

C-reactive protein kinetics as an early predictor of outcome in two-stage revision for periprosthetic joint infection

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Two-stage exchange remains the standard treatment for chronic prosthetic joint infections (PJI), but accurately confirming infection eradication before reimplantation remains challenging. No single test reliably predicts persistent infection or reinfection, requiring integration of clinical, microbiological, synovial, imaging, and inflammatory markers. C-reactive protein (CRP) is widely used but is influenced by infection, surgical trauma, and systemic inflammation. Serial CRP measurements may provide greater clinical value than isolated values. This study evaluated weekly postoperative CRP kinetics after explantation and their association with infection eradication and treatment failure.

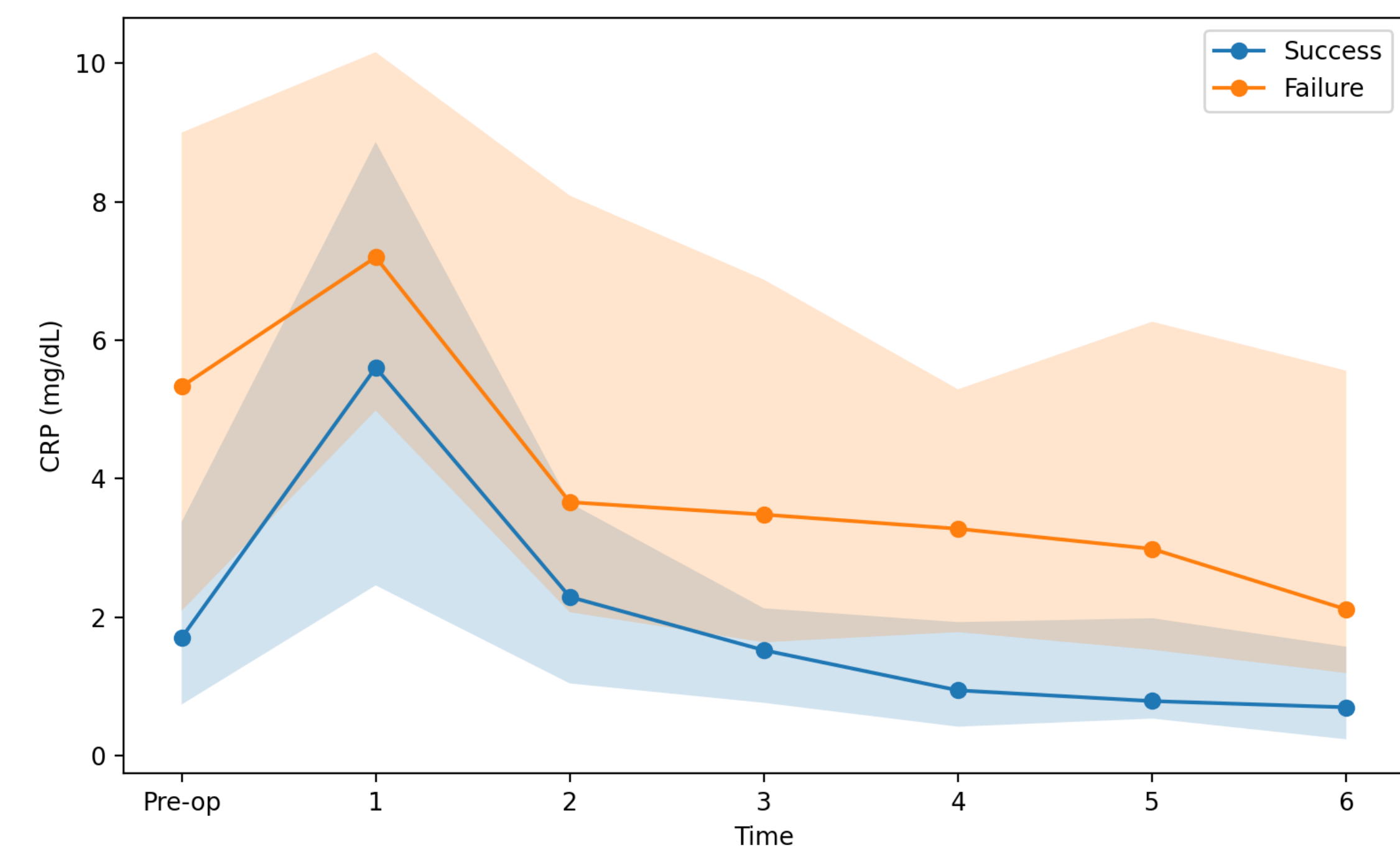
METHODS

