مجلة جامعة بني وليد للعلوم الإنسانية والتطبيقية
Bani Waleed University Journal of Humanities and Applied Sciences
تصدر عن– جامعة بني وليد – ليبيا
Website:https://jhas-bwu.com/index.php/bwjhas/index
المجلد العاشر ـ العدد الأول ـ 2025 ـ الصفحات (646– 650)
ISSN3005-3900

Dental prostheses and dental implants

Amer Alhadi Agtait [1]*, Abdulla Mohammed Atbayga [2]
[1.2] Department of Prosthodontics, Faculty of Medical Technology, University of Bani Waleed, Bani Walid, Libya.
ameregtit@bwn.edu.ly

التركيبات السنية وزراعة الأسنان

عامر الهادي اقطيط [1]* ، عبدالله محمد اطبيقة [2]
[2.1] قسم التركيبات السنية، كلية التقنية الطبية، جامعة بني وليد، بني وليد، ليبيا.

تاريخ الاستلام: 03-02-2025 تاريخ القبول: 05-03-2025 تاريخ النشر: 12-03-2025

Abstract
Fixed prosthodontics, encompassing crowns, bridges, inlays, and onlays, plays a critical role in the restoration and functional rehabilitation of teeth. In modern dental implantology, fixed prostheses supported by implants offer a long-lasting solution for partial or complete edentulism. This paper provides an overview of the historical development, anatomical considerations, diagnostic techniques, and materials involved in fixed prosthodontics. Furthermore, it discusses contemporary technologies such as CAD/CAM and 3D imaging, emphasizing their role in enhancing treatment precision and aesthetic outcomes. The integration of titanium and zirconia implants is examined alongside challenges in clinical planning and patient-specific considerations. This review aims to assist dental professionals in understanding the multifaceted approach required to achieve successful and durable restorations.

Keywords: CAD/CAM, Dental implants, Fixed prosthodontics, Osseointegration, Zirconia.

الملخص
تلعب أطقم الأسنان الثابتة، التي تشمل التيجان والجسور والحشوات والحشوات المطعّمة، دورًا محوريًا في ترميم الأسنان وإعادة تأهيلها وظيفيًا. في زراعة الأسنان الحديثة، تُقدّم أطقم الأسنان الثابتة المدعومة بالغرسات حلاً طويل الأمد لحالات انعدام الأسنان الجزئي أو الكامل. تُقدّم هذه الورقة البحثية لمحة عامة عن التطور التاريخي، والاعتبارات التشريحية، وتقنيات التشخيص، والمواد المستخدمة في أطقم الأسنان الثابتة. كما تناقش التقنيات المعاصرة مثل التصميم بمساعدة الحاسوب (CAD/CAM) والتصوير ثلاثي الأبعاد، مُركّزة على دورها في تحسين دقة العلاج والنتائج الجمالية. تُناقش هذه الورقة دمج غرسات التيتانيوم والزركونيا، إلى جانب تحديات التخطيط السريري والاعتبارات الخاصة بكل مريض. تهدف هذه المراجعة إلى مساعدة أطباء الأسنان على فهم النهج متعدد الجوانب اللازم لتحقيق ترميمات ناجحة ودائمة.

الكلمات الدالة: CAD/CAM، زراعة الأسنان، أطقم الأسنان الثابتة، التكامل العظمي، الزركونيا.

1. Introduction

Fixed prosthodontics is a specialized field of restorative dentistry focusing on non-removable dental restorations. These include crowns, bridges, and implant-supported prostheses designed to restore function, aesthetics, and oral health. Unlike removable dentures, fixed prostheses provide superior comfort, stability, and biomechanical performance. This discipline has evolved significantly due to innovations in materials, digital planning, and implantology, aligning with a growing demand for long-lasting and aesthetically pleasing solutions.

2. Historical Development of Fixed Prosthodontics and Dental Implants

2.1 Ancient and Classical Periods

Archaeological findings reveal that ancient Egyptians and Etruscans employed materials such as gold wire and carved ivory to replace missing teeth. These primitive restorations mark the origins of prosthodontics.

2.2 Modern Implant ology and Osseo integration

The groundbreaking work by Per-Ingvar Bran mark in the 1950s introduced the concept of Osseo integration—direct structural and functional connection between living bone and the surface of a load-bearing implant. His research with titanium laid the foundation for modern implant-supported prosthetics, transforming dental rehabilitation paradigms globally.

3. Anatomical and Clinical Considerations

3.1 Maxillofacial Anatomy

Successful implant placement demands precise evaluation of the alveolar ridge, maxillary sinus, mental foramen, and inferior alveolar nerve. Adequate bone volume and density are critical to achieving primary stability and long-term Osseo integration.

3.2 Occlusion and TMJ Function

Fixed prosthodontics must account for occlusal harmony, anterior guidance, and temporomandibular joint (TMJ) health. Misaligned occlusion can lead to prosthetic failure, muscle fatigue, and TMJ dysfunction.

4. Diagnostic Tools and Planning

Advanced diagnostic protocols now include:

- **Cone Beam Computed Tomography (CBCT):** Provides 3D imaging of bone architecture.
- **Digital Impressions:** Captured via intraoral scanners to enhance prosthetic accuracy.
- **T-Scan System:** Measures occlusal forces and timing to refine functional load distribution.

