

BACKGROUND

- Crystal-positive TKA aspirates can mimic PJI through pain, effusion, erythema, and elevated serum and synovial inflammatory markers
- Treatment diverges: isolated crystalline arthropathy is usually managed medically, whereas PJI often requires surgery and prolonged antimicrobial therapy
- Crystal inflammation may exceed conventional MSIS thresholds; crystals neither confirm nor exclude infection

OBJECTIVES

- Identify clinical and laboratory findings distinguishing isolated crystalline arthropathy from concomitant CA-PJI after TKA
- Evaluate diagnostic performance, candidate thresholds, false-positive findings, and culture-negative presentations in crystal-positive aspirates

METHODS

- Retrospective single-center study of primary or revision TKA aspirations from 2019 to 2024
- 333 of 367 records were excluded for incomplete or ineligible workup, insufficient follow-up, or indeterminate diagnosis
- 34 crystal-positive cases had a complete PJI workup and at least one year of follow-up: 10 CA-PJI and 24 isolated CA
- Aspirates underwent cell count with differential, 14-day aerobic and anaerobic cultures, and polarized-light crystal analysis
- Final diagnosis integrated preoperative and intraoperative findings from the 2018 MSIS framework
- Scores ≥ 6 confirmed CA-PJI; lower or inconclusive scores underwent clinical and microbiological adjudication
- Fisher exact and Wilcoxon tests compared groups
- ROC analysis used DeLong confidence intervals and Youden-optimized candidate thresholds
- Sensitivity analysis excluded four low-pretest-probability aspirations; all patients had at least one year of outcome follow-up

