

The Effect of Differences in the Connecting Portions of Provisional Fixed Partial Dentures Fabricated Using 3D Printing and Milling Methods on Fracture Strength

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Introduction

- In fixed prosthodontic treatment involving crowns and fixed partial dentures, provisional restorations protect prepared abutment teeth and maintain the occlusal relationship.

In the anterior region, aesthetic considerations are additionally required.

- CAD/CAM technologies are increasingly used for provisional restorations.
- Digital design allows precise connector geometry.
- The effect of connector cross-sectional area on fracture strength remains unclear.

Purpose

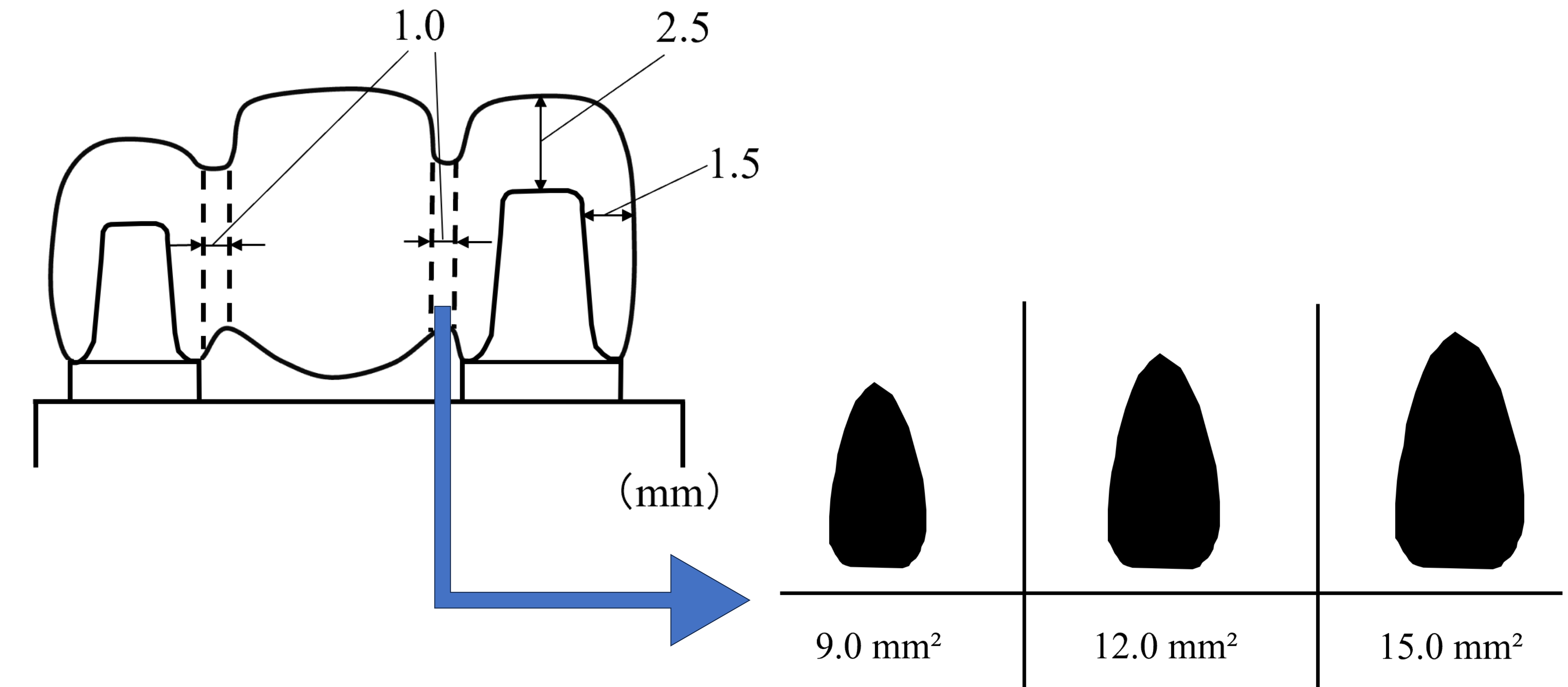
This study aimed to evaluate the effects of fabrication method and connector cross-sectional area on the fracture strength of maxillary anterior three-unit provisional fixed partial dentures (PFPDs).

Materials and Methods

Model and PFPD Design

Maxillary right central incisor and left lateral incisor as abutments.

The abutment device was designed in a simple form
Connector cross-sectional areas: 9.0, 12.0, and 15.0 mm².



