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CASE REPORT

THE SUBTLE SHIFT FROM MINERAL TRIOXIDE AGGREGATE TO BIODENTINE- A REPORT

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ABSTRACT

Bio-active materials have been a game changer in restorative dentistry and endodontics over the last few years, but there still exists a lot of confusion and doubts for a general practitioner on the basic differences between MTA(Mineral trioxide aggregate) and BIODENTINE, how to choose one among them. This short compilation will give a quick idea for a clinician about the major difference between both in a nutshell.

KEY WORDS: MTA, Biodentine, Bioceramics

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INTRODUCTION:

Over the last two decades, the field of endodontics in dentistry is flourishing high. The increased awareness of patients to preserve and restore their natural teeth to function, is one of the main reasons for it. This has ultimately led to new horizons in material sciences too.

The introduction of bioceramics in endodontics is a boom. The cases which were once considered as impossible to treat were all treated with this magnificent material. The remarkable biocompatible material called MTA (Mineral trioxide aggregate) is a breakthrough. It almost replaced the calcium hydroxide-based cements. MTA was found in 1993 by Dr. Mahmoud Torabinejad et al[1] at the Loma Linda University, California, US. The applications of this material were in both surgical and non-surgical procedures including indirect pulp capping, perforation repair, root canal filling, apexification and root end filling[2]. Despite the high efficacy of this wonder cement, there were also some crucial properties reported by the clinicians mainly difficult handling, discoloration of tooth structure and increased setting time[3].

To overcome this, another bioactive material called Biodentine was launched in 2010 by Septodont which is considered the second breakthrough in bioactive materials in endodontics. Biodentine was formulated using the MTA based technology, and hence there is improved properties. It is also claimed as "the dentin substitute" by the manufacturers. This cement has a lesser setting time and more improved handling properties. The compressive, flexural and push out bond strengths are all greater in biodentine when compared to MTA[4]. This tabular column below is a short compilation which comparatively analyses MTA and biodentine in a clinician point of view[5,6,7,8].

PROPERTIES	BIO DENTIN	MTA
Form	Capsule (Single use and needs an amalgamator)	Powder and liquid
Composition (Same main core material which includes tricalcium silicate, dicalcium silicate) plus	Zirconium oxide Iron oxide	Tetracalcium aluminoferrite Bismuth oxide Silicon oxide Aluminium oxide
Setting reaction	Sets by hydration but it contains calcium chloride which acts an accelerator	Sets by hydration
Setting time	Initial setting time: 6 min Final setting time: 10 min	Initial setting time: 70 min Final setting time: 175 min
Compressive strength	First hour: 100 Mpa 24 hours: 200 Mpa 1 month: 300 Mpa	24 hours: 40 Mpa 21 days: 67 Mpa
Porosity	Due to decreased water content in the mixing stage, it exhibits lower porosity.	Due to increased water content in the mixing stage, porosity occurs.

PROPERTIES	BIO DENTIN	MTA
Flexural strength	After 24 hours: 34 Mpa	After 24 hours: 14.27 Mpa
Radio opacity	3.5mm of equivalent thickness of aluminium	7.17mm of equivalent thickness of aluminium
pH	12	9.5 to 11
Discoloration	It exhibits colour stability	It causes discoloration of tooth due to the presence of bismuth oxide and other heavy elements
Cost	Single capsule costs around 1000INR	Per gram costs around 3000-4000INR. Single application costs around 300-400INR.
Adhesion	In addition to the micro mechanical adhesion, there is the formation of "mineral infiltration zone" due to its high pH. There is also formation of cementum like tissue later over the material.	Initially micromechanical adhesion followed by cementum like tissue formation later.

SUMMARY:

Biodentine can be used as permanent dentin replacement and temporary enamel whereas MTA can only be used as sub base[5]. However, there are certain limitation/drawbacks with both MTA and biodentine. The biodentine exhibits poor radio-opacity and lower washout resistance whereas MTA shows discoloration, longer setting time, toxic elements in its composition[7]. Quest for newer materials are never ending especially in the field of dental science. Number of new materials are being formulated and tested every day to deliver a good clinical performance. One such is biodentine which has an increased potential to revolutionize the management of affected tooth in the field of operative dentistry and Endodontics. Although there has been increasing use of bioceramics and evident proof of its clinical outcomes, further studies are still required in this area.

CONCLUSION:

In a world full of continuous innovation, successful treatment outcomes can be achieved not just by different materials, but primarily by clinician's knowledge on these materials and skill to perform procedures precisely to achieve healing, restore function for the patient.

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Nil

CONFLICTS OF INTEREST:

There are no conflicts of interest

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