Customized Ceramic Brackets Shorten Treatment Time With Similar Overall Treatment Quality but More Bracket Failures

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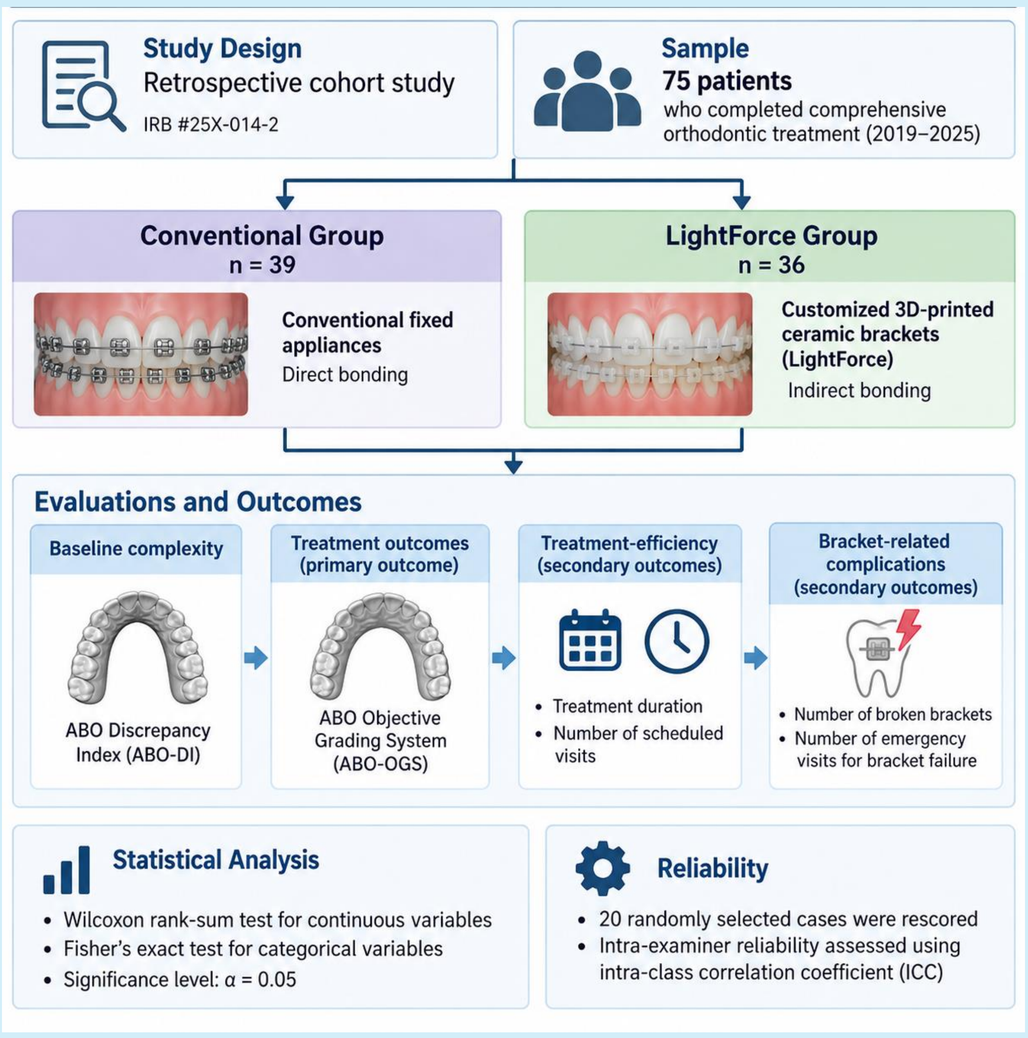
INTRODUCTION

- Accurate bracket placement is critical for achieving predictable orthodontic treatment outcomes.
- Customized 3D-printed ceramic brackets integrate digital treatment planning, individualized prescriptions, and indirect bonding to improve bracket positioning and treatment efficiency.
- However, clinical evidence remains limited regarding whether these advantages translate into better treatment outcomes and efficiency than conventional fixed appliances.

AIM OF THIS STUDY:

- To compare treatment outcomes, efficiency, and bracket related complications between customized ceramic brackets (LightForce) and conventional fixed orthodontic appliances.

