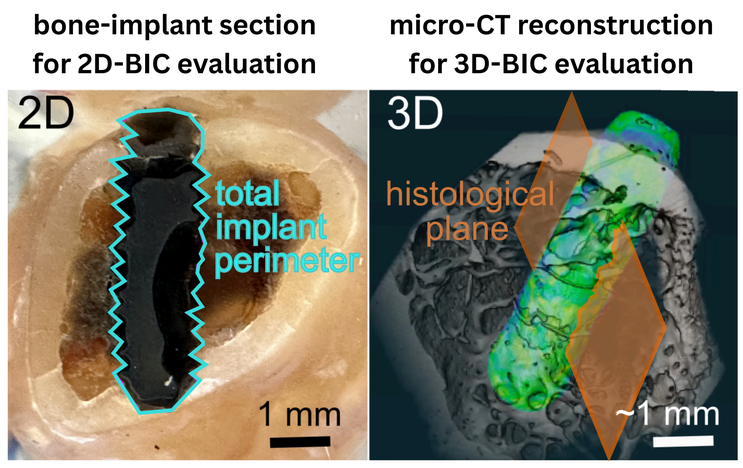
2D histology vs. 3D micro-CT: A comparative study of bone-implant contact (BIC) assessment in biodegradable metal-based orthopaedic implants

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Introduction

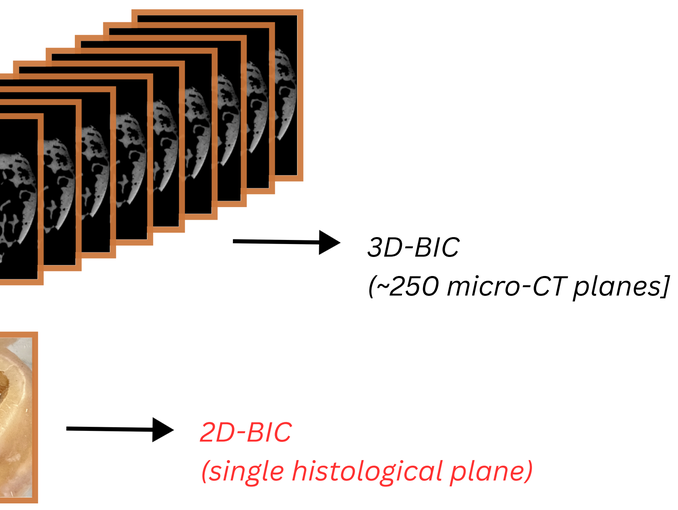
Successful orthopaedic implants require intimate bone–implant contact (BIC) for optimal function and long-term success. BIC, defined as the percentage of the implant surface in direct contact with bone tissue, is a critical parameter influencing implant stability and long-term success. Traditional 2D histological methods assess bone-to-implant contact (2D-BIC) by measuring the length of the bone-implant interface along one or more planes of section and dividing it by the total implant perimeter within those respective planes. In contrast, micro-CT analysis enables the three-dimensional evaluation of BIC (3D-BIC), potentially offering a more comprehensive assessment of the bone-implant interface by quantifying the contact area across the entire implant surface.



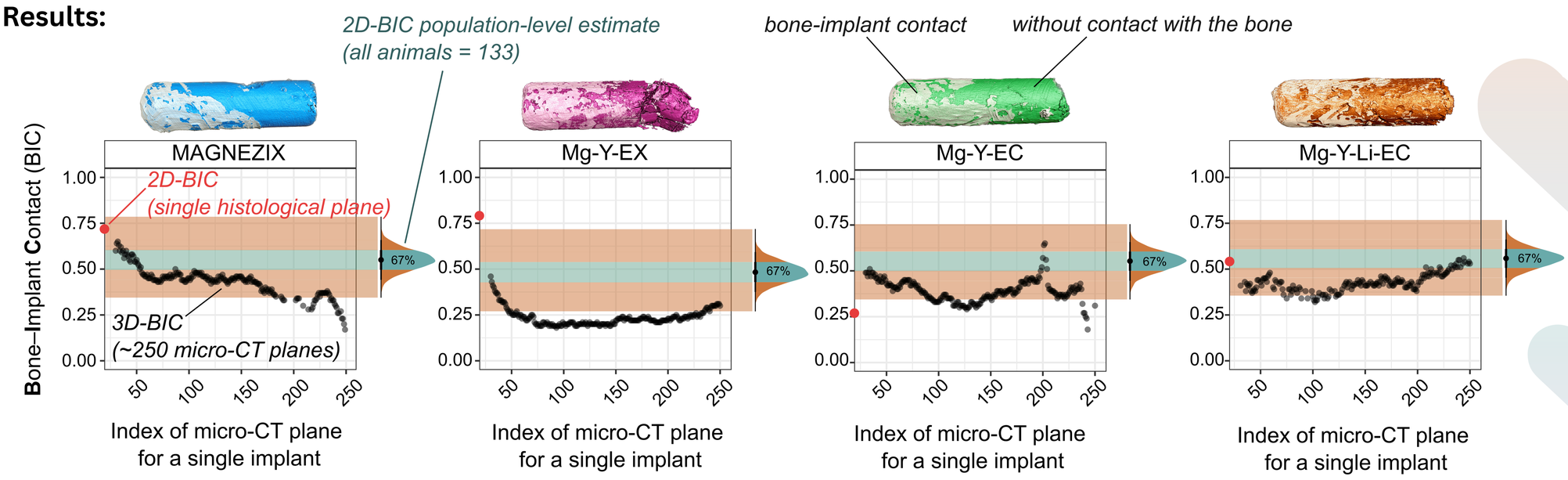
Methods

This *in vivo* study compared a commercial magnesium-based Mg-Y-RE-Zr alloy (MAGNEZIX®) with three experimental biodegradable Mg-Y-(Li)-based alloys processed by extrusion (EX) or equal channel angular pressing (EC). Implants were placed as screws/pins into rat femurs for six months. The interface was evaluated using high-resolution micro-CT (~6µm voxel size) for 3D-BIC, and corresponding 2D-BIC was assessed from histological sections.

Methodology:



Results:



Results and discussion

Key finding: Substantial within-implant variability in BIC is not captured by single-plane histological assessment (2D-BIC).
Implication: Published 2D-BIC values may reflect sampling location as much as true osseointegration quality — a potential source of heterogeneity in meta-analyses and systematic reviews.

Acknowledgement

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