



■ INFECTION

Infographic: Can the oncology classification system be used for prosthetic joint infection?

THE PJI-TNM SYSTEM

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Introduction

Prosthetic joint infections (PJIs) are some of the most relevant complications in arthroplasty. Despite their enormous impact on patients and on the healthcare system, a generally accepted classification system for PJIs is missing. We have presented an idea and rationale on a new PJI classification system based on the TNM classification for malignant tumours in oncology in the editorial of this issue of *Bone & Joint Research*.¹

This infographic illustrates the meaning of three significant letters T, N, and M for this PJI-TNM classification, with ‘T’ representing the local situation of the tissue and the indwelling implant, ‘N’ standing for the causative non-human bacterial and/or fungal organisms, and ‘M’ representing the morbidity of the patient.

Regarding terminology, the name of the affected joint is put in front of the TNM letters in order to clearly state the affected body region, such as hip, knee, and shoulder. If it is a recurrence of infection, the letter ‘r’ is additionally put in front of the affected joint in order to emphasize reinfection.

Typical clinical situations of PJIs classified with the new PJI-TNM system

‘Acute’ postoperative hip PJI, two weeks after implantation with a stable standard implant without soft tissue problem, detection of a rifampicin-sensitive *Staphylococcus aureus* strain, healthy host. Onset of symptoms within the first two weeks postoperatively with redness and swelling with a healthy soft tissue envelope is a typical situation of an early acute infection even in healthy hosts,

often with *Staphylococcus aureus* which is mainly not resistant against rifampicin. In most of these situations, biofilm formation is still immature. These cases were ‘classically’ classified as ‘acute’ or ‘early’ PJIs. The new PJI-TNM system classifies the described case as a Hip-PJI-T0aN0aM0 situation and allows for a more detailed description, as there are details on the causative agent and on the comorbidities of the patient that can be directly derived from this classification compared to the ‘classical’ system.

‘Chronic’ knee PJI, one year after implantation and loosened standard implant without severe soft tissue defect with a ciprofloxacin-resistant *Pseudomonas aeruginosa*, mildly compromised host. This describes the typical situation with ‘chronic’ infection and loosened implant one year after implantation in a mildly compromised host with a Charlson Comorbidity Index of 1. This corresponds to a Knee-PJI-T1aN2aM1 infection covering the local tissue, biofilm, and host comorbidity situation, which would not be possible to classify using classical classification systems.

‘Chronic’ shoulder infection with recurrence of infection after shoulder PJI with stable long stem revision implant after two years, small fistula without major soft tissue lesion, microbiological detection of fungi, highly systemic compromised host who does not tolerate surgery. This patient is mainly compromised by his severe comorbidities and does not tolerate surgery in his chronically infected shoulder revision arthroplasty with the causative agent *Candida albicans*. Shoulder-PJI-rT1bN2cM3c would characterize this situation best with the new classification system.

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TNM Classification System for Prosthetic Joint Infections

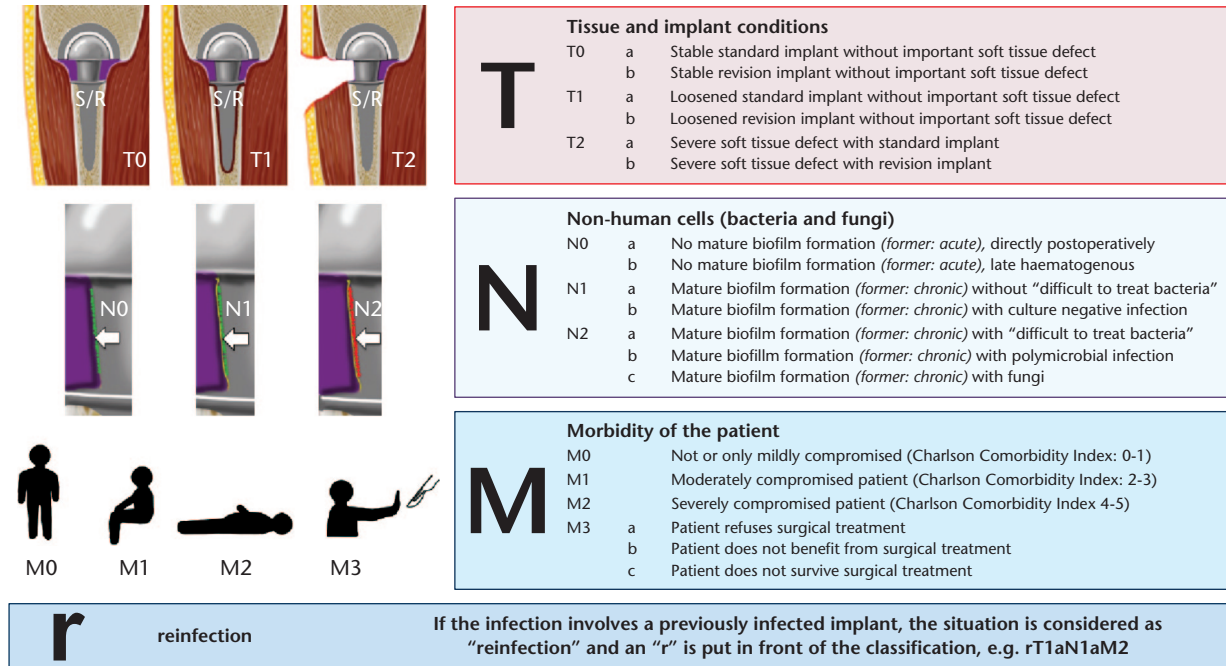


Fig. 1

Reference

- Alt V, Rupp M, Langer M, Baumann F, Trampuz A. Can the oncology classification system be used for prosthetic joint infection? *The PJI-TNM system*. 2020; 9(2):in press.

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Author contributions

- V. Alt: Formulated the idea for the new classification, Conceptualized the design, Wrote the manuscript.
- M. Rupp: Conceptualized the design, Wrote the manuscript.
- M. Langer: Created the figures, Wrote the manuscript.
- F. Baumann: Conceptualized the design, Wrote the manuscript.
- A. Trampuz: Provided scientific input from an infectious disease background, Wrote the manuscript.

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