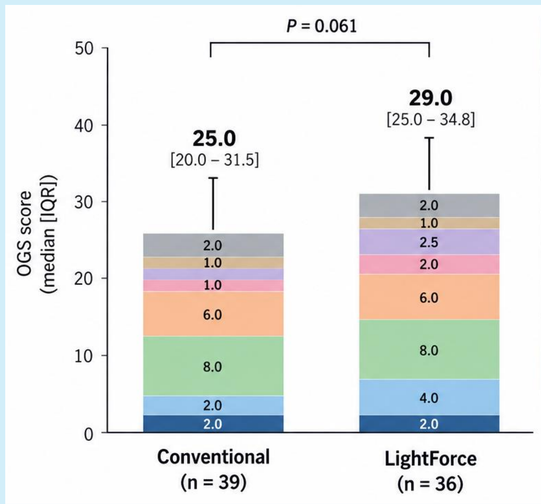
MATERIALS & METHODS



RESULTS

- Baseline malocclusion severity was comparable between groups (P = 0.811)

- Treatment Quality
  Overall ABO-OGS scores were similar between groups
  LightForce: 29.0 | Conventional: 25.0 | P = 0.061
  Marginal ridge scores were higher with LightForce 4.0 vs 2.0 | P < 0.001



OGS component	Conventional (n = 39)	LightForce (n = 36)	*P* value*
Alignment	2.0 (1.0–3.0)	2.0 (1.0–3.0)	0.268
Marginal ridges	2.0 (1.0–3.0)	4.0 (3.0–6.3)	**<0.001**
Buccolingual inclination	8.0 (5.0–10.0)	8.0 (6.0–10.0)	0.806
Occlusal contacts	6.0 (2.0–9.0)	6.0 (3.8–7.3)	0.819
Occlusal relationship	1.0 (0.0–3.0)	2.0 (0.0–4.0)	0.478
Overjet	1.0 (0.0–3.0)	2.5 (0.8–3.0)	0.118
Interproximal contacts	1.0 (0.0–2.0)	1.0 (0.0–1.3)	0.630
Root angulation	2.0 (1.0–3.0)	2.0 (1.0–3.0)	0.581
Total OGS score	25.0 (20.0–31.5)	29.0 (25.0–34.8)	0.061

Values are median (interquartile range).
* Wilcoxon rank-sum test.

- Treatment Efficiency
  LightForce treatment was completed in 16 vs 19 months (P < 0.001).
  LightForce required 12 vs 14 scheduled visits (P = 0.012).

- Bracket-Related Complications
  LightForce had more broken brackets: 3 vs 1 (P < 0.001).
  More emergency visits: 1 vs 0 (P < 0.001).
  At least one bracket failure occurred in 80.6% vs 43.6% of patients (P = 0.002).

CONCLUSION

- Customized ceramic brackets achieved overall treatment quality comparable to conventional fixed appliances.
- LightForce improved treatment efficiency, with shorter treatment duration and fewer scheduled visits.
- These efficiency gains were accompanied by more bracket failures and emergency visits.
- Future studies will evaluate the clinical performance and treatment efficiency of customized ceramic brackets in extraction cases.

CLINICAL TAKEAWAY

- Customized ceramic brackets may improve treatment efficiency, but this benefit should be weighed against their higher rate of bracket related complications.

REFERENCES

1. Casko JS, Vaden JL, Kokich VG, et al. Objective grading system for dental casts and panoramic radiographs. *Am J Orthod Dentofacial Orthop.* 1998;114(5):589–599.
2. Brown MW, Koroluk L, Ko CC, et al. Effectiveness and efficiency of a CAD/CAM orthodontic bracket system. *Am J Orthod Dentofacial Orthop.* 2015;148(6):1067–1074.
3. Penning EW, Peerlings RHJ, Govers JDM, et al. Orthodontics with customized versus noncustomized appliances: a randomized controlled clinical trial. *J Dent Res.* 2017;96(13):1498–1504.
4. Hegele J, Seitz L, Claussen C, et al. Clinical effects with customized brackets and CAD/CAM technology: a prospective controlled study. *Prog Orthod.* 2021;22(1):40.
5. Wheeler TT, Garvan CS, Waldman A, Ford J. Clinical efficiency of LightForce 3D-printed custom brackets in diverse practice settings. J Clin Orthod. 2024;58(5):273–282.