

18F-FDG Labelled Leukocyte PET-CT Accurately Localises Implant-Associated Bone and Joint Infection and Influences Surgical Strategy: A Prospective Diagnostic Accuracy Study

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31

patients scanned, all operated

28

infected at surgery — every one detected

100%

sensitivity

7

operations changed by the scan

Introduction

Successful treatment of implant-related infection depends on adequate source control, appropriate antimicrobials, mechanical stability and host factors. Before surgery, imaging should tell us not only whether infection is present but where it is, how far it has spread, and whether source control can be achieved with the implant retained.

Conventional imaging is limited by metal artefact and by the early postoperative state, and defines the **extent** of infection poorly.

18F-FDG labelled leukocyte PET-CT combines the resolution of FDG-PET with the specificity of labelled leukocytes. It is available at only a few centres in India.

Aim: to corroborate PET-CT findings against intraoperative findings, culture and histopathology, and to record their influence on surgical planning.

Methods

- Single-centre prospective diagnostic-accuracy study, tertiary bone infection unit, December 2022 – November 2025.
- 31 patients with suspected implant-associated infection: preoperative PET-CT, then protocolised surgical exploration.
- Imaging read for presence, location, extent and spread of infection, and for feasibility of source control with implant retention.
- Reference standard: intraoperative findings, histopathology and cultures including extended, mycobacterial and fungal culture.
- Influence of the scan on the planned operation recorded prospectively.

Cohort

31

patients · mean age 64.7 ± 9.3 years

31

scans reported positive for infection

Periprosthetic joint infection	21 · 67.7%
Fracture-related infection	6 · 19.4%
Periprosthetic fracture-related infection	4 · 12.9%

Infection status at surgery

28 / 31

infection confirmed at surgery

100%

sensitivity — no infected patient was missed

Culture was positive in **27 of 28**, at the sites the scan had marked; the one culture-negative patient had a positive aspiration elsewhere and was already on antibiotics. Among the 28: pus in **96.4%**, necrotic tissue in **92.9%**, bone involvement in **85.7%**.

Three scans were false positive: metallosis (2) and early postoperative inflammation in a TKA (1). Both are recognised causes of labelled-leukocyte uptake.

Distribution of uptake

Soft tissue envelope	93.5%
Bone–implant interface	90.3%
Articular extension	74.2%
Medullary canal	41.9%

Multi-compartment involvement in 90.3%.

Influence on surgical decision

- The scan altered the planned procedure in **7 of 31 (22.6%)**.
- Implant retained in 4** — DAIR in place of planned explantation; uptake confined to periprosthetic soft tissue with a stable implant and no medullary or interface involvement.
 - Complete removal in 2** — in place of planned DAIR; a single sinus at presentation, with uptake extending well beyond the clinically evident site.
 - Selective removal in 1** — the infected plate removed, the remaining construct retained.

In the remaining 21 infected patients the procedure was unchanged and the scan defined the extent of debridement.

Implant retention

Seven implants were retained where the mapped disease was judged clearable. **All seven were improved at latest review** — 6 months to 2 years 8 months, four beyond one year.

Follow-up accrued after abstract submission.

Conclusions

- 18F-FDG labelled leukocyte PET-CT findings corresponded with intraoperative, microbiological and histopathological findings in 28 of 31 patients.
- Preoperative mapping of the extent of infection informed the extent of source control required and the decision on implant retention.
- Single-centre pilot with a small sample; a larger series is required.

References

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All images are the authors' own; patient consent obtained under locally applicable legislation. Generic names used throughout.

TAKE-HOME MESSAGE

Preoperative leukocyte PET-CT corresponded with surgical findings in 28 of 31 patients and informed **the extent of source control and the decision on implant retention.**