EP379 | Prosthetic Joint Infections

Adjunctive Hyperbaric Oxygen Therapy for Periprosthetic Joint Infections

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CASES TREATED
7 (6 analysed)
Retrospective review, 2016–2025

SURGICAL PROCEDURES
5.6 → 0.7
Per patient, before → after HBOT (P<0.0001)

PJI SURGERY AFTER HBOT
0 of 6
All suppressed on antibiotics, no relapse

INTRODUCTION

Periprosthetic joint infection (PJI) is a devastating complication associated with reduced quality of life, increased mortality and substantial healthcare resources, often requiring prolonged hospitalisation and multiple complex surgeries.[1,7] In the United States, annual PJI-related costs are projected to reach **$1.85 billion by 2030**.

Hyperbaric oxygen therapy (HBOT) delivers 100% oxygen at elevated atmospheric pressure, enhancing oxygen delivery to ischaemic tissue[8] — chronic wounds and osteomyelitis, both contributing to PJI morbidity. HBOT also holds immunomodulatory properties and enhances antibiotic efficacy against biofilm.[9–11] It has been used as an adjunct for hardware-related infection elsewhere.[12] **No studies have investigated its utility in PJI management.**

This study aimed to evaluate HBOT as an adjuvant therapy for PJI.

METHODS

Retrospective review of PJI cases treated with HBOT from **2016–2025** using our centre's Hyperbaric Medicine Unit Database. PJI was defined by ICM 2018 criteria[3]; host and wound status were staged by the McPherson system[5]; outcomes were reported per MSIS definitions.[4]

- **Primary outcome** — clinical impact of HBOT on infection control, surgical revisions and safety.
- **Secondary outcome** — inflammatory biomarker response; temporal trends in CRP and ESR relative to clinical events.
- **Statistics** — Student's t-test or one-way ANOVA with Tukey's post hoc test. Data are mean ± SEM.

RESULTS

Seven cases were identified; **six completed HBOT** and were included in analyses. One declined further treatment after seven sessions because of anxiety and subsequently died in hospital following an acute cerebral infarct, during an already complex admission.

Total surgical procedures fell significantly (**P<0.0001**) from 5.6 ± 0.8 before HBOT to 0.7 ± 0.5 after. **No patient has since required PJI-related surgery**; all remain on chronic suppressive antibiotics without relapse, with no persistent sinus tracts and well-healed surgical sites.

CRP, markedly elevated before HBOT (59.4 ± 24.5 mg/L), returned to within normal limits by the end of treatment (9.8 ± 3.2) and at 30 days (6.0 ± 3.7), with sustained reduction at one year (24.2 ± 15.3). ESR changed minimally[13] (36.5 ± 11.3 mm/h before treatment, against an upper limit of normal of 28.0 mm/h).

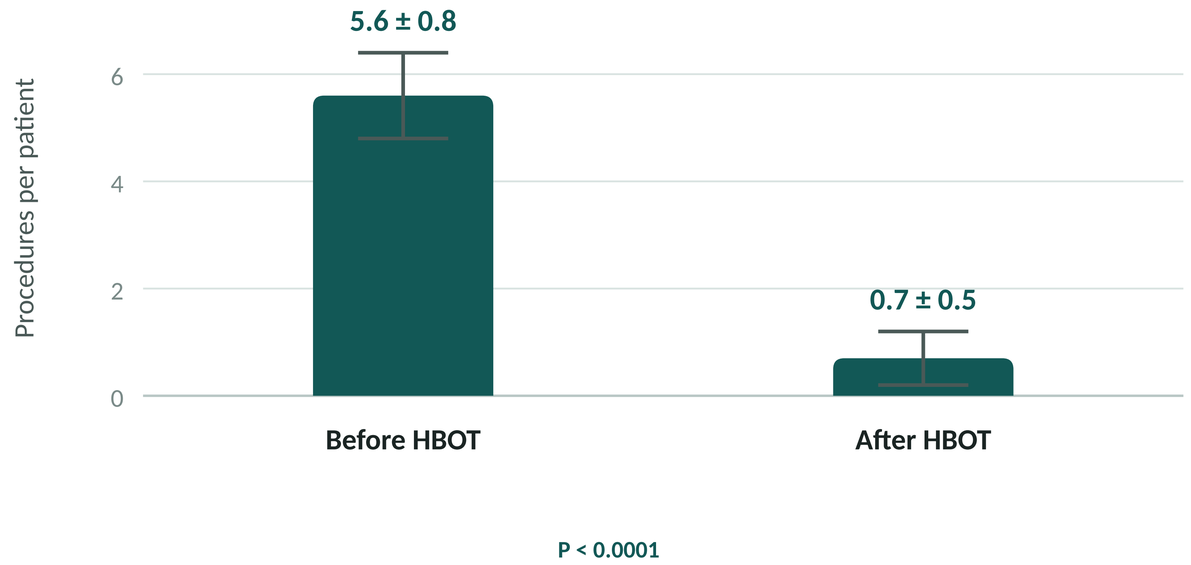
Table 1. Cohort and disease characteristics (n = 7)

