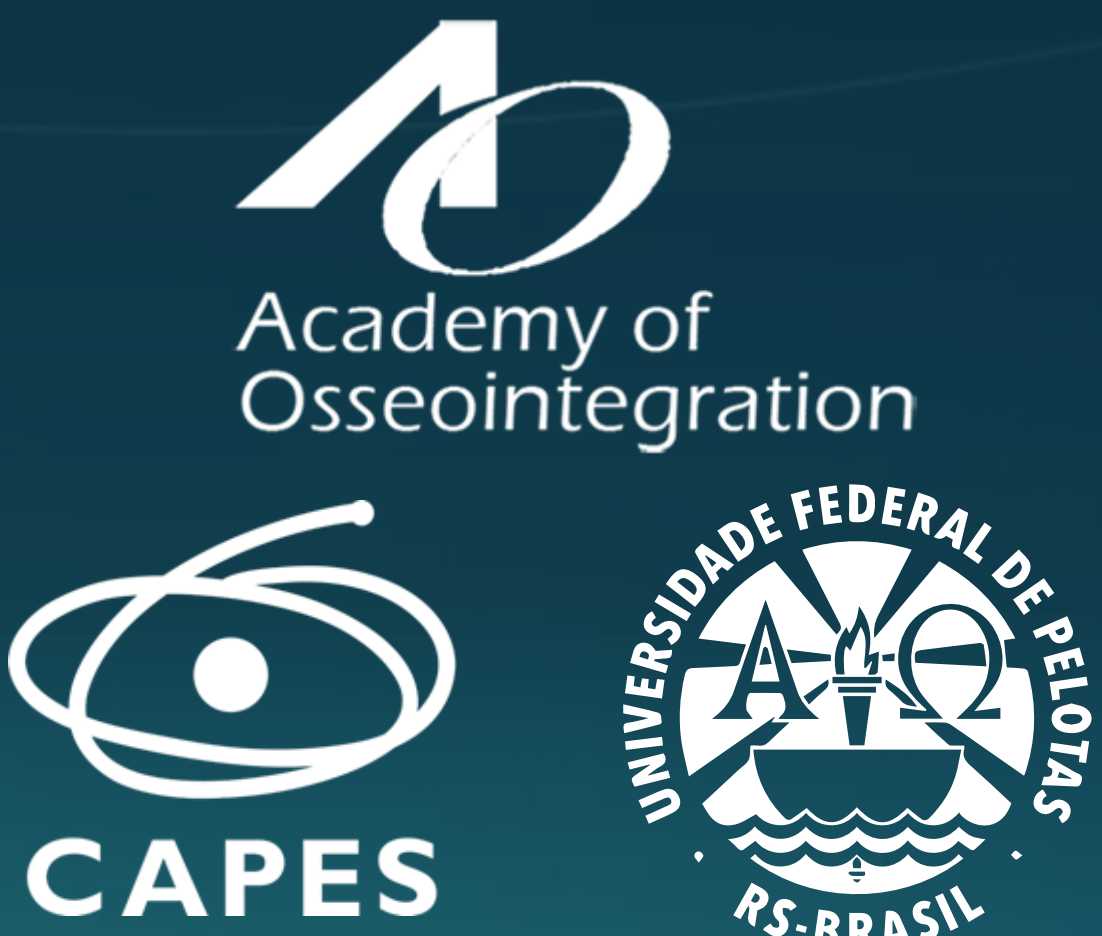


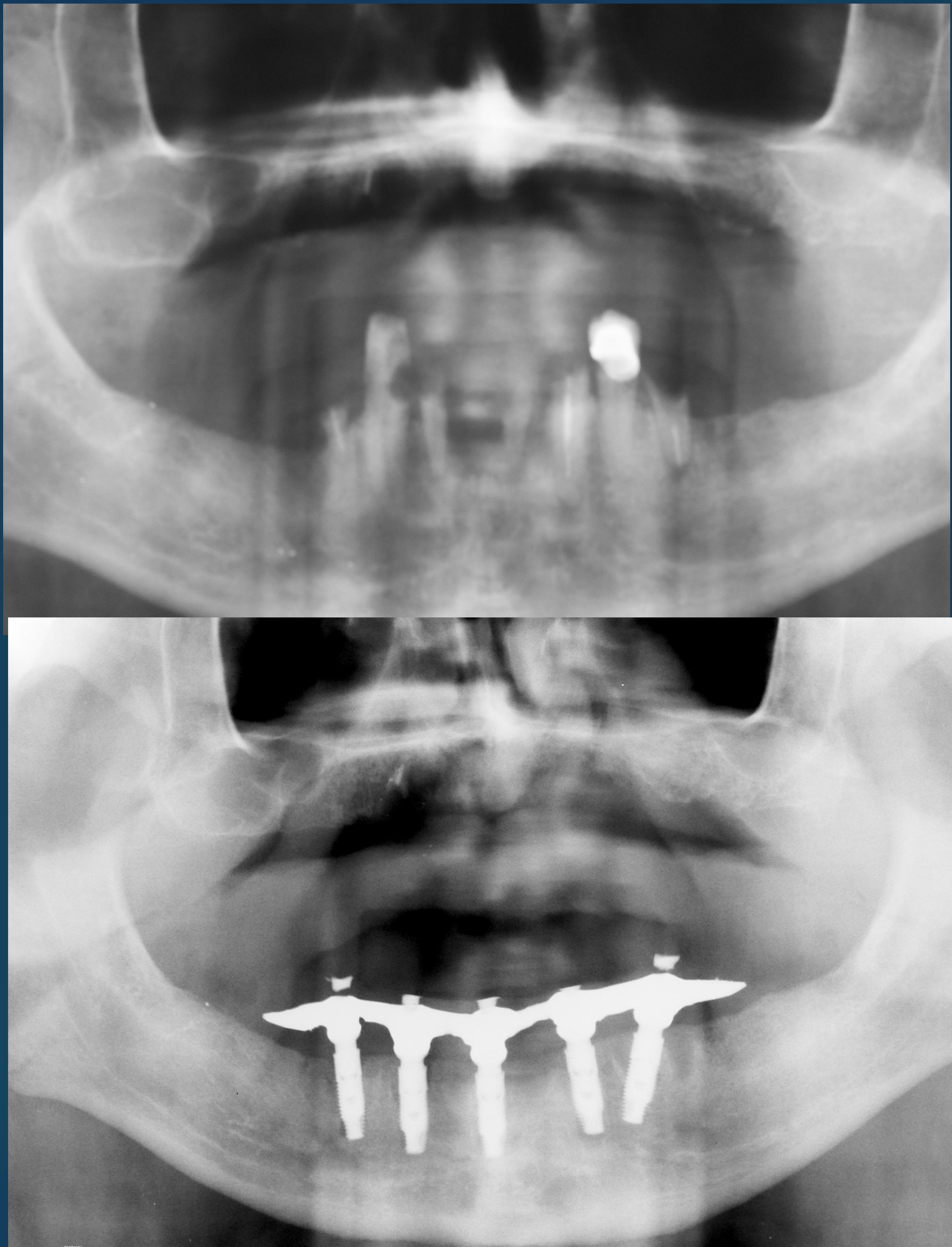
Ten-Year Clinical and Radiographic Outcomes of Immediately Loaded Mandibular Implants Supporting Full-Arch Fixed Prostheses: A Retrospective Study