After Institutional Review Board approval, a retrospective cohort study included consecutive patients undergoing two-stage revision for chronic hip or knee PJI between January 2020 and August 2024. PJI was diagnosed according to EBJIS criteria. Eligible patients completed reimplantation, had weekly postoperative CRP measurements, and ≥ 12 months' follow-up. Patients with acute PJI, previous two-stage revision, spacer in situ at referral, fungal or multifocal infection, retained hardware, spacer complications, inflammatory or systemic conditions affecting CRP, incomplete records, or inadequate follow-up were excluded. Treatment followed a standardized protocol of explantation, debridement, antibiotic-loaded spacer placement, and pathogen-directed antibiotics. Weekly CRP kinetics were compared according to treatment outcome (modified Delphi criteria).

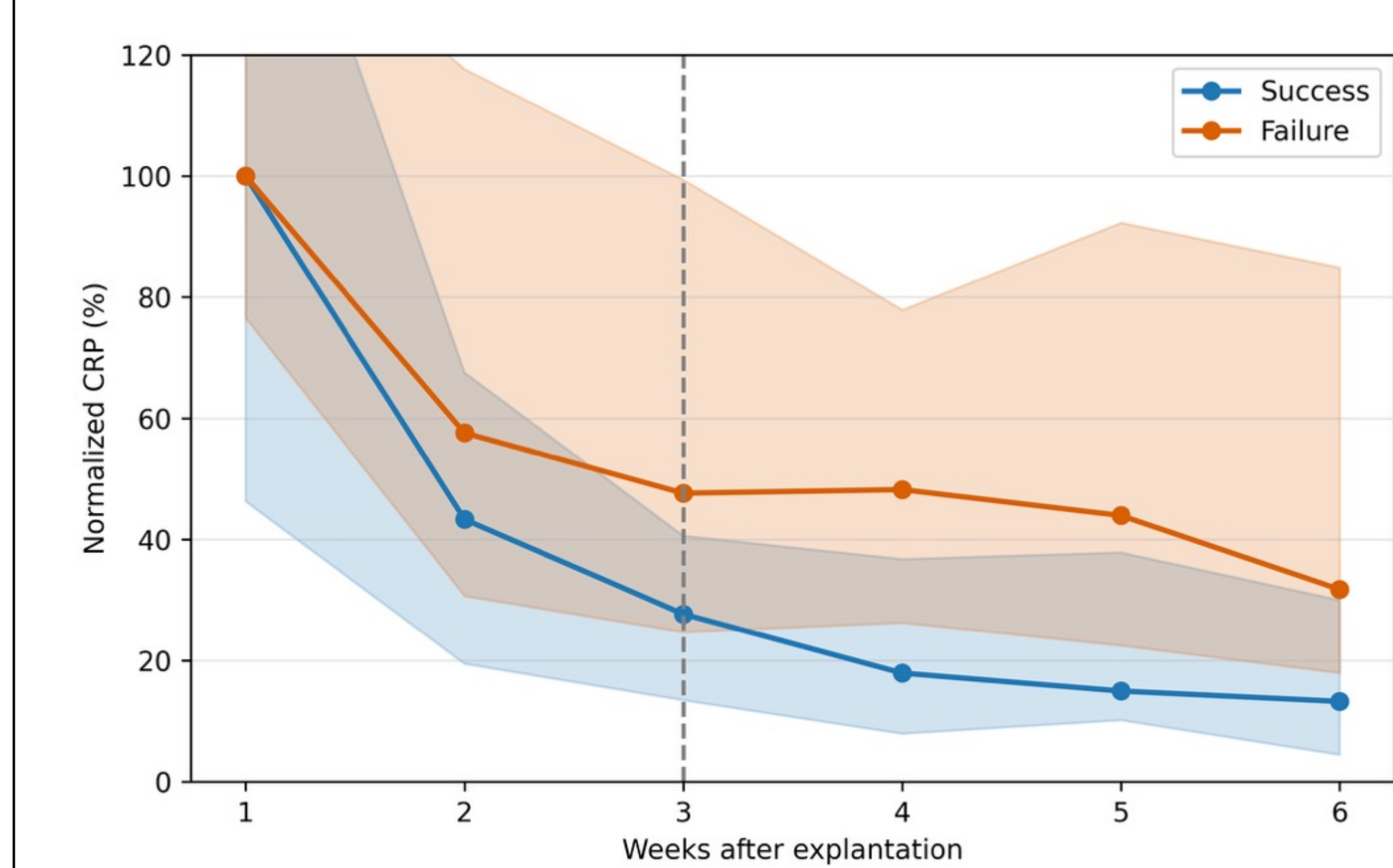
Postoperative week	AUC	Optimal CRP cut-off (mg/dL)	Sensitivity	Specificity
Week 2	0.699	4.16	50.0%	85.1%
Week 3	0.744	2.87	55.6%	83.3%
Week 4	0.781	1.86	75.0%	72.7%
Week 5	0.778	1.41	81.3%	71.1%
Week 6	0.782	1.01	87.5%	61.5%

