrolled from the principal investigator's clinic. Arthrocentesis was performed intraoperatively and at one, three, and five weeks postoperatively. Synovial fluid samples were analyzed for red blood cell count (RBC), total nucleated cell count (TNCC), and % neutrophils using an IDEXX ProCyte diagnostic machine.

RESULTS: To date, 26 patients have been enrolled, with eight withdrawals and eleven patients completing study procedures. The intraoperative TNCC averaged 266 cells/mm^3. The mean TNCC at week one was 5,127 cells/mm^3. By week three, the TNCC average had decreased to 2,649 cells/mm^3. At week five, the TNCC further declined to 2,071 cells/mm^3. The mean neutrophil percentage was 20.3% intraoperatively, peaked at 78.2% at week one, dropped to 55% at week three, then 50.9% at week five.

DISCUSSION AND CONCLUSION:
These preliminary results establish early postoperative reference ranges for synovial fluid cell counts following TKA, suggesting that some previously accepted thresholds for infection inaccurately estimate normal values in the acute setting. Further patient enrollment is needed to validate these findings and enhance diagnostic accuracy in differentiating infection from expected postoperative inflammation.

Table 1: Patient and Surgical characteristics

Characteristics	
n=11	
Age (years)	56.9 ± 10.6 [52.0, 61.8]
BMI	38.4 ± 7.8 [34.7, 42.0]
Gender	
Female	4 (36.5%)
Male	7 (63.5%)
Smoking status	
Non-Smoker	6 (55%)
Former-Smoker	5 (45%)
Cement vs Press-Fit	
Cemented	5 (45%)
Press-Fit	6 (55%)

Values are expressed as mean ± SD with 95% confidence interval in brackets

Postoperative Neutrophil %

Total Nucleated Cell Count After TKA