PFPD Processing, Fabrication Groups (n=5)

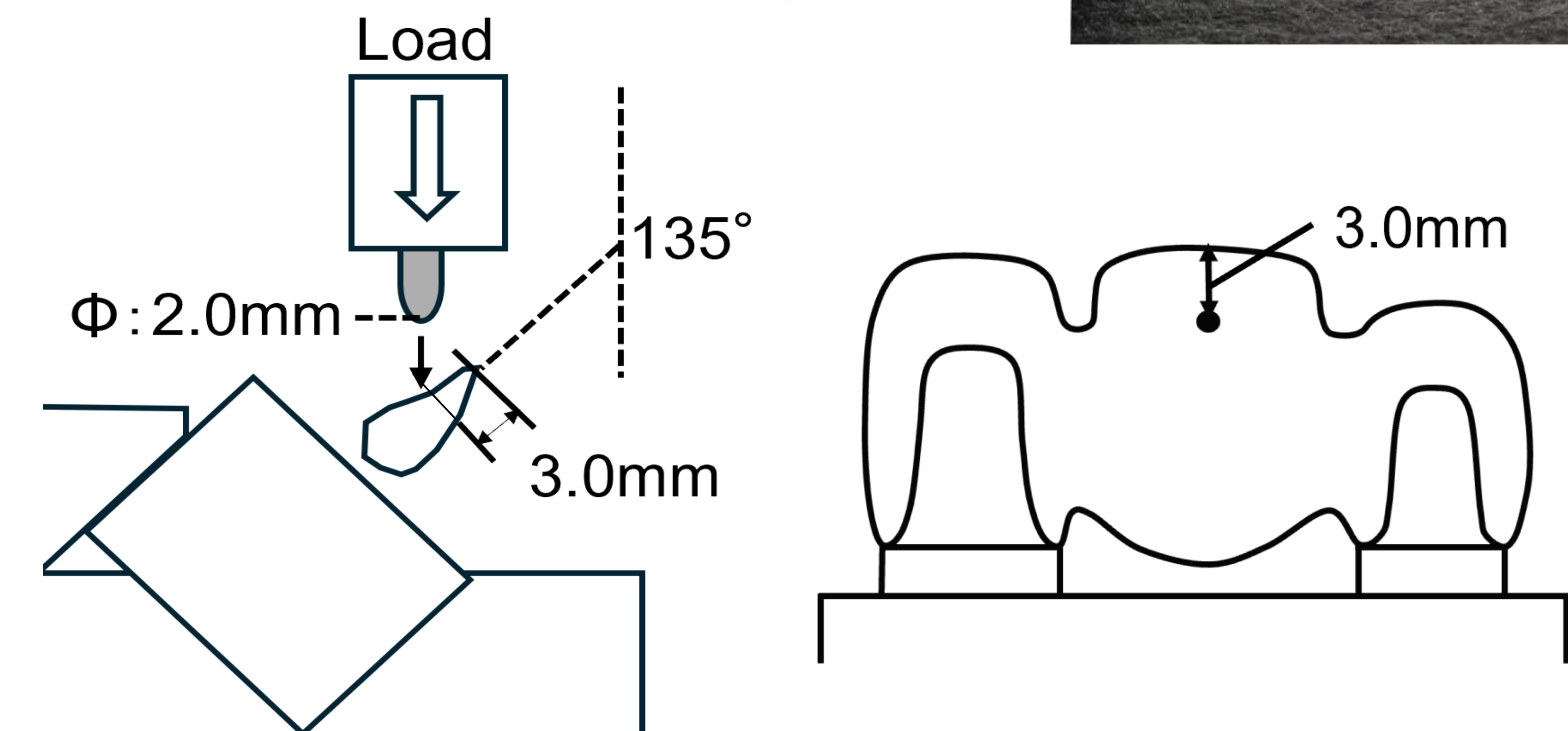
All materials used were PMMA-based materials.

- Mi group: M-PM disc (MERZ DENTAL)
- 3D-C group: Ceramage3D (Shofu)
- 3D-D group: dima Print Denture Teeth (Kulzer)



