

REVIEWER'S REPORT

Manuscript No.: IJAR-55610

Title: 3D Printing in Dentistry: From current applications to future potential

Recommendation:

Accept as it is
Accept after minor revision..... Yes.....
 Accept after major revision
 not accept (*Reasons below*)

Rating	Excel.	Good	Fair	Poor
Originality	•			
Techn. Quality	•			
Clarity	•			
Significance	•			

Reviewer Name: Dr. Sireesha Kuruganti

Detailed Reviewer's Report

Detailed Review of Manuscript: 3D Printing in Dentistry: From Current Applications to Future Potential Strengths

- **Clear Abstract (Lines 3–15)**
 - Concisely highlights the transformation of dentistry through 3D printing and introduces 4D printing as a future direction.
 - Mentions specific innovations (shape-memory elastomers, hydroxyapatite polymers, surface-modified metals) that enhance adaptability and bioactivity.
- **Comprehensive Background (Lines 16–38)**
 - Strong explanation of additive manufacturing vs. subtractive methods.
 - Good coverage of CAD/CAM, CBCT, and imaging technologies that support clinical adoption.
 - Effective emphasis on applications in prosthodontics, orthodontics, and oral surgery.
- **Materials Section (Lines 55–197)**
 - Very detailed classification: polymers, thermoplastics, metals, ceramics, novel composites, biopolymers, and bioinks.
 - Line 131–145: Excellent comparison of zirconia vs. lithium disilicate, with flexural strength values and translucency differences.
 - Line 147–153: Innovative mention of graphene composites with antimicrobial properties.
 - Line 154–177: Strong introduction of 4D smart materials and natural biopolymers for bioinks.
- **Applications Section (Lines 199–269)**
 - Orthodontics (Lines 200–223): Clear distinction between thermoformed vs. direct 3D printed aligners.
 - Prosthodontics (Lines 227–241): Provides quantitative data on flexural strength (60–90 MPa) and

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fracture resistance (1000–1200 N).

- *Maxillofacial Surgery (Lines 271–334):* Excellent coverage of surgical guides, orthognathics surgery, TMJ reconstruction, and tissue engineering scaffolds.

- **Future Potential (Lines 395–429)**

- *Strong vision for 4D printing in adaptive prosthetics, drug delivery, and tissue regeneration.*

- *Line 414–419:* Notable mention of shape-memory elastomers (SMEs) with dual/multi-shape capabilities.

- *Balanced discussion of limitations in metal 3D printing (cost, complexity, lack of long-term evidence).*

Weaknesses

- **Redundancy (Lines 9–15 vs. 395–429)**

- *Abstract and future potential sections repeat similar points about adaptability and smart materials. Could be condensed.*

- **Limited Clinical Evidence (Lines 346–351, 429–433)**

- *While applications are well described, survival rates and long-term outcomes (e.g., customized implants at 94.5% survival, Line 348–349) need more comparative data.*

- **Market Data (Line 224–226)**

- *Orthodontics market share (40% in 2024, CAGR 26.42%) is mentioned but lacks broader industry context (regional distribution, competitors, adoption barriers).*

- **Figures and Visuals (Line 405)**

- *Only one figure (Dental 3D Bioprinting Challenges) is referenced. More diagrams comparing technologies, workflows, or material properties would strengthen clarity.*

- **Standardization Issues (Lines 47–53, 425–429)**

- *Manuscript acknowledges lack of standardized protocols but does not propose concrete frameworks or guidelines.*

Opportunities

- **Integration with AI (Line 49–51)**

- *Brief mention of AI-assisted design could be expanded into a dedicated subsection on predictive modeling and automated workflow optimization.*

- **Regenerative Dentistry (Lines 318–320, 401–403)**

- *Tissue engineering scaffolds and bioprinting are promising areas. Manuscript could benefit from more case studies or pilot trials.*

- **Environmental Sustainability (Line 398)**

- *Direct printing of aligner stores to reduce waste is noted. Expanding on eco-friendly materials and recycling strategies would add value.*

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Recommendations

1. **Condense Repetitive Content**

- Merge overlapping discussions of adaptability (Lines 9–15 and 395–429).

2. **Expand Clinical Evidence**

- Provide more longitudinal data on survival rates, fracture resistance, and patient outcomes (Lines 346–351).

3. **Add Comparative Tables**

- Summarize material properties (flexural strength, modulus, biocompatibility) across polymers, metals, ceramics (Lines 65–145).
- Include a table comparing 3D vs. 4D printing applications.

4. **Strengthen Market Analysis**

- Add regional adoption trends, cost-benefit analysis, and barriers to entry (Lines 224–226).

5. **Increase Visual Aids**

- Add workflow diagrams for orthodontics, prosthodontics, and implantology.
- Include comparative charts of SLA, DLP, FDM, SLS, SLM (Lines 40–45, 248–257).

Overall Verdict

This manuscript is **well-structured, comprehensive, and forward-looking, with strong coverage of materials and applications. However, it would benefit from **greater clinical evidence, standardized frameworks, and expanded market analysis**. With revisions, it has strong potential for publication in a high-impact dental or biomedical engineering journal.