Synovial Calprotectin Accurately Detects Periprosthetic Joint Infection in Tumor Megaprostheses: A Prospective Cohort Study

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Significance & Hypothesis/Techniques: Periprosthetic joint infection (PJI) after tumor megaprosthetic reconstruction is difficult to diagnose because conventional serum and synovial markers often perform poorly in this biologically and surgically complex setting. We hypothesized that synovial calprotectin, measured with a rapid lateral-flow assay, would accurately detect PJI in patients with megaprostheses and improve classification of diagnostically equivocal cases.
Innovation: This is, to our knowledge, the first prospective diagnostic accuracy study of synovial calprotectin focused specifically on tumor megaprosthetic reconstructions. The study also evaluates performance in low-CRP presentations and in cases classified as inconclusive by 2018 International Consensus Meeting (ICM) criteria.
Approach (Materials & Methods): Twenty consecutive adults with suspected infection after tumor-related megaprosthetic reconstruction at a tertiary sarcoma referral center were prospectively evaluated. Synovial calprotectin was measured at aspiration; values ≥50 mg/L were considered positive. Results were compared with a predefined composite infection reference standard based on clinical, microbiological, operative, and follow-up data. Secondary analyses assessed agreement with 2018 ICM classification, performance in low-CRP cases, and exploratory threshold behavior.
Results: Thirteen of 20 patients (65%) were classified as infected. Synovial calprotectin yielded 92.3% sensitivity, 100% specificity, 100% positive predictive value, and 87.5% negative predictive value, with no false-positive results. The area under the receiver operating characteristic curve for continuous values was 1.00. Agreement with ICM classification was substantial (κ=0.76). Among three ICM-inconclusive cases, calprotectin correctly reclassified two. In patients with CRP <10 mg/L, calprotectin maintained 75% sensitivity, 100% specificity, and 85.7% negative predictive value.
Discussion & Impact: Synovial calprotectin demonstrated excellent rule-in and rule-out performance for PJI in tumor megaprosthesis patients, including diagnostically difficult low-CRP and ICM-inconclusive cases. These findings support calprotectin as a rapid, practical adjunct for infection workup in orthopedic oncology and justify larger multicenter validation.