39th IACDE National Conference

Biomimetic Approaches in Clinical Endodontics: A Paradigm Shift

Biomimetic dentistry is the art and science of restoring or repairing damaged teeth with various approaches that mimic natural dentition in terms of aesthetics and function.

INTRODUCTION

Biomimetic term coined by ***Otto Schmitt*** in 1950

Objective: To explore biomimetic approaches in endodontics aimed at preserving pulp vitality. When preservation is unachievable, we focus on minimally invasive endodontics and, as a last resort, regenerative endodontics

BIOMIMETIC HIERARCHY IN ENDODONTICS

Pulp Vitality Preservation → Minimally Invasive Endodontics → Regenerative Endodontics

BIOMIMETIC MATERIALS IN ENDODONTICS

For Preservation of Pulp Vitality

- MTA
- Biodentine
- Hydroxyapatite
- Bioactive Glass

For Minimally Invasive Endodontics

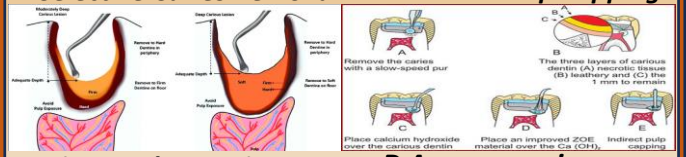
- Bioceramic Sealers
  - EndoSequence BC Sealer
  - BioRoot RCS
  - AH Plus Bioceramic
  - GuttaFlow Bioseal
- Resin-based Adhesives
  - Clearfil SE Bond
  - OptiBond FL
- Flowable Composite

For Regeneration

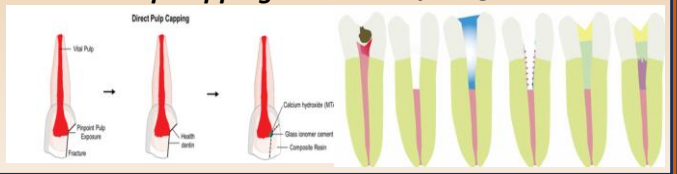
- Scaffolds
  - Collagen-Based
  - Polylactic Acid
- Growth Factors
  - Platelet Derived Growth Factor (PDGF)
- Bioceramic Putty
  - Endo Sequence Root Repair Material
- Stem Cell Sources
  - Autologous Blood

PULP VITALITY PRESERVATION

A.Selective Caries Removal ***B.Indirect Pulp Capping***



C.Direct Pulp Capping ***D.Apexogenesis***



PULP REGENERATION

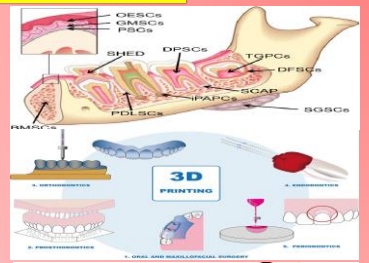
Stem cell therapy

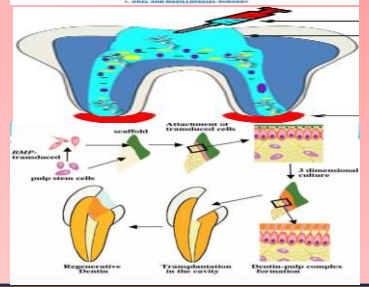
3D Cell Printing

Pulp Implant

Scaffold Implant

Gene Therapy



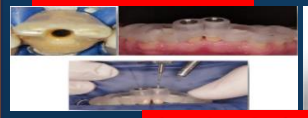


MINIMALLY INVASIVE ENDODONTICS (MIE)

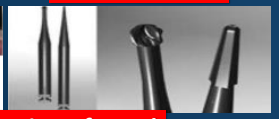
Narrow Access Cavity Preparation

Conservative access Cavity ***Ninja Endodontic Access Cavity*** ***'Truss' Access Cavity*** ***Incisal Access*** ***Cala Lilly Enamel Preparation***

Microguided Endodontic Access



Modern Endodontic Burs



3D Disinfection

A.Endoactivator system ***B.GentleWave***

Cleaning & shaping of canals

Self-Adjusting File System ***XP-endo Shaper*** ***TruNatomy Files*** ***Endo-Eze technology***

C.Photoactivated Disinfection (PIPS) ***D.SWEEPS***

ADVANTAGES & DISADVANTAGES OF BIOMIMETIC APPROACH

Advantages

- Enhanced Pulp Vitality
- Structural Preservation
- Reduced Need for Retreatments
- Biocompatibility

Disadvantages

- Higher Costs
- Complexity of Tooth Anatomy
- Technique-Sensitive
- Longer Treatment Time

FUTURE DIRECTIONS

Advancements in biomimetic materials and techniques include tooth regeneration, autotransplantation with improved cryopreservation and enamel repair with amelogenin-inspired peptides and hydroxyapatite coatings. These approaches aim to restore natural tooth structure and function more effectively.

REFERENCES

1.Kumar, N.; Maher, N.; Amin, F.; Ghabbani, H.; Zafar, M.S.; Rodríguez-Lozano, F.J.; Oñate-Sánchez, R.E. Biomimetic Approaches in Clinical Endodontics. *Biomimetics* **2022**, *7*, 229

2.Anjum, Arbiya and Swaroop Hegde. "Minimally Invasive Endodontics-A Review." (2019).