International Journal of Research and Review
Volume 11; Issue: 12; December 2024
Website: www.ijrrjournal.com
Review Article *E-ISSN: 2349-9788; P-ISSN: 2454-2237*

Endodontic Implants: Gap Between Root Canal Treatment and Tooth Replacement - A Review Article

Dr. Kanupriya[1], Dr. Rudhra Koul[2], Arjun Mahajan[3], Dr. Kirti[4], Dr. Shubhangi Mittal[5]

[1,4,5]Post graduate second year, Department of Conservative Dentistry & Endodontics, Genesis Institute of Dental Sciences & Research, Ferozepur, Punjab.
[2]Senior Lecturer, Department of Conservative Dentistry & Endodontics, Genesis Institute of Dental Sciences & Research, Ferozepur, Punjab.
[3]Second year, BDS student, Genesis Institute of Dental Sciences & Research, Ferozepur, Punjab.

Corresponding Author: Dr. Kanupriya

DOI: https://doi.org/10.52403/ijrr.20241242

ABSTRACT

The primary goal of dentistry is to preserve and restore natural dentition to normal functional state. When teeth are lost or damaged beyond repair, it can lead to both functional and aesthetic concern. Teeth replacement is needed to restore function, improve appearance and maintain oral health by preventing bone loss. Endodontic implants have emerged as an innovative solutions to certain challenges, offering patients an alternative to traditional tooth extraction and full dental implants. Endodontic implants focus on restoring a tooth from within, specifically within the root canal after it has undergone endodontic treatment. This approach not only preserves more of the natural teeth but also provides a functional, aesthetic restoration for patients suffering from severe tooth decay, trauma, or failed root canal treatments.

Keywords: Endodontic implant, Root canal, Dental restoration.

INTRODUCTION

Endodontic Implant

Endodontic implants are placed directly into the root canal space following the removal of infected or necrotic tissue. They are artificial metallic extension, which can safely extend out through the apex of the tooth into sound bone[1]. Endodontic implants increases the root to the crown ratio and stabilizes a tooth with weakened support[2].

History

First endodontic implant was described by Orlay. Later on, Frank developed proper instruments for placement of implant. Frank and Abrams reported that properly placed endodontic implant was well accepted by apical tissue[1] .

Endodontic implant material and design

The endodontic implant typically have a root-form shape that mimics the natural tooth root often tapered for better fit and stability. Common materials for fabrication include titanium for its strength, corrosion resistance, and biocompatibility, as well as zircornia for its aesthetic advantages, particularly in visible areas, and bioceramic for their natural dentin like qualities[3]. The implant surfaces are often roughed or coated with hydroxyapatite to enhance retention and promote tissue integration. Internal thread or tapered designs help secure the implant within the canal and the use of biocompatible materials minimizes adverse reactions[3]. *Wein et al.* were the first to introduce designs like threaded and non-threaded implants, which provided various amounts of retention

and inadvertently led to dentin crazing. Modern designs also focus on customizing the implant to the tooth's anatomy using advanced imaging technologies, ensuring a better fit and more effective restoration.

Trade names

Recent trade names in the field of endodontic implants and related dental technologies include Straumann® BLX Implant System, Dentsply Sirona® Implants, NobelActive® by Nobel Biocare, Zimmer Biomet® Tapered Screw-Vent®, BioHorizons® Laser-Lok®, Megagen® AnyRidge®, Endopore® by BioHorizons, TITANIUM® Endo-Implants, Rootform® by Rootform Endodontics, and the Revitalization® System from Rootform Endodontics[4].

Selection of Patients for Endodontic Implants

The selection of patients for endodontic implants involves a thorough assessment of various clinical, radiographic, and health factors to determine whether the procedure is appropriate or not. Key criteria for patient selection include:

1. Tooth Structure and Extent of Damage: Patients should have a tooth with a compromised root structure that cannot be salvaged through conventional root canal treatment but still retain a healthy crown that can be preserved[5].
2. Root Canal Treatment Failure: Patients who have undergone previous root canal therapy that failed due to infection, root fractures, or incomplete healing may be suitable candidates[6].
3. Severe Root Damage or Fracture: Individuals with severe root fracture or damage to the root caused by trauma or infection may benefit from endodontic implants[7].
4. Good Bone Quality: Stern et al. in 2010 focused on implant success and the importance of bone quality for good outcomes in dental implantology Adequate bone volume and density are essential for implant stability and osseointegration. Bone grafting may be required if there is significant bone loss.
5. Absence of Active Infection: Any active infection in the area should be treated prior to implant placement. The infection must be under control to ensure the success of the implant[8].
6. 6.Patient Health and Medical History: A thorough evaluation of the patient's medical history and current medications is critical. Contraindicated in surgery, uncontrolled diabetes, severe periodontal disease, or immune system disorders.
7. Age Considerations: Patients should be over the age of 18, as the bone is still developing in younger individuals, which may affect implant success[9].
8. Patient Expectations and Commitment: Patients must have realistic expectations and a commitment to post-operative care, including proper oral hygiene and follow-up visits to ensure the long-term success of the implant[5].

Indications for Endodontic Implants

The primary indications for considering an endodontic implant include the following conditions:

a) Horizontal root fracture of a tooth that require the removal of the apical segment and the remaining coronal portion is too weak to remain due to an unfavorable crown-root ratio

b) Periodontal bone loss, which involves single tooth, where extraction and replacement is difficult; c) Pulpless tooth with short roots d) Pathological root resorption of the root apex which is because of chronic abscess [2].