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BACKGROUND



- ✔ Mandibular edentulism significantly impacts mastication, phonetics, and overall oral health-related quality of life.
- ✔ Immediate loading protocols reduce treatment time and accelerate functional recovery through primary stability.
- ⊕ Current evidence for full-arch fixed prostheses is often limited to 1–5 year follow-up periods.
- ✔ **Standardized radiographic evaluation is essential to validate long-term peri-implant bone stability.**

OBJECTIVE



This retrospective study evaluated the 10-year success rate, peri-implant bone remodeling, and prosthetic complications of immediately loaded mandibular implants supporting full-arch fixed prostheses.

Experimental design



Ethical Committee Approval

- CEP-UnG #241.602/2013

Study type

- Retrospective (10 Years)

Sample selection

- 2,216 records screened → 42 patients included
- Conventional complete denture wearers

Intervention: Surgical-Prosthetic Protocol

- Reverse prosthetic planning
- 4–6 internal-hex implants placed
- Titanium oxide-treated surface
- Primary stability ≥ 30 N·cm
- Provisional prosthesis delivered ≤ 48 h

Outcomes / Time points

- Implant Success Rate
- Technical complications
- Radiographic: 4,12,36,60,120 months



IMPLANT SUCCESS RATE

- Biological Endpoint:

- Implant survival in function
- Early failure ≤ 12 months
- Late failure > 12 months
- Peri-implantitis: BL > 3 mm + PD ≥ 5 mm + BOP/suppuration

- Primary Endpoint:

- 10-year implant success rate
- Functional implants / total placed
- Long-term clinical performance