Patients (joints)	7 — all right hip arthroplasty · 6 female / 1 male
Age at PJI diagnosis	67.4 y (range 59–81)
BMI	36.3 (range 27.7–46.3)
Comorbidities	2 former smokers · 2 non-insulin-dependent diabetes
Index procedure	4 primary · 3 revision arthroplasty
Index surgery → PJI diagnosis	167 d (range 18–927)
ICM 2018 chronic PJI	7 / 7 · sinus tract 7 / 7 (100%) · soft-tissue compromise 4 (57%)
Initial surgical approach	DAIR 3 (43%) · Girdlestone 2 (29%) · I&D 2 (29%)
Surgical interventions / patient	7 (range 3–10) · VRAM flap reconstruction in 2
First PJI operation → HBOT	437.5 d (range 77–1583)

Table 2. HBOT delivery, tolerability and safety

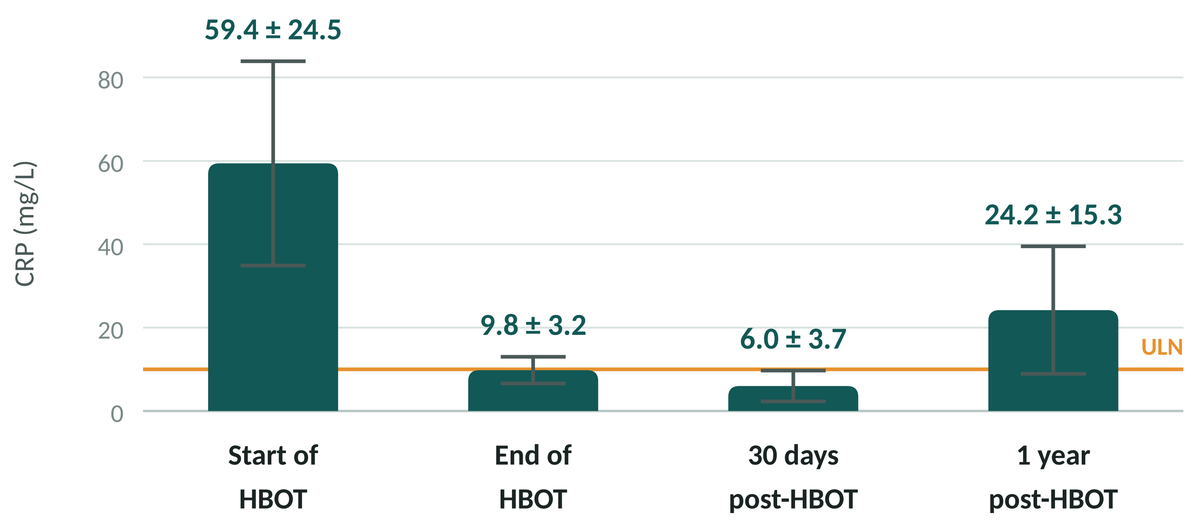
Intended protocol	40 sessions · 2.5 ATA · 90 min · 2 air breaks (community site: 2.4 ATA · 90 min · no air breaks)
Sessions delivered	40 in 5 patients · 36 in 1 (healing achieved) · 7 in 1 (declined, anxiety)
Adverse events	Transient myopia (1) · anxiety (1)
In-hospital death (non-completer)	1 — after acute cerebral infarct
PJI-related surgery after HBOT	0 / 6
Suppressive antibiotics, no relapse	6 / 6