Figure 1: Synovial WBC vs PMN% by Diagnosis

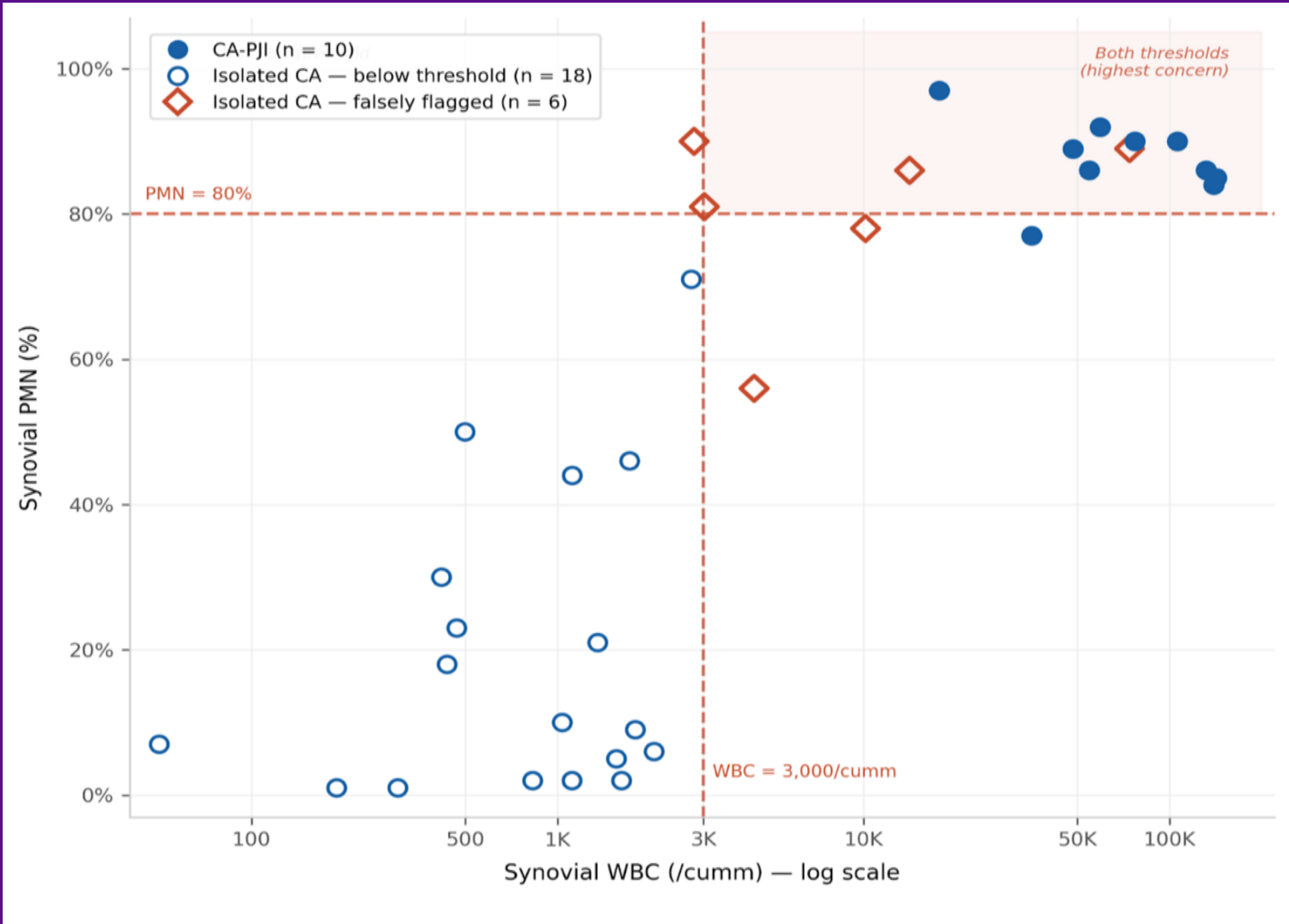


Table 1: Key Clinical and Diagnostic Findings

Finding	CA-PJI / cut-off	Isolated / Sens.	p / Spec.	AUC
Clinical presentation				
Cohort	10	24	-	n=34
ED presentation	80%	25%	0.006	
Acute symptoms <3 wk	100%	54%	0.014	
Fever	11%	11%	1.000	
Aspirate culture positive	70%	0%	<.001	7/10
CPPD	32/34	94%	-	
Laboratory separation				
CRP median (mg/L)	215	4	$\leq .006$	
Synovial WBC median	68,220	1,456	$\leq .006$	
Conventional false positives	-	6	-	isolated
Candidate diagnostic performance				
Synovial WBC	17,670	100%	95.8%	.979
Synovial PMN	77%	100%	79.2%	.923
CRP (mg/L)	71.1	90%	84.2%	.942
MSIS minor score	≥ 4	90%	91.7%	.975
Culture-negative CA-PJI	30% asp.	40% IO	-	-
External validation	required	n=10	-	yes

RESULTS

- Concomitant CA-PJI occurred in 10/34 cases (29%); 24/34 (71%) had isolated CA
- CPPD predominated in 32/34 cases (94%)
- Emergency presentation was 80% vs 25% ($p = 0.006$), and acute symptoms were 100% vs 54% ($p = 0.014$)
- Erythema (70% vs 35%) and effusion (100% vs 78%) were more frequent but not statistically significant
- Fever occurred in 11% of both groups
- Aspirate cultures were positive in 7/10 CA-PJI cases vs 0/24 isolated-CA cases ($p < 0.001$)
- 30% of CA-PJI aspirates and 40% of intraoperative cultures were negative
- All serum and synovial markers were higher with CA-PJI (all $p \leq 0.006$)
- Median CRP was 215 vs 4 mg/L; six isolated-CA cases crossed a conventional synovial threshold
- Candidate thresholds were synovial WBC 17,670 cells/ μ L (AUC 0.979), PMN 77% (0.923), CRP 71.1 mg/L (0.942), and MSIS minor score ≥ 4 (0.975)
- One initially missed infection required DAIR 71 days later

CONCLUSIONS

- Crystals do not rule out PJI: nearly 1 in 3 crystal-positive TKA aspirations had concomitant infection, including culture-negative CA-PJI
- Synovial WBC and CRP were the strongest individual candidate discriminators
- The composite MSIS minor score also performed well
- PMN% alone was less specific
- Thresholds should complement cultures, complete MSIS assessment, intraoperative findings, and follow-up
- External validation is required

Disclosure: The authors have something to disclose. Detailed disclosure information is available via: AAOS Orthopaedic Disclosure Program on the AAOS website at <http://www.aaos.org/disclosures>