TECHNICAL COMPLICATIONS

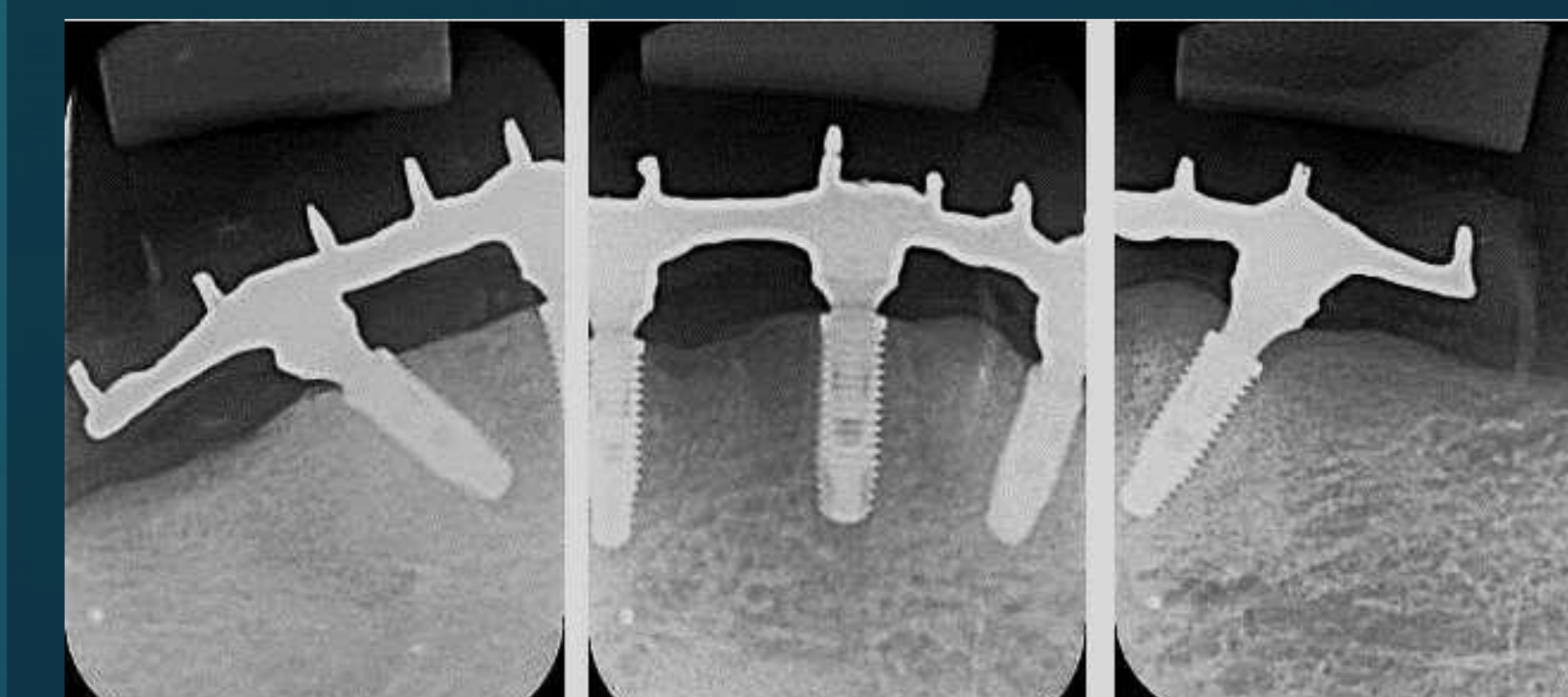
- Technical Endpoint

- Resin fracture
- Tooth fracture/loss
- Access sealing loss
- Prosthesis loosening
- Framework fracture



RADIOGRAPHIC OUTCOMES

- Digital periapical radiographs
- ImageJ software (NIH, USA)
- Platform → first bone-implant contact
- Mesial & distal measurements
- Marginal Bone Level (MBL) Changes
- Bone Remodelling (BR)



4 months

12 months

36 months

60 months

120 months

Statistical analysis

➤ Mixed-effects linear regression:

- changes in MBL and BR over time
- Influence of smoke and periodontitis history

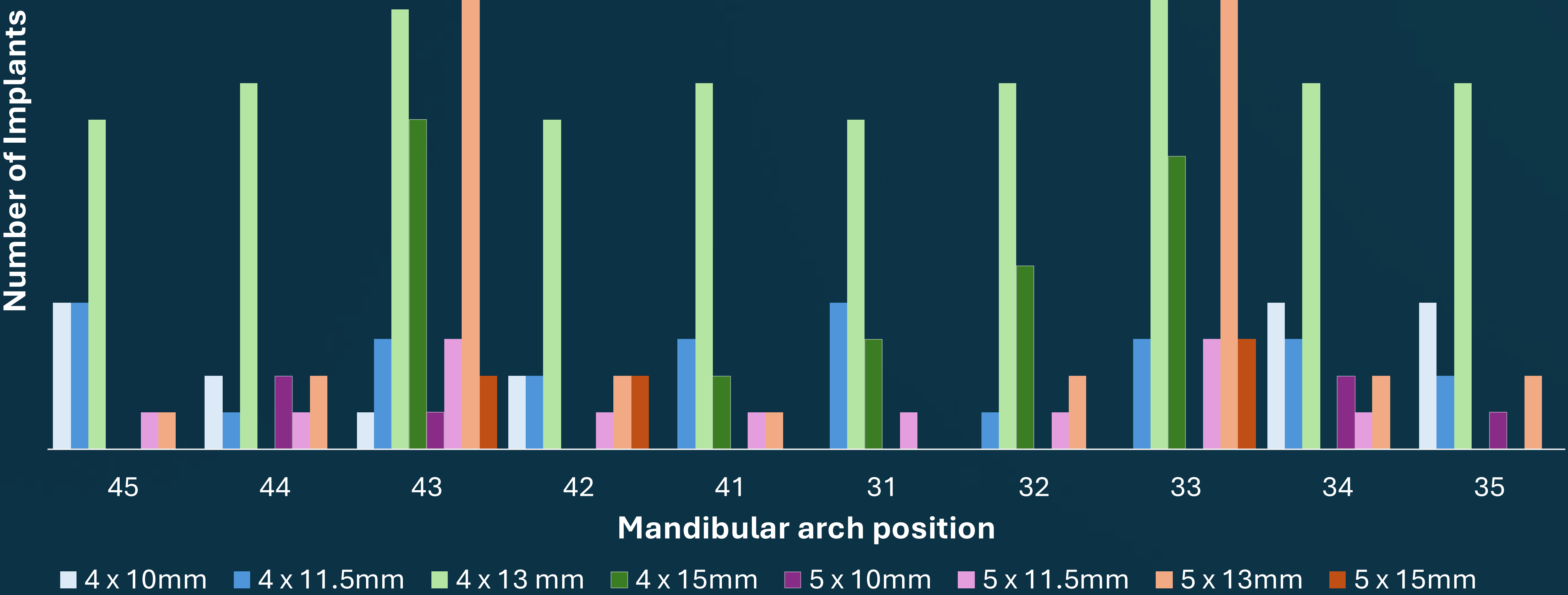
➤ Paired t-test:

