



## Socket Preservation Using Demineralized Dentine Graft: An Update

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### Abstract

The residual alveolar bone resorption is very rapid immediately after tooth extraction. Which causes difficulty in seating of prosthesis at a later stage or might also be esthetically unpleasant. Hence, alveolar bone preservation after teeth extraction is becoming a common practice these days. To overcome these bone loss problems various graft materials also have been used in day to day practice. These materials have its own advantages and disadvantages. The research community keeping these disadvantages in mind always strived to find new and economic alternatives.

The history of a bone-inducing research in dentin began with a report in 1967 that animal derived Demineralized Dentine Matrix (DDM) induced bone formation within intramuscular pockets. Since then the research has started to introduce the DDM as one of the safe and economic bone graft material in socket preservation. This paper reviews the existing literature on DDM and delineates the clinical usage, its advantage, disadvantage and clinical implications of same in routine dental practice. This paper will guide the clinician and researchers about DDM usage and its expanding scope in bone regeneration and tissue engineering.

**Keywords:** Bone graft; Dentine; Extraction; Impaction; Implant; Replacements

### Introduction

The residual alveolar bone resorption is very rapid immediately after tooth extraction [1]. Which causes difficulty in seating of prosthesis at a later stage or might also be esthetically unpleasant. Hence, alveolar bone preservation after teeth extraction is becoming a common practice these days [2]. To overcome these bone loss problems various graft materials also have been used in day to day practice [3]. These materials have their own advantages and disadvantages. The research community keeping these disadvantages in mind always strived to find new and economic alternatives. This paper reviews the existing literature on DDM and delineates the clinical usage, its advantage, disadvantage and clinical implications of same in routine dental practice. This paper will guide the clinician and researchers about DDM usage and its expanding scope in bone regeneration and tissue engineering. The literature search has been carried out using various combinations of words related to graft, DDM, extraction, impaction, implant, and ridge preservation. The articles which met the inclusion criteria of human usage of DDM have been considered for review. The in-vitro and non-human studies not considered for review.

### Demineralized Dentine Matrix (DDM)

DDM consists of type-I collagen (95%) and non-collagenous proteins which includes growth factors. The DDM induced bone formation was reported in 1967 using animal derived DDM [1]. Tooth consists of inorganic components like hydroxyapatite, Tricalcium Phosphate (TCP), Octacalcium Phosphate (OCP), Amorphous Calcium phosphate (ACP) and dicalcium phosphate dihydrate and organic components such as collagen [4]. The chemical composition of dentin is very similar to bone which consists of 65% inorganic, 35% organic substances and water [4].

### Preparation of DDM and its usage

Auto Crush mill is used (Osteo mill, Tokyo) at 12000 rpm for 60 sec with 15 saline ice blocks. The crushed granules will be demineralized in 0.34 N Nitric acid solution for 20 min and extensively washed in distilled water to prepare patients own DDM (Granule size 0.5 mm to 2.0 mm) [2]. Periodontally involved teeth without root canal filling, wisdom tooth; tooth extracted due to orthodontic reasons can be used for DDM preparation for immediate grafting [3]. Restoration like crowns and fillings should be removed immediately after tooth extraction. High speed tungsten

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carbide burs are used to remove carious lesion, discolored dentin and remnants of PDL and calculus [4,5]. In multi rooted teeth root will be splitted and put into grinder for 3 sec, and then vibrating movement for 20 sec in sterile chamber of "Smart Dentin Grinder" [6]. The particles will be separated, and particulate dentin drawer is immersed in basic alcohol for 10 min in a small sterile glass container remaining waste will be discarded [6]. Basic alcohol cleanser consists of 0.5 mm of NaOH and 3% alcohol for deflating dissolving all organic debris bacteria and toxins later washed 2 times in Phosphate Buffered Saline (PBS) [6]. Now dentin will be ready for grafting in extracted socket or alveolar bone defects or in maxillary sinus augmentation [6]. The whole process from extraction till placement of graft takes 15 min to 20 min [6]. Hot plate for 5 min at 140°C will be used to dry the particulate of autologous dentin which can be used for immediate or future grafting [6]. This can be used as particulate or block graft [4,5,7].

