

SEAL TO HEAL- MANAGEMENT OF PERFORATION REPAIR

Manali Saoji¹, Rasika Kashikar², Manoj Chandak³, Pradnya Nikhade⁴, Gopal Tawani⁵, Neelam Chandwani⁶

1. PG 1st year in Department of Conservative dentistry and endodontics, Datta meghe institute of medical sciences (Sharad pawar dental college)
2. PG 1st year in Department of Conservative dentistry and endodontics, Datta meghe institute of medical sciences (Sharad pawar dental college)
3. Professor and H.O.D in Department of Conservative dentistry and endodontics, Datta meghe institute of medical sciences (Sharad pawar dental college)
4. Professor in Department of Conservative dentistry and endodontics, Datta meghe institute of medical sciences (Sharad pawar dental college)
5. Reader in Department of Conservative dentistry and endodontics, Datta meghe institute of medical sciences (Sharad pawar dental college)
6. Reader in Department of Conservative dentistry and endodontics, Datta meghe institute of medical sciences (Sharad pawar dental college)

ABSTRACT:

Perforations are the mechanical or pathologic communication between the root canal system and external tooth surface. Perforation result in destruction of dentine root wall or floor along with investing cementum. Perforation will lead to infections in the periapical area, periodontium which in turn will destroy the periapical tissue and will lead to failure, Hence perforation repair is needed. Several material have been used in past to repair perforation including Zinc oxide eugenol , Glass inomer cement , Composite resin, Amalgam, Calcium hydroxide , Polycarboxylate. The newer materials can be added and condensed to improve sealability with minimal inflammation along with osseointegration that includes Mineral trioxide aggregate, Biodentine, Bio-aggregate and Endosequence root repair material. This has been proposed for repair of perforation due to its sealing ability and cementum repair occurring at material interface, also the Ph of material supports repair and hard tissue formation. The purpose of treatment is to achieve tight and permanent seal that will prevent bacteria and bio-products in root canal from entering surrounding periodontal tissue.

Keyword: Bioactive material, Perforation, Seal

INTRODUCTION:

Perforation is an artificial communication between root canal system in the supporting tissues of the teeth or to the oral cavity.

Accidents occur mainly during:

- Accidents During Access Preparation

- Accidents During Cleaning and Shaping
- Accidents During Obturation
- Accidents During Post Space Preparation

There are many older materials which were used for perforation repair they are:

- Amalgam
- Zinc polycarboxylate

- Composite
- Glass ionomer cements
- Zinc oxide eugenol

BIOACTIVE MATERIAL

In 1969, Hench gave the concept of bioactivity as “A bioactive material is one that elicits a specific biological response at the interface of the material which results in the formation of a bond between the tissues and the material”¹

BIOACTIVE MATERIALS CAN BE CLASSIFIED AS:

Class A: Osteopductive Materials

In osteopductive materials the bioactive surface is colonized by osteogenic stem cells. Class A bioactivity occurs when a material elicits both an *intracellular* and an *extracellular* response at its interface.

Group B: Osteoconductive Materials

The osteoconductive materials simply provide a biocompatible interface along which bone migrates. Osteoconductive

bioactivity occurs when a material elicits only an *extracellular* response at its interface.

THE VARIOUS BIOACTIVE MATERIALS ARE:

- Calcium Hydroxide
- Mineral Trioxide Aggregate (MTA)
- Bioaggregate
- Biodentine
- Endo Sequence Root Repair Material.

Calcium Hydroxide

Ca(OH)₂ was first introduced as a pulp capping agent and its extended use in endodontics has helped to treat perforations, resorptions, weeping canals, non-surgical healing of apical lesions, incompletely formed apex and as canal sealers.²

COMPOSITION (TWO PASTE SYSTEM)

ACIDIC PASTE	FUNCTION
Alkyl salicylate (iso-butyl salicylate or 1-methyl triethylene salicylate)	
Titanium oxide 12-14%	Inert fillers
Barium sulphate 32-35 %	Radioopacifier
Calcium tungstate/ calcium sulphate 14-15%	
BASIC PASTE	FUNCTION
Calcium hydroxide 50-60%	
Sulfonamide or paraffin oil	Plasticizer

ADVANTAGES

- Initially bactericidal to bacteriostatic.
- Promotes healing and repair
- High Ph stimulates fibroblast

- It neutralizes the low ph of the acids present at the inflammation site.
- It stops internal resorption
- Inexpensive & easy to use(3)

DISADVANTAGES

- Poor sealing ability

- Does not exclusively stimulate
- dentinogenesis.
- dentin bridge formation
- Primary tooth resorption

Mineral Trioxide Aggregate (MTA)

Mineral Trioxide Aggregate (MTA) has been investigated as a potential compound to seal off the pathways of communication between the root canal system and the external surface of the tooth. This material was introduced to dentistry, in the field of endodontics in 1993 by **Mahamoud Torbinejad** at Loma Linda University, as a material for root end filling and perforation repair.⁴

COMPOSITION

MTA consists of 50-75% (wt) calcium oxide is a powder consisting of fine hydrophilic particles of:

- Tricalcium silicate
- Tricalcium aluminate
- Tetra calcium aluminoferrite
- Tricalcium oxide
- Silicate oxide
- Bismuth oxide for radiopacity.

It also contains small amounts of other mineral oxides such as magnesium oxide, calcium sulphate and potassium sulphate. These modify its physical & chemical properties.⁵

ADVANTAGES

- MTA has a higher sealing and lesser sensitivity to moisture.

- Biocompatible
- Osteoinductive property

DISADVANTAGES

The main drawbacks of MTA includes-⁶

- Presence of toxic elements (arsenic) in the material composition
- Difficult handling characteristics
- Long setting time
- High material cost
- Discoloration potential of teeth treated with GMTA

BIOAGGREGATE

BioAggregate is new generation of a root canal repair filling material.

COMPOSITION:-

- Tricalcium Silicate
- Dicalcium Silicate
- Calcium Phosphate Monobasic
- Amorphous Silicon Dioxide, And
- Tantalum Pentoxide

ADVANTAGES

- Excellent handling characteristics
- Promote cementogenesis
- More biocompatible than MTA

BIODENTINE

Biodentine is the first all-in-one bioactive and biocompatible dentine substitute used to treat damaged dentine both for restorative and endodontic purposes.⁷

POWDER	FUNCTION
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Tri-calcium silicate	Main core material
Di-calcium silicate	Second core material
Calcium carbonate and oxide	Filler
Iron oxide	Shade
Zirconium oxide	Radiopacifier
LIQUID	FUNCTION
Calcium chloride	Accelerator
Hydrosoluble polymer	Water reducing agent

ADVANTAGES

- Good push out bond strength
- Better handling properties
- Better manipulation
- Provides sealing with bacterial tight effect
- Bioactivity of material

DISADVANTAGES

- Material cost
- Delayed setting time

ENDOSEQUENCE ROOT REPAIR MATERIAL

ERRM (Brasseler USA, Savannah, GA, USA), a new bioceramic material, is a hydrophilic, insoluble, radio-paque, and aluminum-free material .

COMPOSITION:-

- Calcium Silicates
- Zirconium Oxide
- Tantalum Oxide

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- Calcium Phosphate Monobasic
- Filler Agents

ADVANTAGES

- Nano bioceramic nano particle material
- Antibacterial activity
- Improve handling characteristics

DISADVANTAGES

Less sealing ability as compared to MTA

CONCLUSION:

Bioactive material can be considered as a boon to dentistry because of its regeneration material. Thus in newer future it can be envisioned that there will better alternatives in the field of restorative dentistry in the form of bioactive material

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