- difference in means between faces in each period

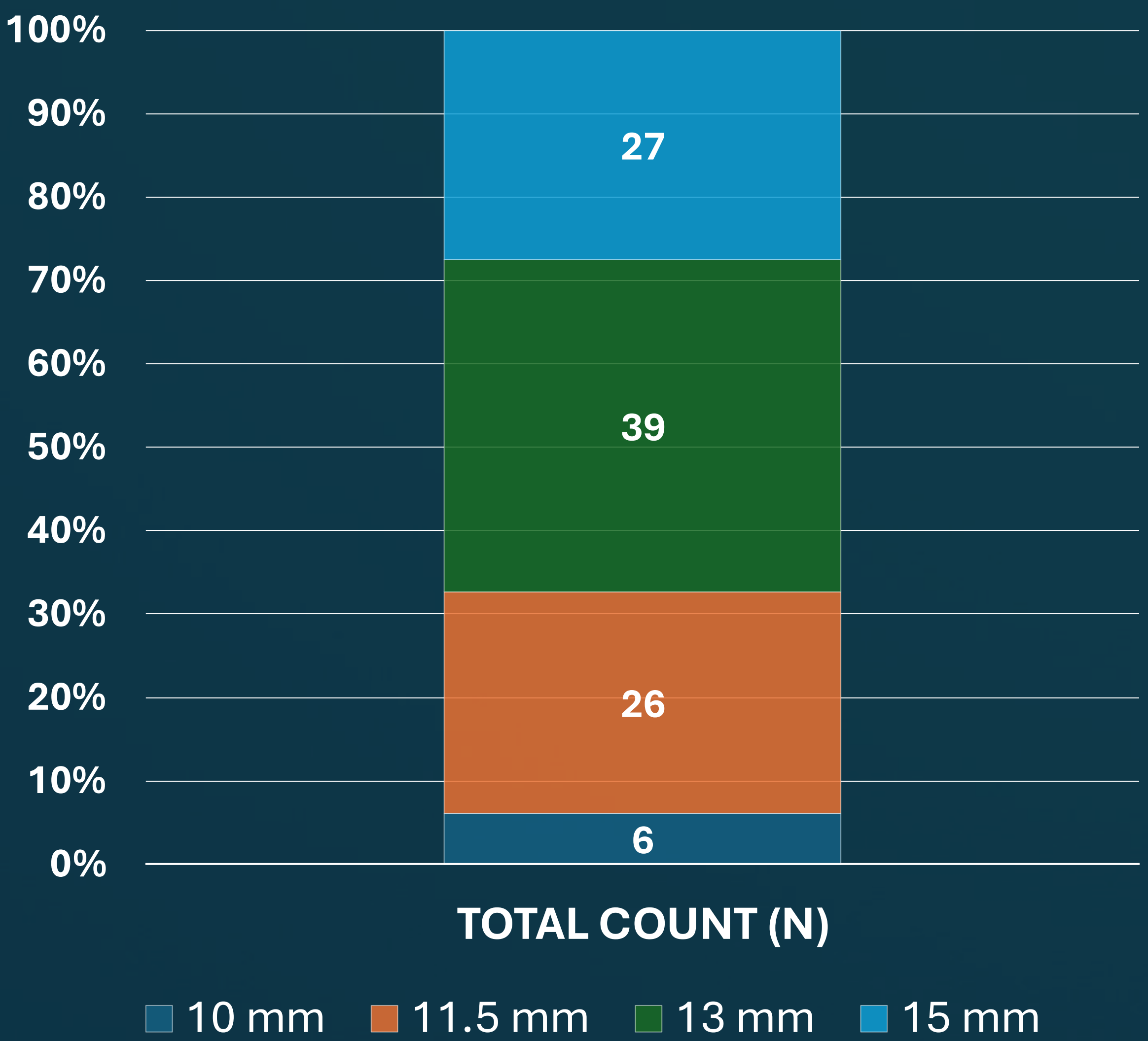
RESULTS

SAMPLE CHARACTERISTICS

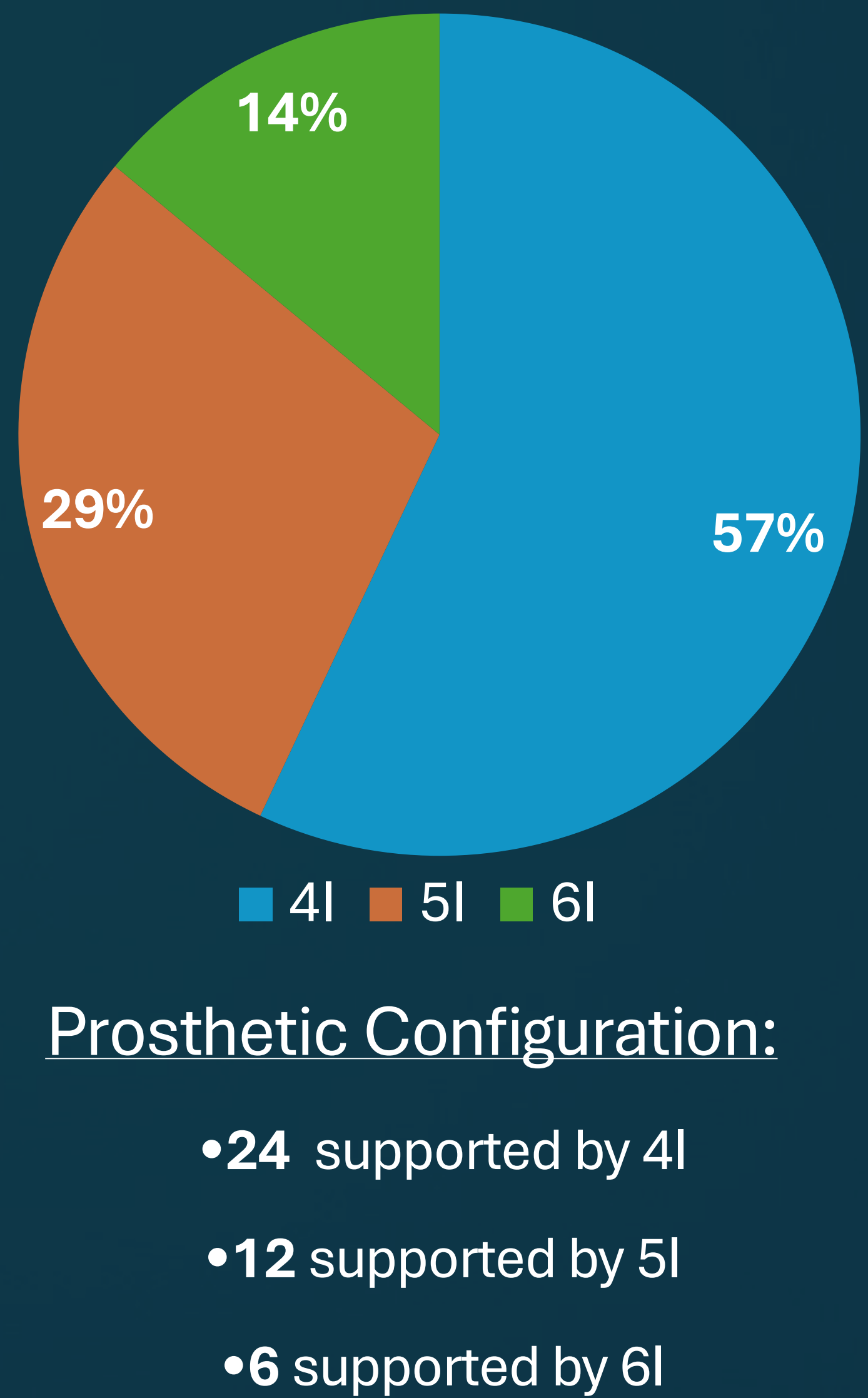
Graph 1. Distribution of implants inserted in the study by region.



