



Zirconia VS PFM in Long-Span Bridges

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OBJECTIVE

This literature review aims to critically evaluate and compare zirconia and porcelain-fused-to-metal (PFM) fixed partial dentures (FPDs) in long-span bridge cases. This review focuses on their clinical performance, survival rates, complication profiles, and long-term outcomes, especially in patients who are not suitable candidates for implant therapy. While implant-supported prostheses have shown high success rates, they may not be feasible for all patients due to bone loss or medical conditions. In such cases, tooth-supported fixed partial dentures (FPDs) remain a reliable, long-standing restorative option. By examining mechanical strength, esthetic results, and biological compatibility of the bridges, this study intends to provide clinicians with evidence-based insights for effective treatment planning.

Zirconia vs. PFM in Long-span Fixed Partial Dentures: Literature-Based Comparison

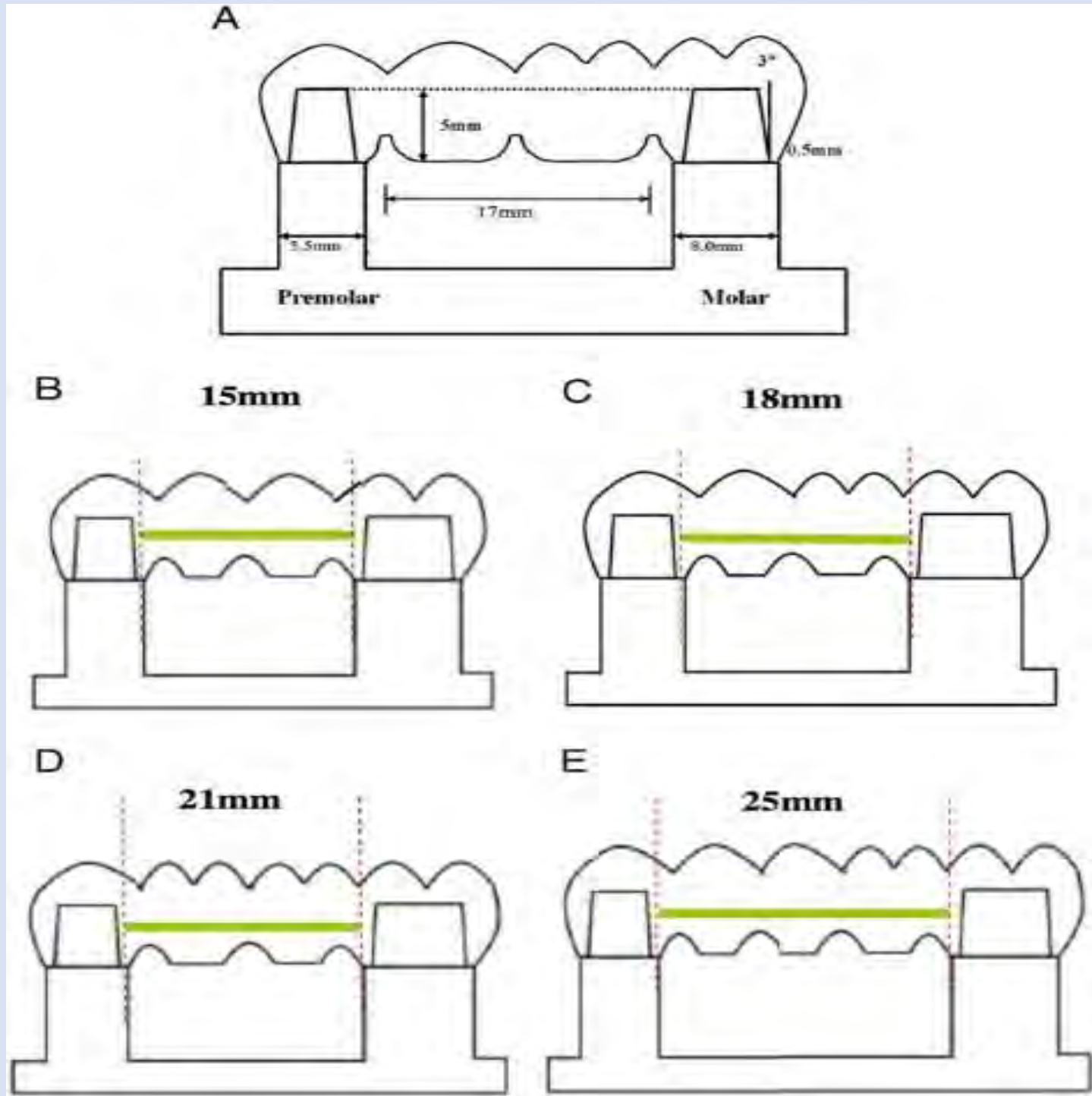
Parameter	Zirconia	PFM (Porcelain-Fused-to-Metal)
Esthetics	Superior; no metal exposure, better gingival	Can show metal margins, potential gingival discoloration
Framework Fracture	Reported in long-span designs (Schmitter et al.)	Rare; metal substructure adds resistance
Tooth Preparation	Conservative with monolithic zirconia	Requires more reduction due to porcelain layering (Conrad et al.)
Biomechanical Behavior	High flexural strength; sensitive to span length and connector size	Better flexural tolerance due to ductile metal substructure
Complications in Long Spans	Chipping, de-cementation, abutment fracture	More stable, but esthetics and prep are trade-offs
Clinical Survival	Good short-to-medium term results; limited long-term data	Proven long-term success over decades (Conrad et al.)
Adjustment/Repair	Technically challenging	Easier due to metal base
Biocompatibility	Excellent; minimal tissue reaction	Good, but potential metal sensitivity in some patients