CONCLUSIONS

Serial CRP kinetics may provide greater prognostic value than isolated measurements during two-stage revision for PJI. Following the expected postoperative peak, successful cases demonstrated rapid CRP decline from Week 2, whereas treatment failures showed persistent elevation or fluctuating trajectories. Week 3 represented the earliest clinically informative time point, while diagnostic performance was highest during Weeks 4–6. The progressive reduction in optimal CRP thresholds over time supports a time-dependent interpretation rather than a universal cutoff. However, CRP remains nonspecific and should not independently determine reimplantation timing. Persistently unfavorable trajectories should prompt comprehensive reassessment and consideration of repeat debridement and spacer exchange. Limitations include the retrospective, single-center design, potential residual confounding, and lack of external validation. Prospective multicenter studies are warranted to validate these findings and thresholds.



Postoperative serum CRP kinetics during the first six weeks after prosthesis explantation. Lines represent median values and shaded areas the interquartile range (IQR), stratified by treatment outcome according to the modified Delphi criteria.



Normalized postoperative serum CRP kinetics following prosthesis explantation according to treatment outcome. Values are expressed as the percentage of the Week 1 CRP concentration (100%). Solid lines represent median values and shaded areas the interquartile range (IQR).

RESULTS

Ninety-one patients were included, with a median follow-up of 16.1 months. Infection eradication was achieved in 50 patients (54.9%), according to the modified Delphi criteria. Following explantation, CRP increased during the first postoperative week in both groups, followed by a progressive decline. Patients with successful infection eradication demonstrated a rapid and sustained decrease, whereas those with treatment failure showed persistently elevated CRP, slower normalization, and occasional secondary increases. Divergence between groups became evident from Week 2 and was greatest between Weeks 3 and 5. Relative CRP reduction from Week 1 was significantly greater in the success group from Week 2 onward. Similar kinetics were observed in hip and knee PJI and across microbiological subgroups. ROC analysis showed progressively improved discrimination, with Week 3 representing the earliest clinically informative time point and Weeks 4–6 providing the highest accuracy.