Graph 2. Implants frequency according to length.



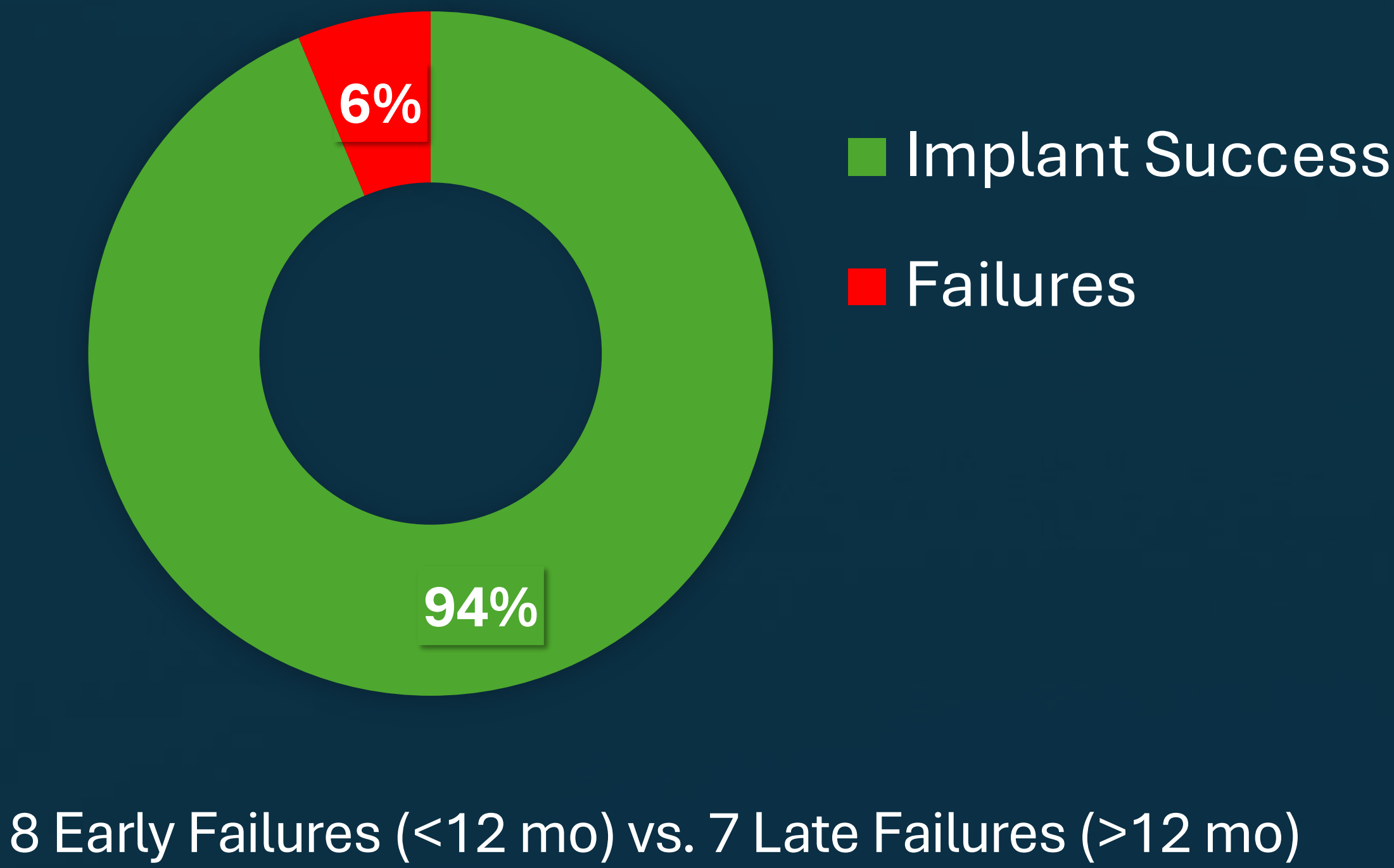
Graph 3. Anchorage distribution.