Fracture Test

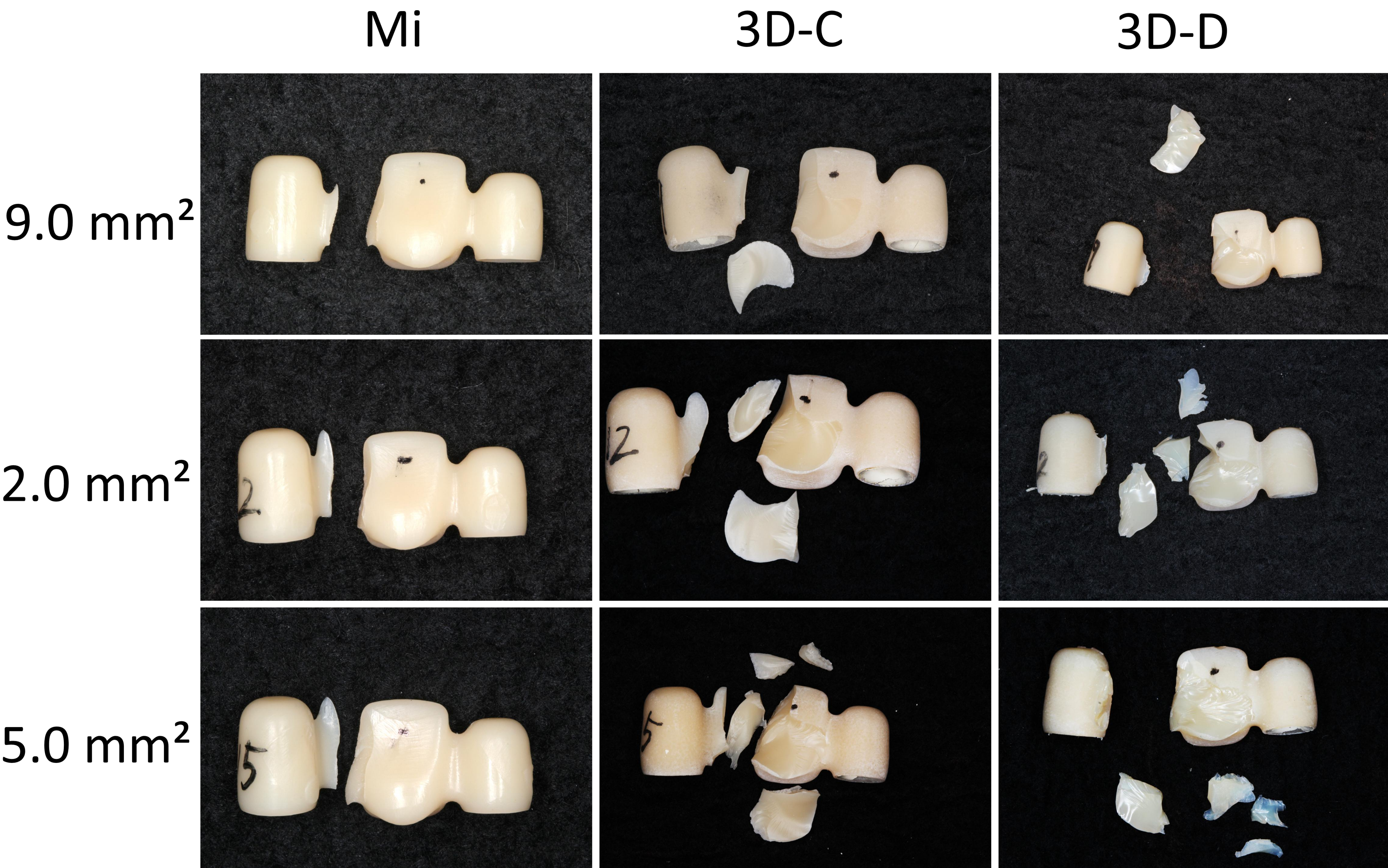
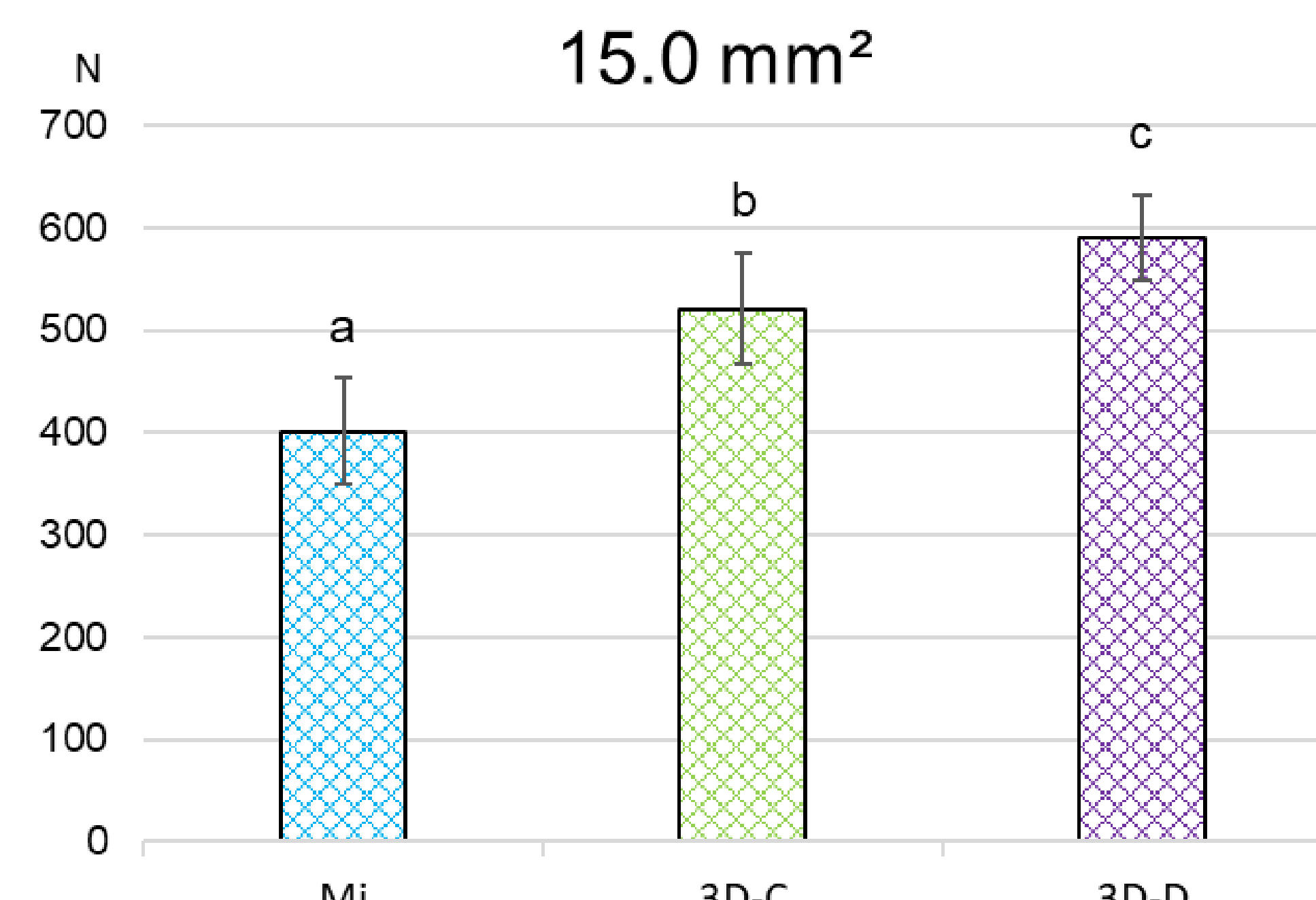
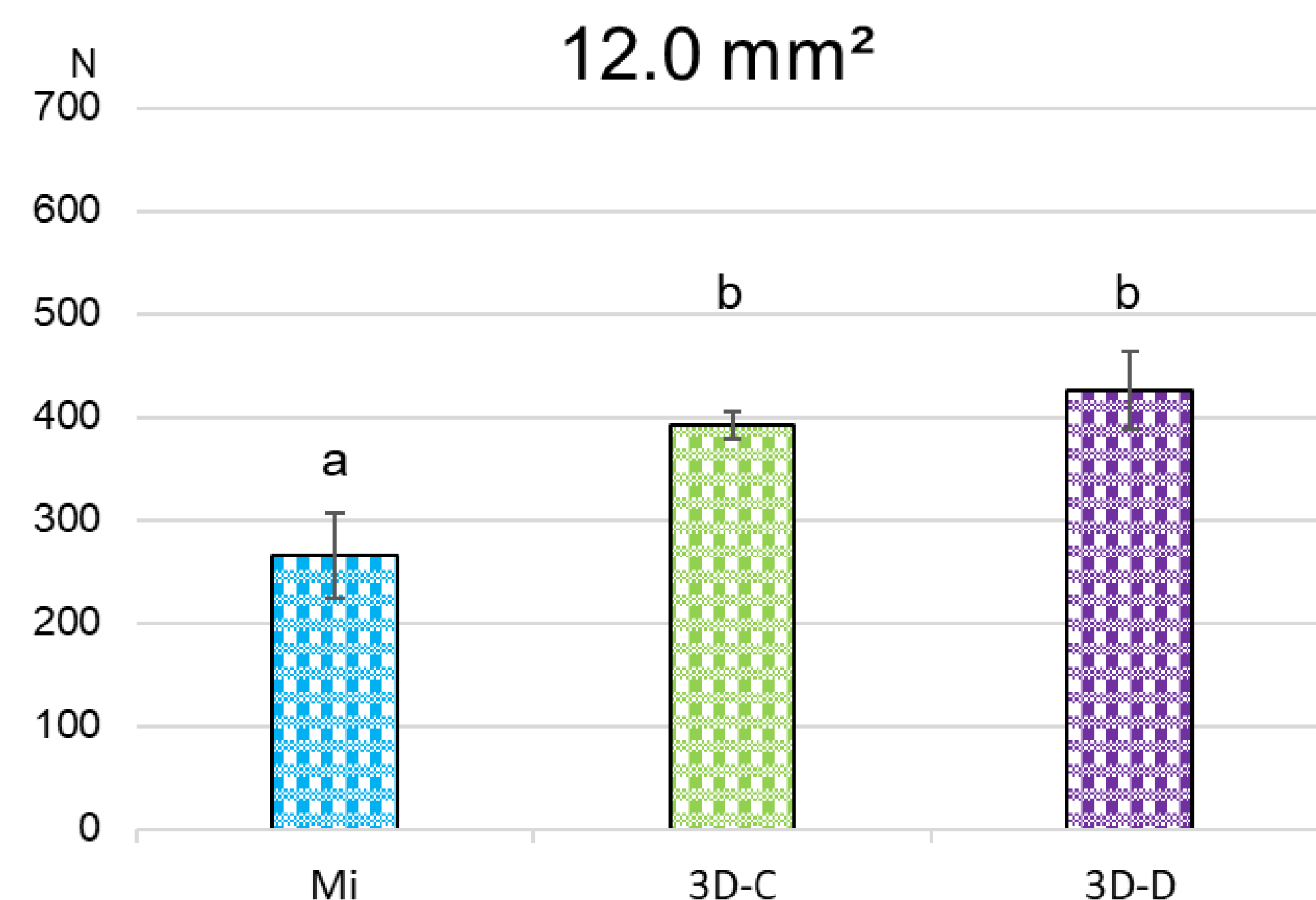
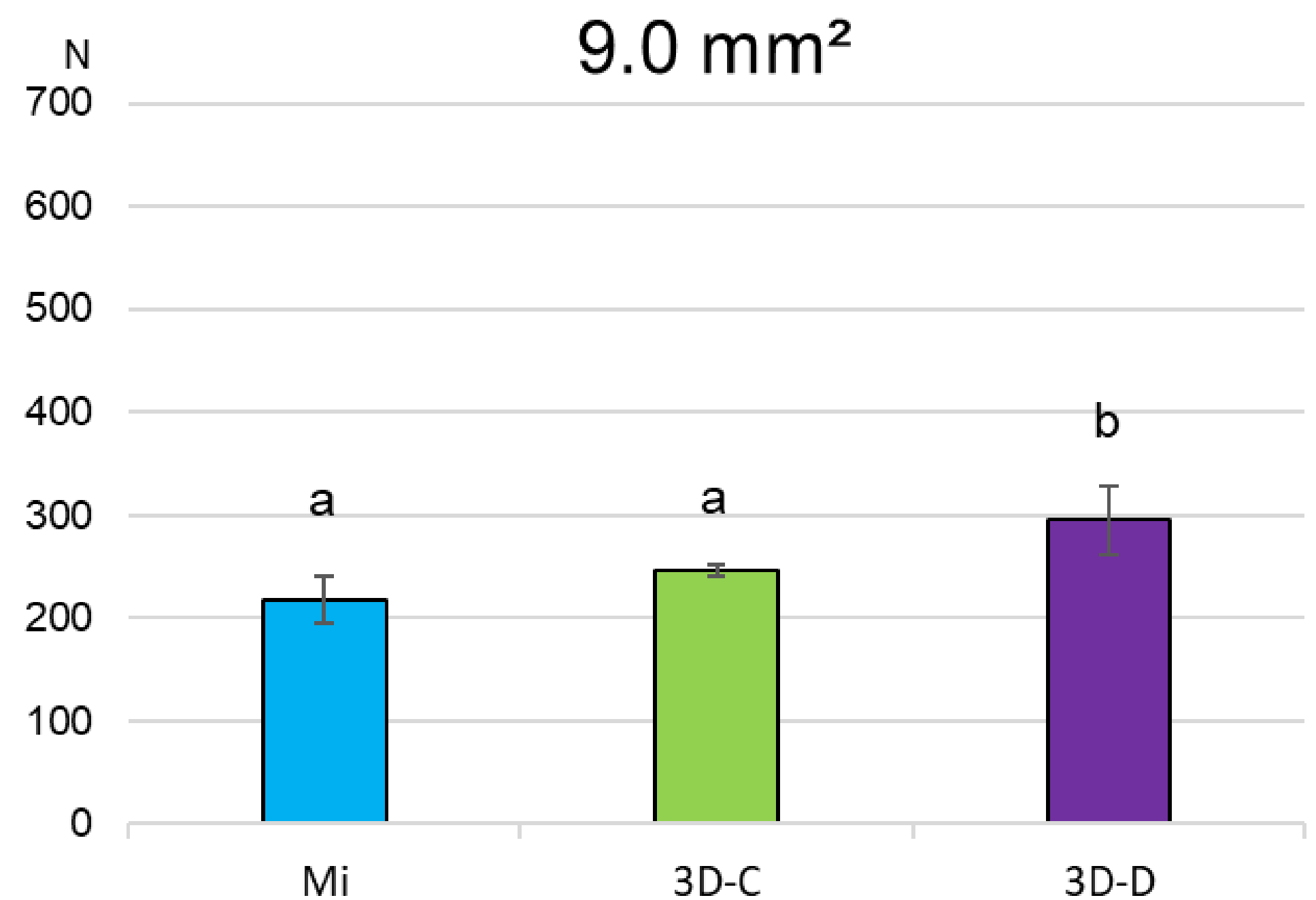