Figure 1. Surgical procedures per patient



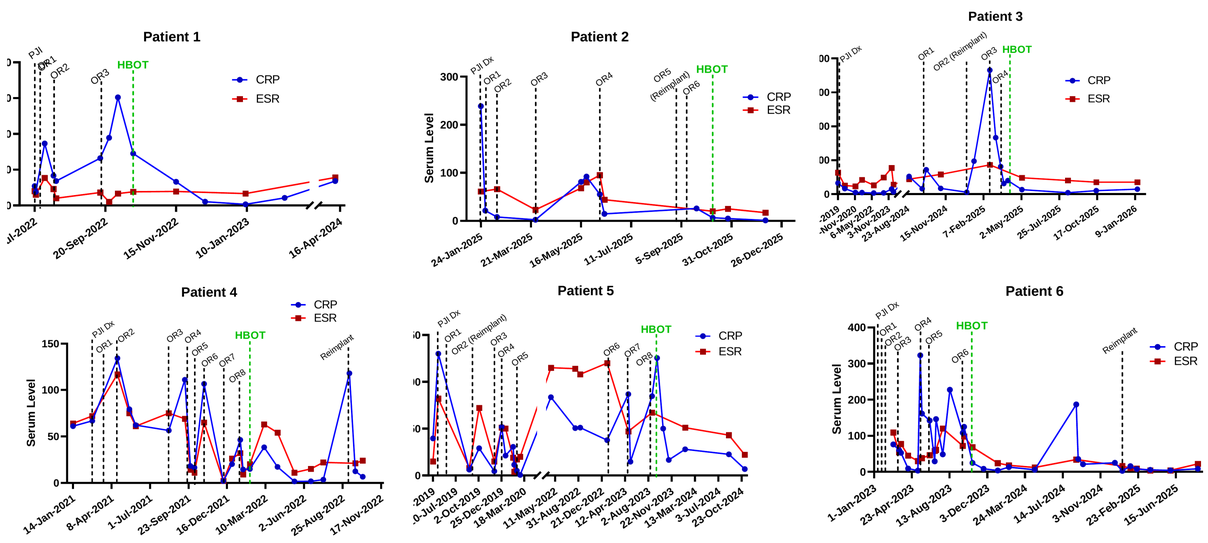
Primary outcome. Mean ± SEM total surgical procedures per patient before and after adjunctive HBOT (n = 6).

Figure 2. C-reactive protein response



Secondary outcome. Mean ± SEM CRP. Levels normalised by the end of HBOT and at 30 days, with sustained reduction at one year. Orange line = upper limit of normal (ULN), 10 mg/L.

Figure 3. Patient-specific temporal mapping of CRP and ESR



CRP (blue) and ESR (red) for each of the six patients who completed HBOT, plotted against key clinical events. Black dashed lines mark PJI diagnosis, operations and reimplantation; green dashed lines mark the start of HBOT. A persistent attenuation of inflammatory markers follows hyperbaric treatment, alongside a clear fall in the requirement for surgical intervention.

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CONCLUSIONS

In patients with recurrent PJI, adjunctive HBOT was associated with a **substantial reduction in the need for repeat surgical interventions** and **sustained suppression of systemic inflammation**. Hyperbaric therapy was safe and well tolerated. Although limited by small sample size, retrospective design and the absence of a comparator, these findings support HBOT as a promising adjunct for PJI. Prospective studies are being designed to further evaluate its efficacy and its role within standard of care.

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