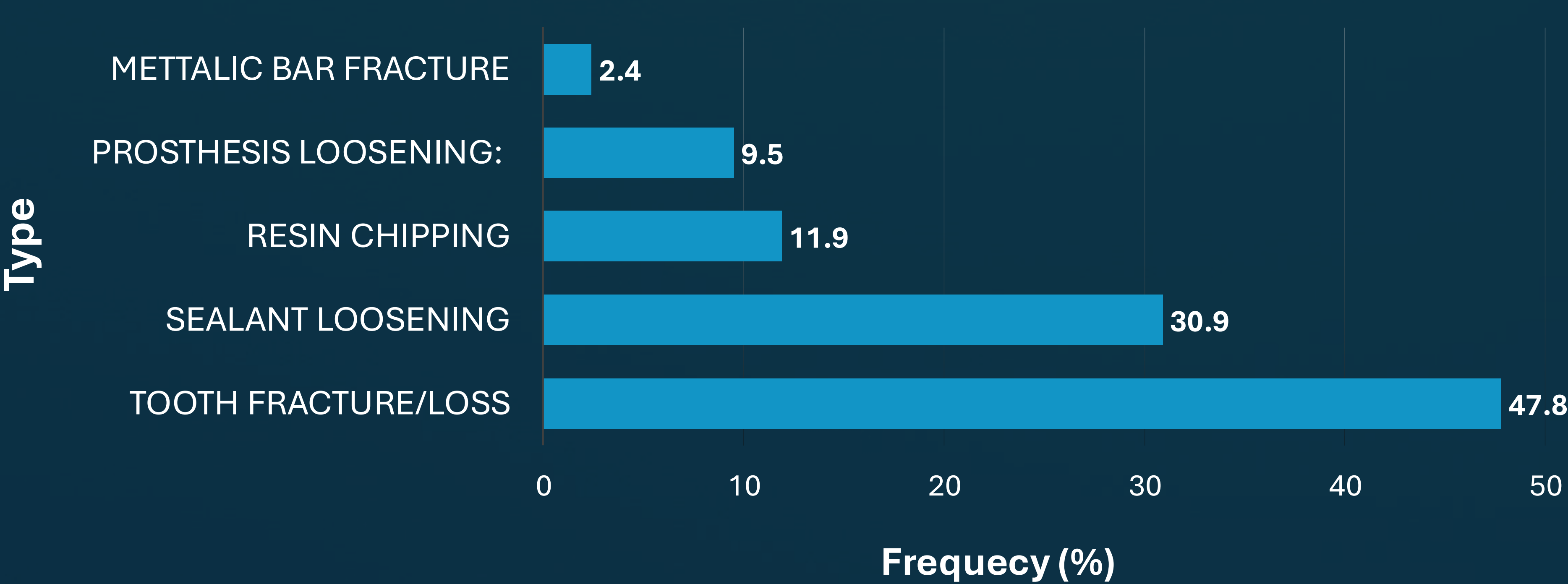
Case	Age/ Gender	Failed Implants	Period (Months)	Diameter (mm)	Length (mm)
1	62 / F	3	4	3.75	13
2*	49 / F	2	4	3.75	11.5
3	57 / F	1	4	4	13
4	41 / M	1	4	5	11.5
5*	65 / M	1	12	4	13

Table 1: Demographic characteristics of implants lost up to 1 year of evaluation (* smoking patients).