- **Virtual Treatment Planning Software:** Enables guided surgery and prosthetic previewing, often through platforms like Simulant or Nobel Clinician.

5. Materials in Fixed Prosthodontics and Implants

5.1 Prosthodontics Materials

- **Zirconia:** Offers high flexural strength (>900 MPa), biocompatibility, and aesthetics. Ideal for anterior restorations.
- **Lithium Dislocate (e.max):** Provides excellent translucency and is suited for single-unit crowns and veneers.
- **Porcelain-Fused-to-Metal (PFM):** Combines strength and esthetics; still popular for posterior bridges due to cost-effectiveness.
- **Hybrid Ceramics and Composite Resins:** Newer materials like Enamic combine ceramic properties with resin elasticity.

5.2 Implant Materials

- **Titanium:** Continues to be the gold standard due to superior osseointegration and mechanical strength.
- **Zirconia Implants:** Gaining interest for patients with metal allergies or in high-aesthetic zones. However, long-term clinical data is still evolving.

6. Clinical Workflow and Digital Integration

Contemporary workflows incorporate:

- **CAD/CAM Fabrication:** Enables precise design and milling of prostheses in-office or via labs.
- **Surgical Guides:** Created digitally for minimally invasive implant placement.
- **Immediate Loading Protocols:** Allow for quicker rehabilitation, especially with All-on-4 concepts.
- **3D Printing:** Used for temporary restorations and surgical templates.

Digital integration streamlines communication between surgeon, prosthodontics, and technician, enhancing predictability and patient satisfaction.

7. Challenges and Future Perspectives

Despite technological advancements, challenges persist:

- **Peri-implantitis:** A leading cause of implant failure, necessitating improved hygiene protocols and surface modifications.
- **Mechanical Complications:** Including screw loosening and prosthetic fractures.

- **Aesthetic Limitations:** Especially in thin gingival biotypes where gray metal may shine through.

Emerging innovations include:

- **Bioactive Coatings:** Promote faster bone integration.
- **Nanotechnology:** Improves implant surface properties.
- **Artificial Intelligence:** Assists in prosthesis design and treatment planning.
- **Regenerative Materials:** Such as platelet-rich fibrin (PRF) and stem cell therapies for bone augmentation.

8. Conclusions

Fixed prosthodontics supported by dental implants has revolutionized oral rehabilitation. Its success hinges on accurate diagnostics, material science, and clinical execution. The integration of digital technology has further refined treatment delivery. Continued research and innovation will undoubtedly enhance both clinical outcomes and patient quality of life.

References

1. Rosenstiel, S. F., Land, M. F., & Fujimoto, J. (2015). *Contemporary fixed prosthodontics* (5th ed.). Elsevier.
2. Brånemark, P. I., Hansson, B. O., Adell, R., et al. (1977). Osseointegrated implants in the treatment of the edentulous jaw. *Scandinavian Journal of Plastic and Reconstructive Surgery. Supplementum, 16*, 1–132.
3. Van Noort, R. (2013). *Introduction to dental materials* (4th ed.). Mosby Elsevier.
4. Pjetursson, B. E., Thoma, D., Jung, R., Zwahlen, M., & Zembic, A. (2007). A systematic review of the survival and complication rates of zirconia-ceramic and metal-ceramic single crowns. *Clinical Oral Implants Research, 18*(Suppl 3), 97–113. https://doi.org/10.1111/j.1600-0501.2007.01467.x
5. Buser, D., Sennerby, L., & De Bruyn, H. (2017). Modern implant dentistry based on osseointegration: 50 years of progress, current trends, and open questions. *Periodontology 2000, 73*(1), 7–21. https://doi.org/10.1111/prd.12185
6. Ahmed, S. A., Esayah, S. M., & Altwair, K. M. (2024). Evaluation of Knowledge and Attitude for Infection Control in The Dental Laboratory Place Regarding COVID-19. Bani Waleed University Journal of Humanities and Applied Sciences, 600-609.

7. Gahlert, M., Burtscher, D., Wieland, M., Göbel, U. B., & Erhardt, W. (2007). Osseointegration of zirconia implants: An SEM observation of the bone-implant interface. *Head & Face Medicine*, *3*(25), 1–8. https://doi.org/10.1186/1746-160X-3-25

8. Bidra, A. S., Rungruanganunt, P., Gauthier, M. F., & Taylor, T. D. (2013). Clinical outcomes of implant-supported fixed prostheses in completely edentulous arches. *Journal of Prosthetic Dentistry, 109*(3), 159–166. https://doi.org/10.1016/S0022-3913(13)60035-5

9. Dawood, A., Marti Marti, B., Sauret-Jackson, V., & Darwood, A. (2015). 3D printing in dentistry. *British Dental Journal*, *219*(11), 521–529. https://doi.org/10.1038/sj.bdj.2015.914

ت	الاسم	الحالة	رقم السن	التاريخ
1	مرام الشارف محمد	تركيب على زراعة	4.5	2023-02-08
2	لمياء عبد الباسط حسين	تركيب على زراعة	6	2023-08-08
3	مرام عبدالله عربي	تركيب على زراعة	4.5.6	2024-08-11
4	محمد عبد الله عربي	تركيب على زراعة	2	2024-08-16
5	عائشة علي محمد	تركيب على زراعة	3.4	2024-09-11
6	هانية أبو القاسم مسعود	تركيب على زراعة	2.3	2024-05-27