METHODS

A comprehensive literature review was conducted using Boolean searches on PubMed/MEDLINE, Direct Science, and Google Scholar, covering studies published between 2010 to 2025. The inclusion criteria focused on randomized clinical trials, cohort studies, and in vitro studies discussing zirconia and PFM in the context of long-span FPDs. From an initial pool of 44 articles, 10 studies were selected after systematic screening based on relevance, content quality, and study design. The selected studies included comparisons of mechanical strength, survival rates, complications, and esthetic outcomes of both materials.

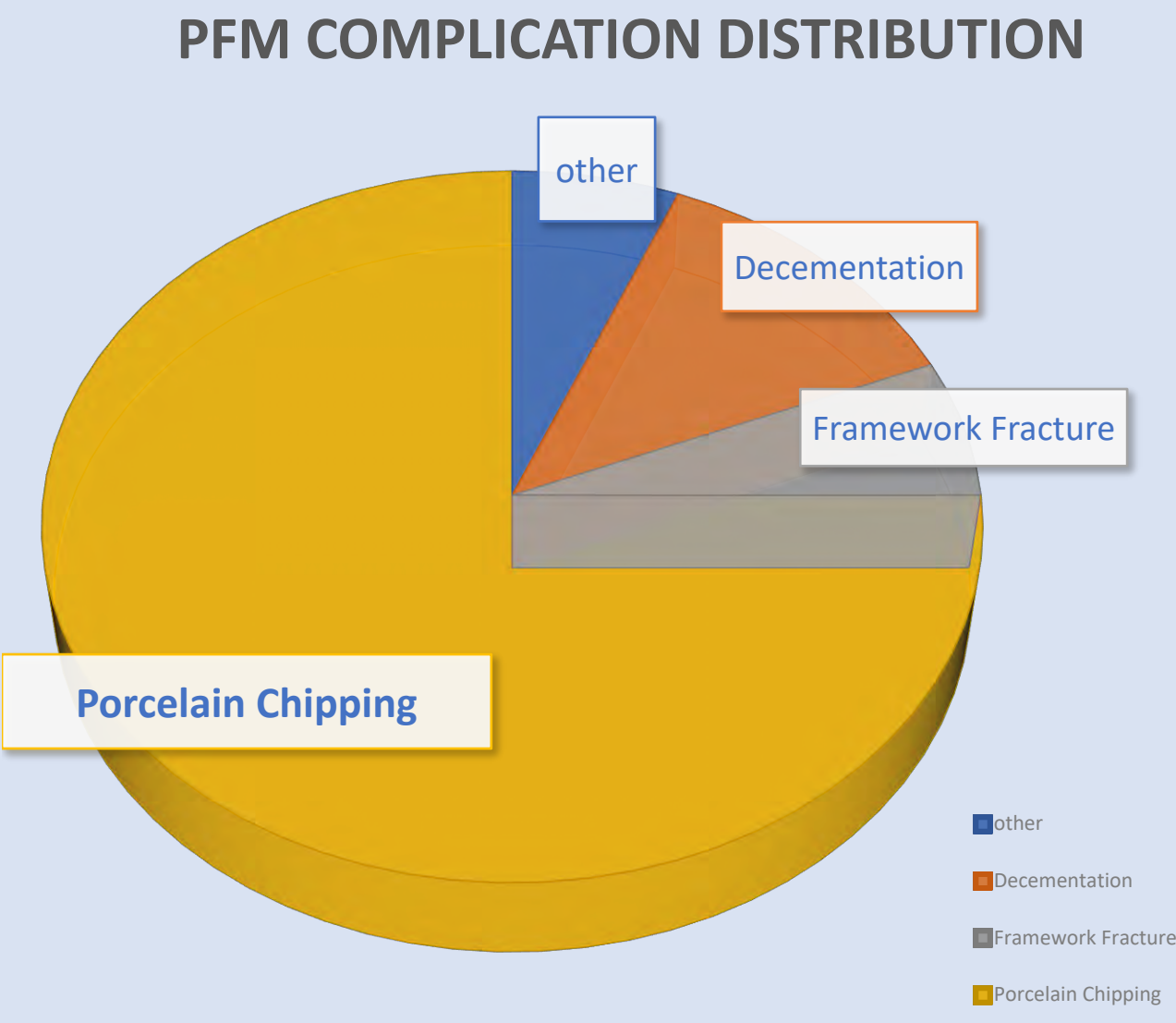
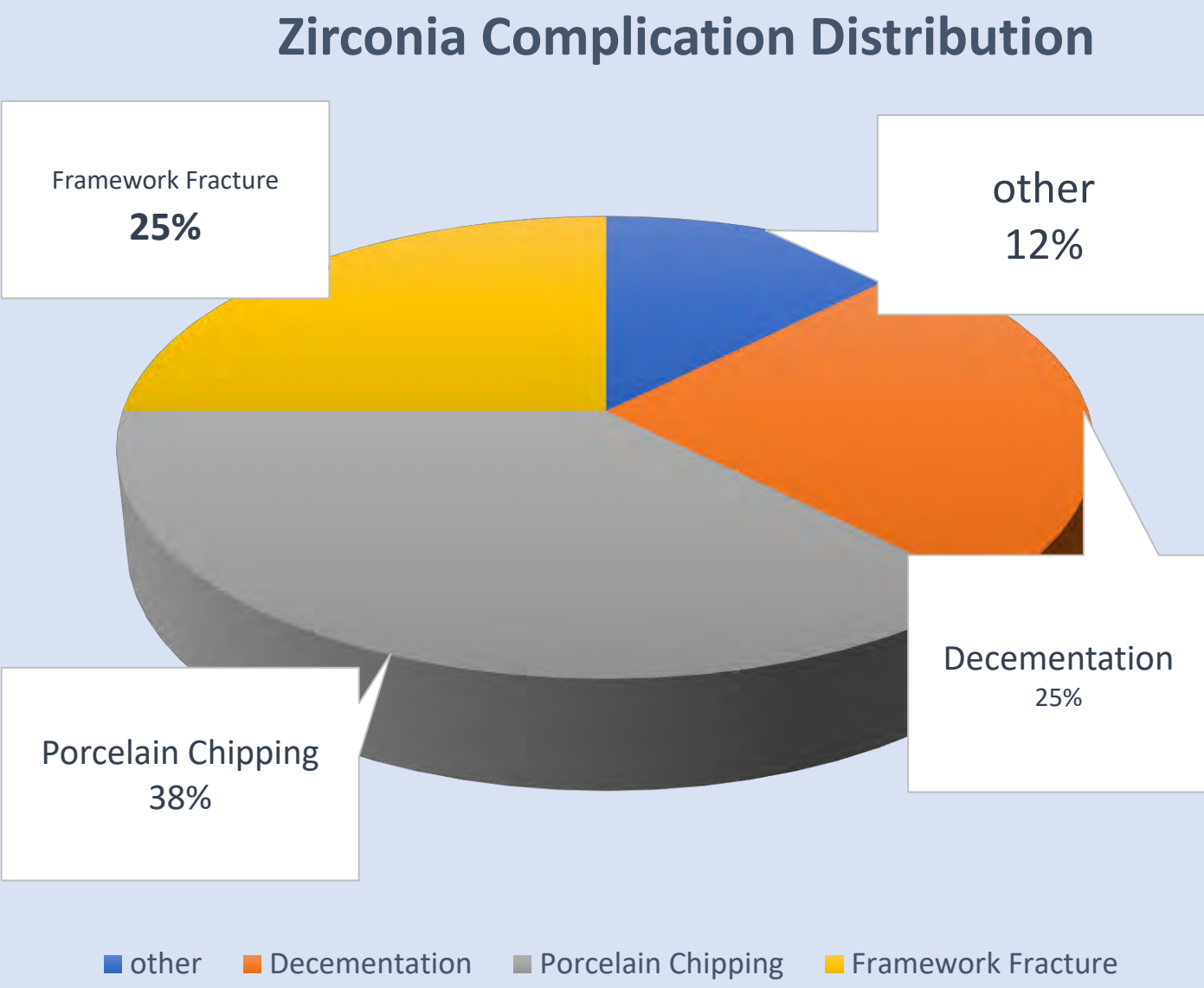
RESULTS