Graph 4. Implant Success Rate

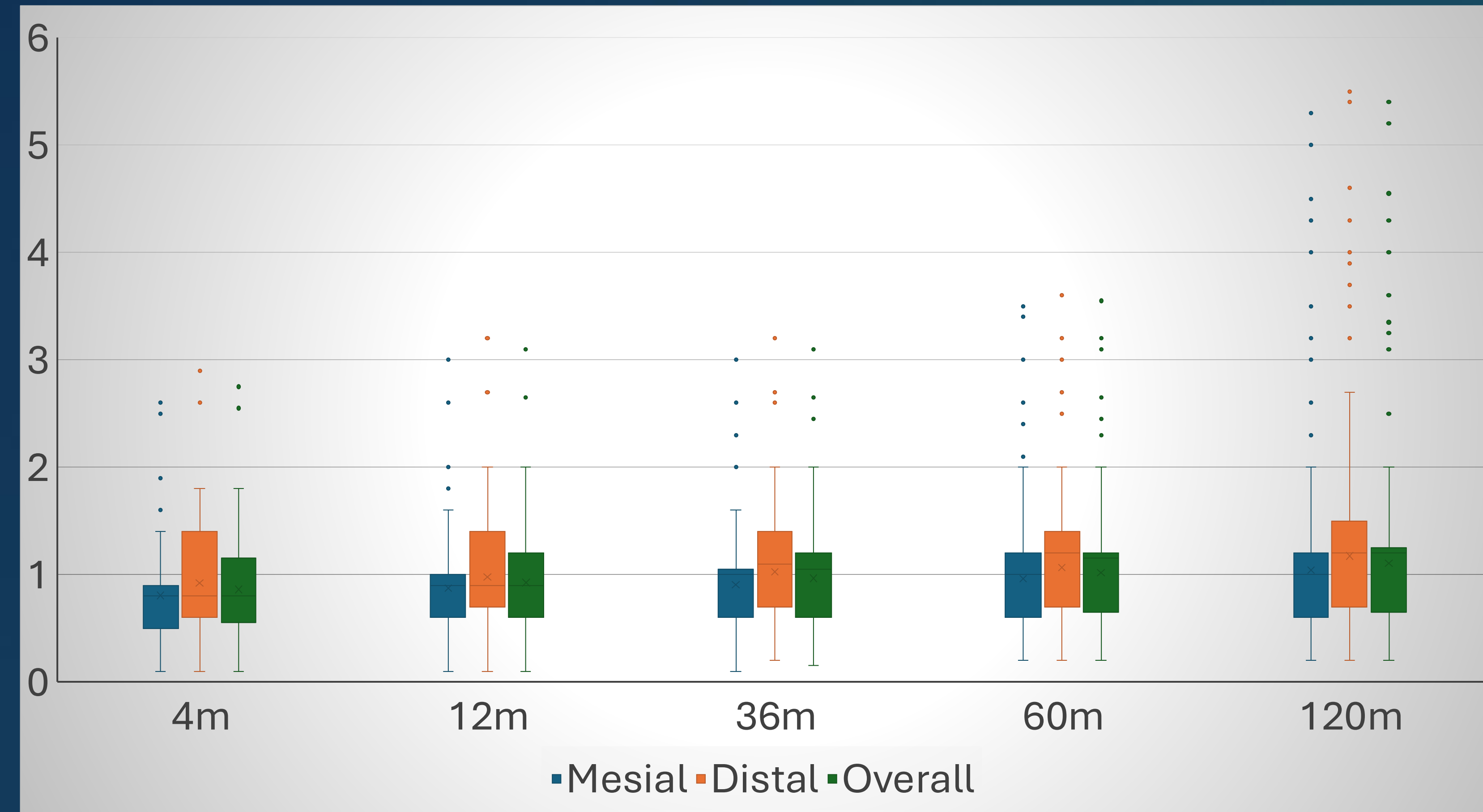


Graph 5. Technical Complications

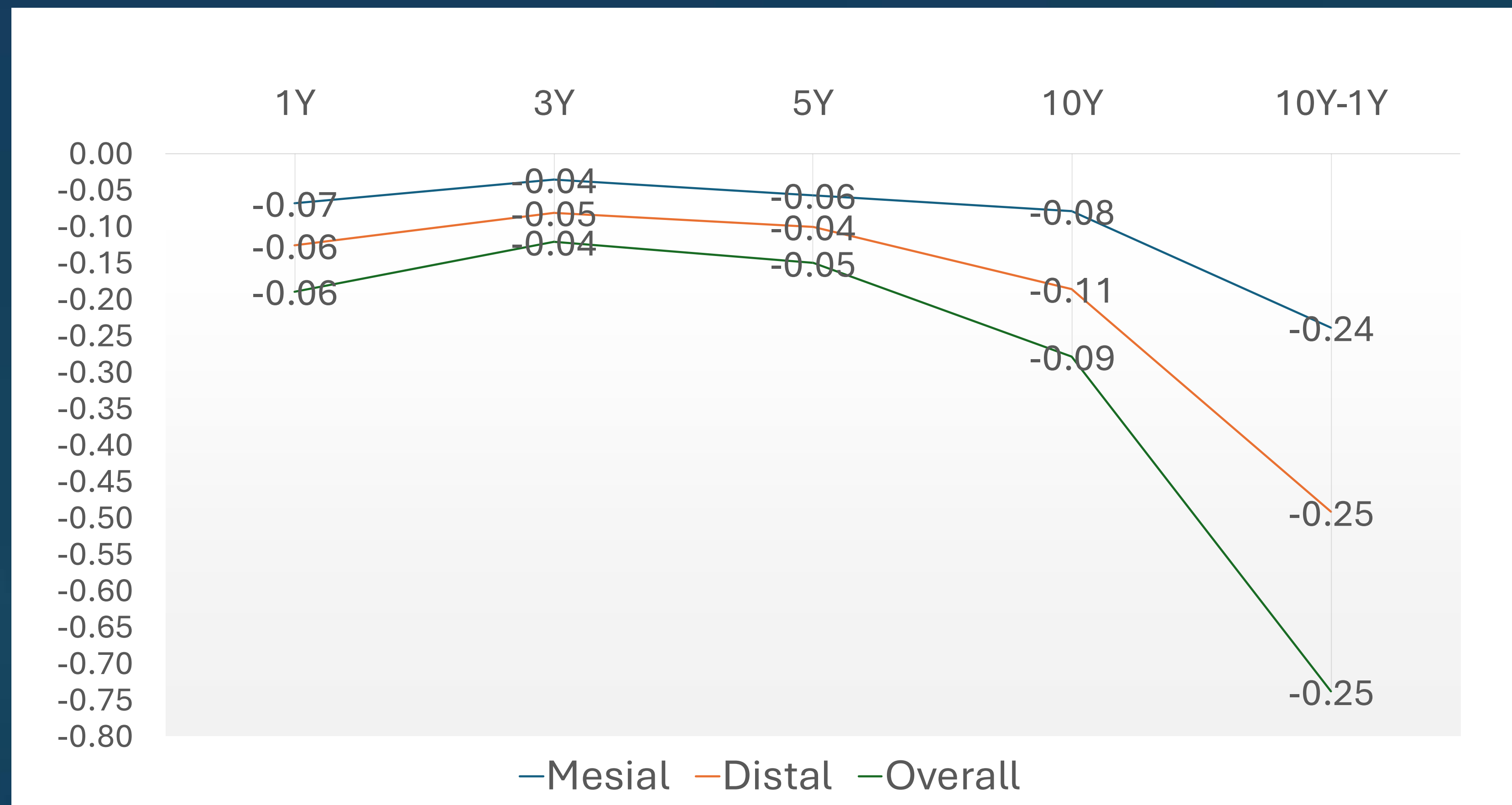


RESULTS

LONG-TERM BONE LOSS TRAJECTORY



Graph 6. Longitudinal evolution of peri-implant marginal bone level during 10 years of follow-up. Mesial and distal measurements showed similar patterns of bone remodeling, with a gradual increase in marginal bone loss over time and greater variability in the late periods (120 months).