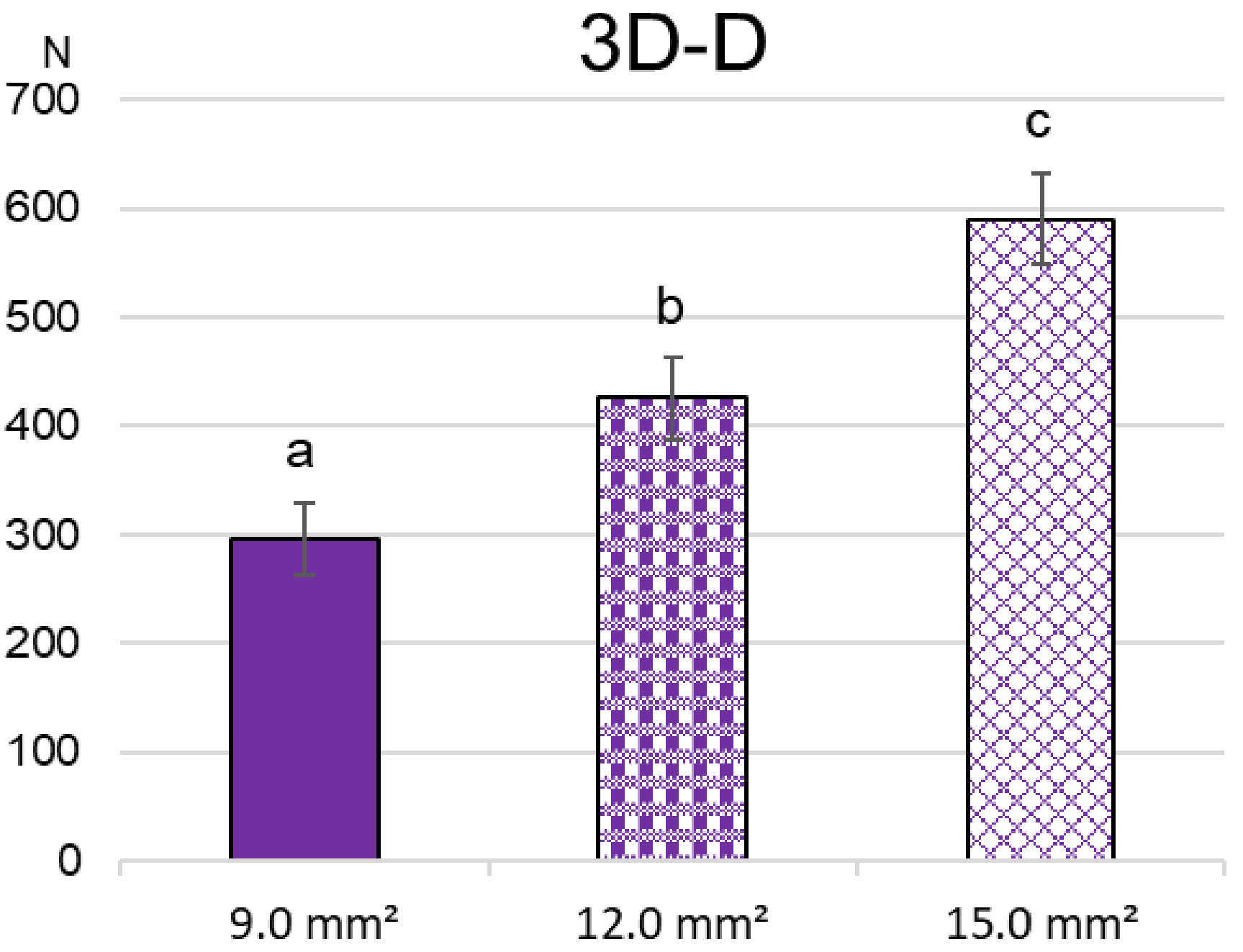
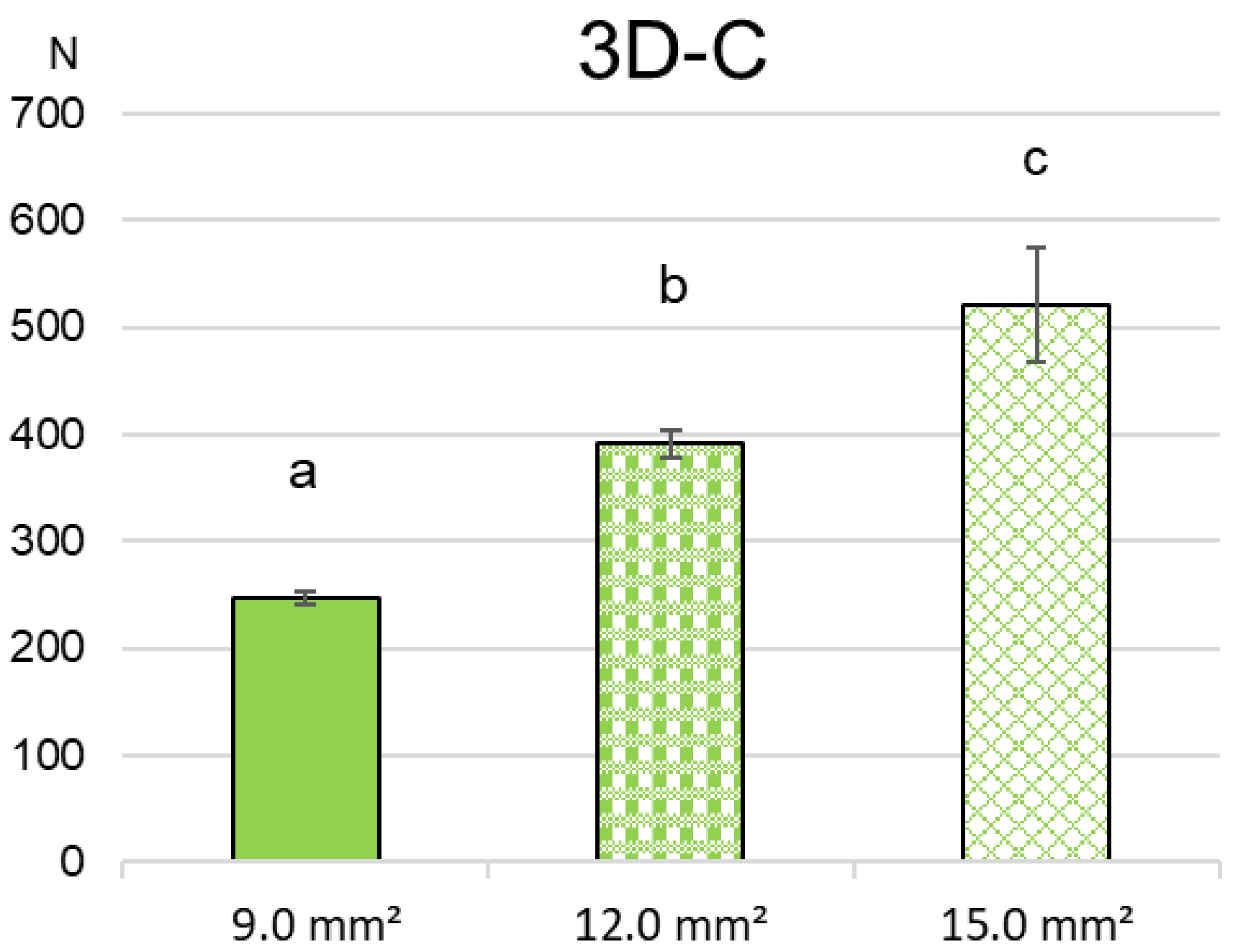
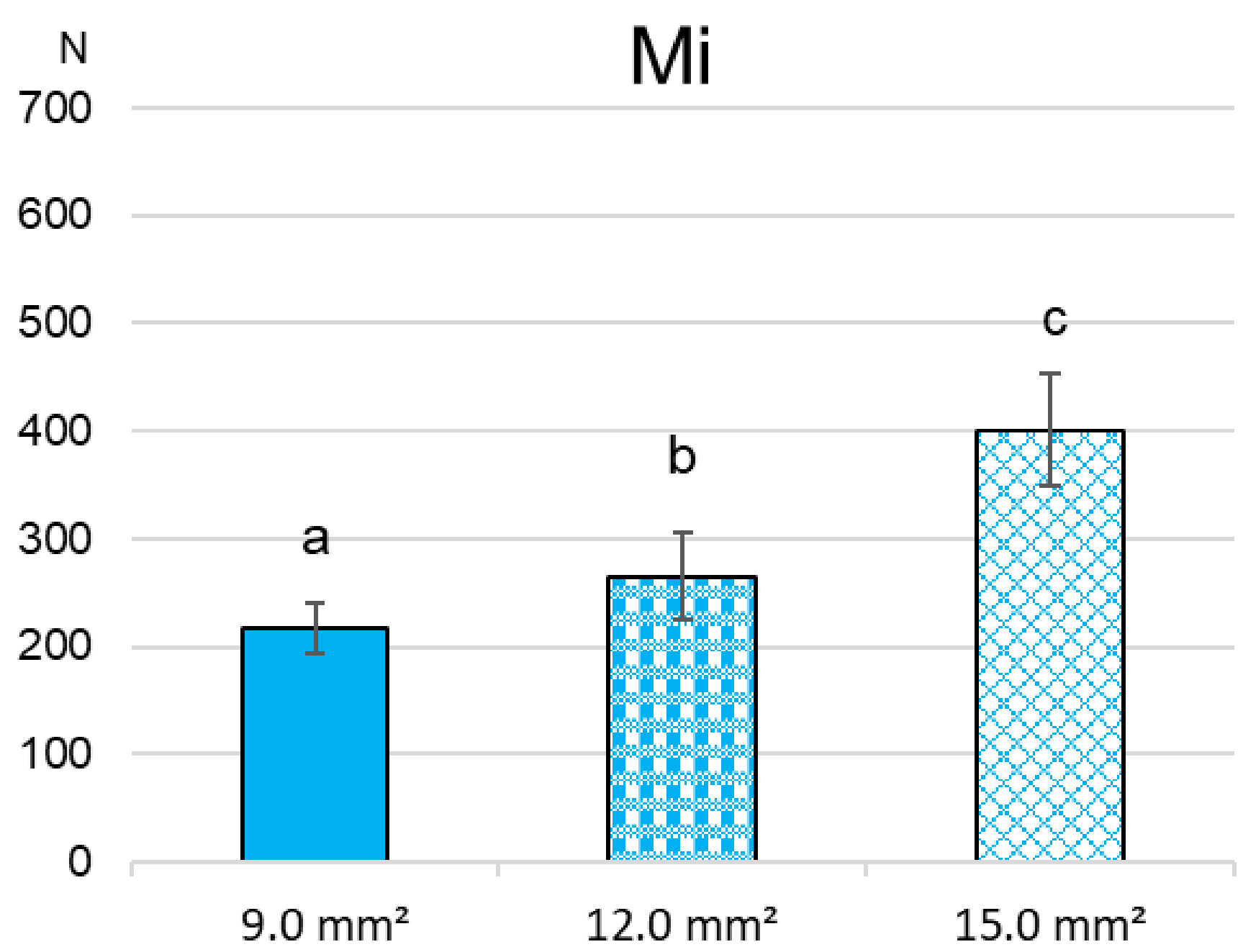
PFPDs were temporarily cemented to a testing Jig.
Fracture load measured using a universal testing machine.



Results

methods

connector cross-sectional areas



Discussion

The mean fracture load values ranged from 218 to 400 N for the Mi group, whereas those for the 3D groups ranged from 246 to 590 N.

The maximum bite force in the maxillary anterior region has been reported to be approximately 300 N.
(Takamizawa T et al., 1965)

Based on these findings, it is suggested that maxillary anterior three-unit provisional fixed partial dentures require a minimum connector cross-sectional area of at 15.0 mm² for milling and 12.0 mm² for 3D printing.

Conclusions

In maxillary anterior three-unit PFPD fabricated using CAD/CAM methods, an increase in the connector cross-sectional area resulted in an increase in the fracture load of the PFPDs.