Contraindications for Endodontic Implants

While endodontic implants can be an effective treatment option in many cases, there are certain situations where their use may not be recommended. It includes severe bone loss in the jaw, uncontrolled systemic health conditions like diabetes mellitus, osteoporosis, cardiovascular diseases, severe tooth mobility, active infection or abscess, tooth with severe root resorption beyond repair, poor oral hygiene, bruxism[6].

Advantages of Endodontic Implants

Endodontic implants provide a range of benefits over traditional dental treatments. Some of the key advantages include:

1. Preservation of natural tooth
2. Avoids bone grafting procedures
3. Faster healing time
4. Improved aesthetic outcome
5. Reduced need for extensive dental work
6. Long-term durability
7. Minimizes the risk of complications[6]

Disadvantages of Endodontic Implants

Some of the potential disadvantages of endodontic implants:

1. Complex treatment planning
2. Potential for infection
3. Expensive
4. Potential for implant failure
5. Longer treatment time
6. Long-term maintenance[10][11].

Endodontic Implants vs Traditional Implants

While both endodontic implants and traditional dental implants serve the same basic function. Traditional implants are used when a tooth is completely missing or needs to be extracted. They involve placing a titanium post directly into the jawbone, which serves as an artificial tooth root[5].

In contrast, endodontic implants are specifically designed for situations where the tooth still exists but is severely damaged or has undergone unsuccessful root canal treatment[5]. This hybrid approach provides a more conservative solution that eliminates the need for tooth extraction, potentially offering better long-term results for patients with compromised teeth.

Endodontic Implant Failure: Causes, Prevention, and Management

Endodontic implant failure can occur due to a variety of factors, including 1. Infection: Infection is a common cause, often resulting from poor oral hygiene, pre-existing infection, or surgical contamination, leading to peri-implantitis, signs of failure include pain, implant mobility, swelling, pus discharge, and visible bone loss on radiographs. 2. Poor osseointegration: Inadequate osseointegration can occur if the implant fails to fuse with the bone, often due to poor bone quality, insufficient volume, or mechanical stress. 3. Implant overload 4. Incorrect positioning 5. Biomechanical issues 6. Material defects[5].

Management includes prevention strategies include thorough preoperative assessment, bone grafting if necessary, accurate implant placement, infection control, managing occlusion and loading, educating patients on post-operative care, and regular follow-ups [5].

CONCLUSION

Endodontic implants represent a crucial advancement in restorative dentistry, offering a reliable solution for replacing teeth that have failed after root canal treatment or those that are no longer viable due to factors like fracture or infection. By combining the principles of endodontics and implantology, these implants help patients regain both the function and aesthetics of their natural teeth, while also preventing bone loss and promoting oral health.

Looking ahead, the future of endodontic implants appears promising, driven by ongoing advancements in dental material, techniques, and technology.

Declaration by Authors

Ethical Approval: Not Applicable

Acknowledgement: None

Source of Funding: None

Conflict of Interest: No conflicts of interest declared.

REFERENCES

1. Yadav, R.K., Tikku, A. P., Chandra, A., Wadhwani, K. K., Ashutosh Kr, & Singh, M. Endodontic implants. Natl. J. Maxillofac. Surg 2014; 5(1): 70-3.
2. Kaur K, Kaur R, Khanna R. Custom Fabricated Endodontic Implant. J Adv Med Dent Scie Res 2020; 8(8):102-5.
3. Mangesh Panchal, Shreyas Khare, Parth Khamkar, Kiran Suresh Bhole. Dental implants: A review of types, design analysis,

materials, additive manufacturing methods, and future scope. Mater. Today Proc 2022; 68(6): 1860-7.
4. Larsen, R. M., Patten, J. R., & Wayman, B. E. Endodontic endosseous implants: case reports and update of material. J. Endod 1989; 15(10) :496–500.
5. Ramesh, Sindhu and James David Raj. Endodontic Stabilizers: A Myth 2015
6. Chatzopoulos, G. S., & Wolff, L. F. Implant and endodontic treatment selection are influenced by patients' demographic characteristics, insurance status, and medical history: A retrospective cohort study. Quintessence Int. 2017; 48(9) :753–64.
7. Seymour, David & Patel, Monika & Carter, Lachlan & Chan, Marcus. The management of traumatic tooth loss with dental implants: Part 2. Severe trauma. Br. Dent. J 2014 217.
8. Siqueira, J. F., & Rôças, I. N. Clinical implications and microbiology of bacterial persistence after treatment procedures. Endodontic Topics, 2004; 7(1): 74-91.
9. Gonzalez-Martin, M., & Lopez-Quiles, J. Endodontic Implants: A Clinical Review. J Clin Exp Dent 2015; 7(4): e489-e495.
10. Alnojaidi, S. F., Alnojaidi, G. F., Alnojaidi, R. F., & Alyousef, S. M. Endodontics and Implant Relationship.2022;1–29.
11. Kokane, Vandana & Patil, Swapnil. Management of Grade III Mobile Anterior Tooth in Function Using Endostabilizer - A Case Report. JCDR 2014; 8:6-7.

How to cite this article: Kanupriya, Rudhra Koul, Arjun Mahajan, Kirti, Shubhangi Mittal. Endodontic implants: gap between root canal treatment and tooth replacement - a review article. *International Journal of Research and Review*. 2024; 11(12): 391-394. DOI: *https://doi.org/10.52403/ijrr.20241242*

******