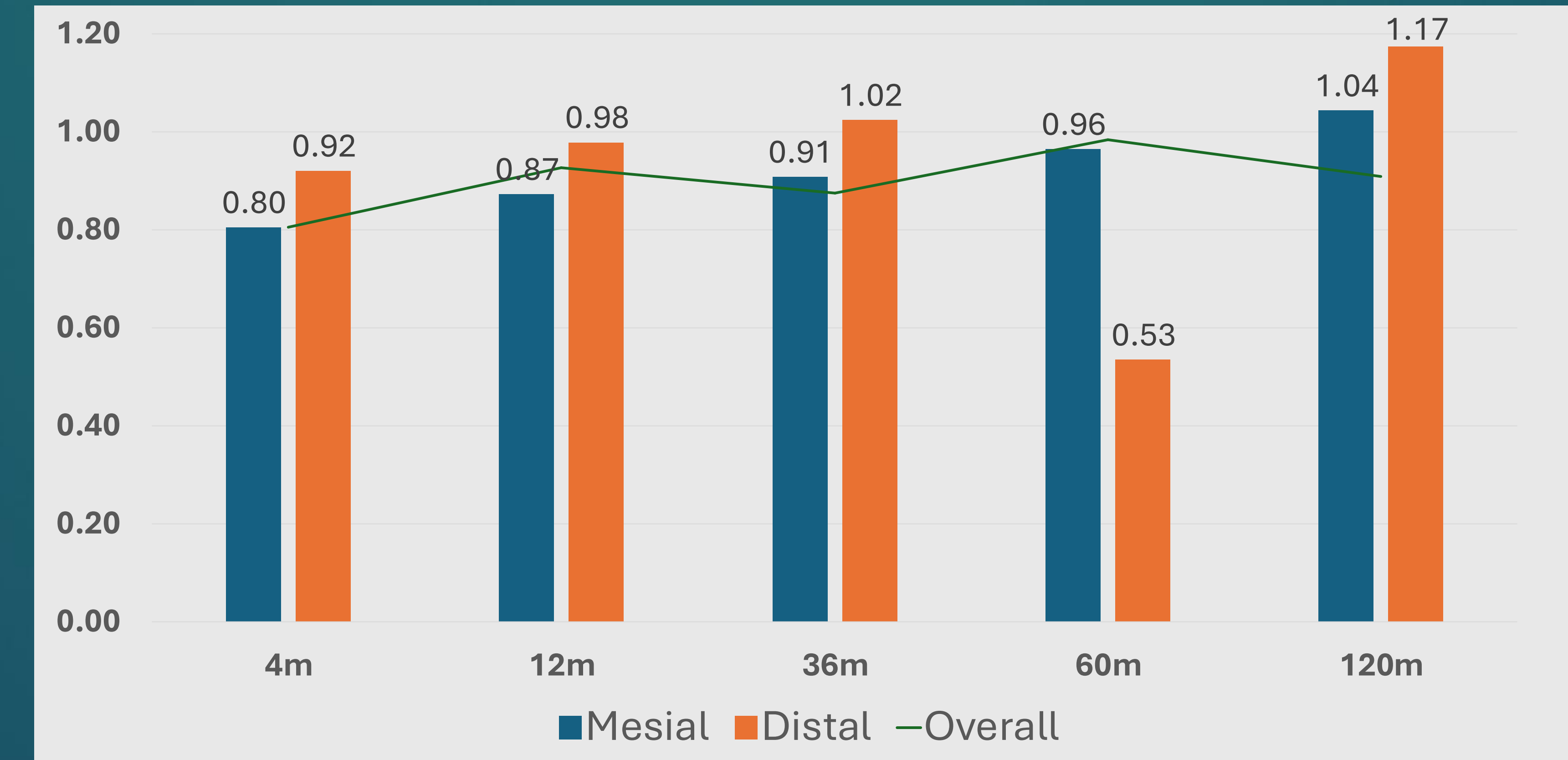
Graph 7. Longitudinal evolution of peri-implant bone remodeling during 10 years of follow-up. Early bone remodeling strongly predicts short-term outcomes but poorly predicts 10-year bone levels.

Early remodeling and late bone loss represent biologically distinct processes.

- **Early phase (0–3 years)**
 - ✓ Highly predictable remodeling
 - ✓ Minimal additional loss
 - ✓ Strong correlations (≈ 0.92 – 0.94)

- **Transition phase (3–5 years)**
 - ✓ Beginning of inter-individual variation
 - ✓ Moderate additional bone loss

- **Late phase (5–10 years)**
 - ✓ Increased variability
 - ✓ Reduced predictability
 - ✓ Cumulative biological and functional factors



Graph 8. Longitudinal evolution of marginal bone loss (MBL) according to the implant face during 10 years of follow-up. Significant differences were observed between faces across all follow-up periods ($p < 0.05$).

- Distal faces consistently exhibited greater MBL than mesial faces (≈ 0.1 – 0.13 mm difference).
- Both faces showed similar long-term bone patterns with minor site-specific variations.

RISK FACTORS AND BONE RESPONSE

Smoking

- ↑ Greater bone loss across all time periods
- ↑ Higher cumulative bone loss (10y)
- ↓ Reduced early bone remodelling (3y)

Previous Periodontitis

- ✓ No impact on average bone loss
- ✓ Transient effect only (3y)
- ✓ No significant effect on long-term bone loss

CONCLUSION

- Immediate loading enabled predictable full-arch rehabilitation in edentulous mandible with sustained biological stability over a decade.
- Despite statistically significant differences between mesial and distal bone levels, these site-specific variations were small and clinically stable over time, supporting the long-term predictability of the treatment—even in patients presenting risk indicators.