- PFM bridges, while historically considered the gold standard, exhibited complications such as porcelain chipping, gingival discoloration, and metal exposure.
- Zirconia bridges demonstrated improved esthetics and biocompatibility, but were associated with issues like framework fractures, connector failures, and veneer chipping in layered designs.
- Long-span bridges (≥5 units) in both material groups showed increased risks of de-cementation, fractures, and biomechanical complications.
- Studies reported higher fracture resistance in reinforced zirconia FPDs, and favorable survival rates when proper connector dimensions were maintained.
- The 5-year survival rate for zirconia was slightly better than PFM (zirconia: ~97%, PFM: ~94.3%).
- Use of supporting implants in long-span bridges did not show significant improvement and introduced added risks.



LIMITATIONS

- Lack of Clinical Trials: Few high-quality clinical trials directly comparing long-span zirconia and PFM bridges.
- Short-Term Data: Most studies reviewed had limited follow-up periods, restricting insights into long-term survival and complications.
- Small Sample Size: Only 10 relevant studies were included, which may not provide a fully comprehensive overview.
- Variability in Methods: Inconsistencies in study design and materials used make it difficult to draw standardized conclusions.



CONCLUSION

Although both PFM and zirconia materials are viable options for long-span FPDs, zirconia offers better esthetics and biocompatibility, while PFM retains advantages in mechanical resilience, particularly in cases of heavy occlusion. Long-span designs (5+ units) remain more prone to complications regardless of material. Importantly, there is a notable gap in long-term clinical trials directly comparing zirconia and PFM in long-span cases. Further research is essential to establish definitive guidelines for material selection in such complex restorations.

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