## Discussion

Post extraction dimensional changes of the alveolar ridge is inevitable as post extraction sequelae [1]. It is important to maintain alveolar ridge dimensions for replacement of missing tooth through the preservation of hard tissue Horowitz et al. [1] stated that alveolar ridge preservation prevents the ridge resorption, in comparison with non-grafted site [6]. Alveolar bone defect grafting is increased recently because of implant supported replacements. The DDM can be used effectively because tooth extraction and socket grafting can be performed on the same day [2]. Various allogeneic and synthetic bone replacement materials are used for grating [3]. These materials may have osteoconduction, osteoinduction or osteogenesis properties depending on the various material factors [4]. The bone graft material can be classed into auto, allo, xenograft and alloplasts. These materials use depends upon clinical applications, volume deficiency and evidence based studies. Even though autogenous bone grafts considered as gold standard but have limitations like morbidity, potential resorption and high cost.

Gomes et al. conducted a human study in 2006 using autogenous DDM. Twenty-seven lower third molar sockets were selected. The experimental sockets were filled with autogenous DDM and were covered with PTFE membrane. After 90 days, the experimental sockets showed bone formation of the same radiopacity as the surrounding bone. Also, these sockets had shown a faster rate of bone formation as compared to the other groups (control group with no material in the socket and the third group with PTFE in the sockets). It was also proven that the experimental socket had a superior bony architecture. Kim et al. [1] used autogenous tooth bone powder and block in a socket immediately after tooth extraction. They reported good healing of the socket after 3 to 3.5 months which was then taken up for implant placement [1]. Until now, few studies have reported the osteoinductive potency of DDM and presence of BMP molecule in DDM [2]. Hoary and Mealey conducted RCT to assess particle size for the use of socket grafting in 20 patients and concluded that the ridge preservation using DDM was effective irrespective of the particle sizes used, but allografts showed no effects.

## Outcome measures of DDM

Kim et al. [7] have contributed large number of studies and was successful in finding out that autogenous DDM can be used for alveolar ridge augmentation, tooth socket preservation and sinus lift. Pioneer studies performed by Jeoman and Urist in year as early as

1967 proved that autogenous DDM possessed regenerative property. Gomes et al. had pointed out that auto DDM had osteoconductive properties and produce radio-opaque bone. Liang et al. have showed that auto DDM may prosper in near future as apexification material and as a permanent root canal filling material in endodontics. Lec et al. conducted a study to compare the efficiency of auto DDM and other bone graft materials used in sinus bone graft surgeries, after the groups showed favourable bone formation, but auto DDM showed faster rate and superior quality bone formation [8].

The modernization of dental bone grafting was combined with a contemporary preventive approach to bone loss has virtually eliminated the need for such drastic measures. A simplified explanation for the success of this form of grafting is that an autogenous bone graft is placed to act as a "biological placeholder" [8]. Initially, it mechanically prevents the collapse of the surrounding tissues, whether that is bone or soft tissue. Then, through a process called "guided tissue regeneration," the human body is fooled biochemically to recognize the graft as natural bone and over time resorbs and replaces it with the patient's own native bone.

## Limitations of the DDM

Presence of decay, infection or discrepancy between the teeth that is being lost or any possibility of a grossly carious tooth in which it is not possible to extract the dentin i.e., autogenous graft out of the tooth.

## Conclusion

It is essential to perform ridge preservation to prevent atrophy. The ridge or socket grafting will fill the void and allow natural bone to proliferate and fill the space with high quality bone. Depending on the size of the extraction socket the required amount of graft will be necessary so that wound will heal between three to six months completely. It is an economic alternative to other bone grafts.

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