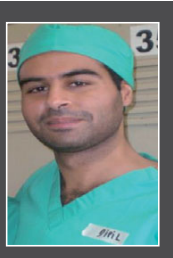
Use of autologous dentin as a bone graft material: a systematic review

Nathalal D.[DDS,MSc] **; Caetano A.*[DDS,MSc] **; Xavier I.*[DDS,MSc] **; Zagalo L.*[DDS,MSc] **; Rodrigues P.*[DDS,MSc] ****

Volunteers at the Implantology Consultation at I.U.E.M. Implantology consultation at I.U.E.M.*



Introduction and Objectives

•Autologous Bone (AB) grafts have osteogenic, osteoinductive and osteoconductive properties[1, 2, 3], therefore are considered the "gold standard" in bone regeneration.[1, 4]

• AB Disadvantages: risk of infection at the donor site, a limited availability of the autologous bone and a high graft resorption. [2]

•Dentin and bone are similar mineralized tissues in terms of chemical composition, like the presence of hydroxyapatite, though the dentin is a more effective graft material because it does not have as many disadvantages as the bone in such matter. [5, 6, 7, 8]

• The dentin is also rich in growth factors such as BMPs, which enhances bone formation and tissue repair [7, 9]

• Auto-BT is a form of demineralized dentin matrix that can be used as a graft material and it comes in the form of powder, chip or

•block. [5, 6, 7, 9, 10, 11, 12, 13, 14, 15 ,16]

•The objective is to assess the utility of autologous dentin for:

a) its efficiency as a graft material in implantology

b) preservation and augmentation of the alveolar ridge

c) the advantage of being an alternative to other bone graft materials

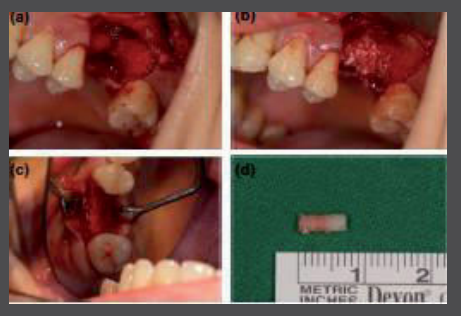


Figure 1: AutoBT grafted 4 weeks after extraction. 6 months after the graft, osseous regeneration was observed and a sample was harvested for histological evaluation

Methods

• Article search was performed using PubMed, regarding the use of autologous dentin as a graft material, published between 2012 and 2017.

•The following words were used in two different searches: "autologous dentin" and "autogenous dentin" respectively.

•The search was completed with the review of the cited references of the selected articles in order to generate studies not initially identified. The revisers analyzed the titles of the results with the application of inclusion (IC) and exclusion criteria (EC) : IC: 1) Articles published between 2012 and 2017; 2) Articles in English; 3) Studies performed only in humans; 4) Studies that evaluate the use of dentin as a graft material; 5) Minimum follow-up of 4 months after the procedure; 6) Results with radiographic or histologic evidence. EC: 1) Studies performed in animals; 2) Studies that used xenogenic or allogenic dentin; 3) Studies that used other dental tissues excluding dentin; 4) Single-case reports; 5) Studies that used the dentin for other purposes rather than bone grafting. The authors performed a new selection of the selected articles after abstract analysis and, finally, the full text articles.

•For this study, from all the information included in the selected articles, only studies with the use of autologous dentine as a bone graft material was considered.

•16 articles were selected.

Results

AUTHOR	YEAR	NUMBER OF PATIENTS	FOLLOW-UP	PURPOSE OF GRAFTING	CONCLUSION
Binderman et al[1]	2014	> 100	2 years	Sinus bone augmentation and filling bone defects after extraction	"Gold-standard" for bone augmentation and bone defects
Jun et al[2]	2014	43	4 months	Sinus augmentation	As effective as bovine xenografts
Kim et al[3]	2014	13	3 years	Bone augmentation for implants	Good alternative to autologous bone
Valdec et al[4]	2017	4	4 months	Ridge preservation	Successful
Pang et al[5]	2016	24	6 months	Ridge preservation for implants	As effective as bovine xenografts
Kim[6]	2015	38	12 months	Graft for implants	Good alternative
Murata et al[7]	2013	2	4 months	Bone augmentation and onlay graft	Successful cases
Kim[8]	2012	n/a	n/a	Bone augmentation	Safer than autologous bone
Park et al[9]	2012	250	6 months	Implant placement	Good alternative for autologous bone
Lee et al[10]	2013	9	30 months	Vertical and horizontal augmentation	Excellent results
Lee et al[11]	2013	20	9 weeks	Implant placement	As effective as GBR
Kim et al[12]	2014	37	2 years	Implant placement	Good alternative to synthetic bone grafts
Murata et al[13]	2013	6	2 years	Bone augmentation	Best material
Pohl et al[14]	2016	6	5 years	Sinus augmentation	Good alternative for other materials
Kim et al[15]	2013	n/a	n/a	Socket preservation and implant placement	Good option
Kim et al[16]	2015	4	4 months	Implant placement	Effective

Figure 2 – Extracted tooth ready to be fabricated into AutoBT in either powder or block form. B. AutoBT powder. C. AutoBT block form

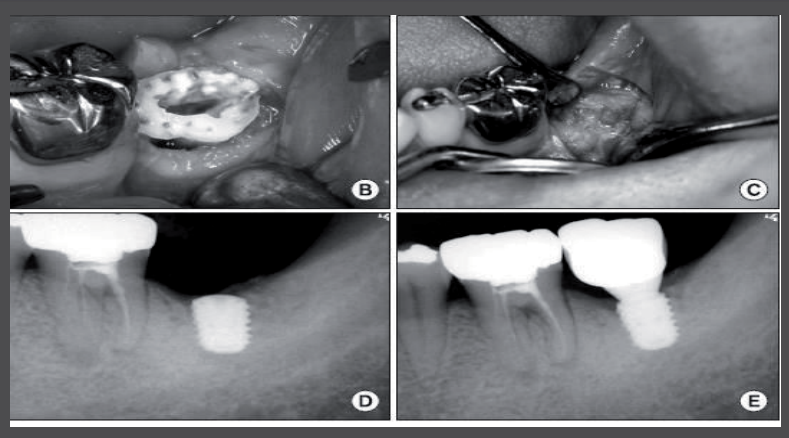


Figure 3 – B and C:A case of AutoBT block graft. D- 5 months later, the implant was placed.E- 6 months after the final prosthesis

Conclusions

Autologous dentin graft shows to be a viable alternative to autologous and xenogenic bone, having had stable results.

Dentin has a similar chemical composition to bone, having also growth factors which give its osteogenic, osteoinductive and osteoconductive properties

Autogenous tooth–derived bone material (AutoBT) is a safer way to harvest autogenous graft material than autologous bone and shows the same effectiveness as other grafting materials

The authors could conclude its efficiency with successful cases, but they suggest further tests and studies

Clinical Implications:

The use of autologous dentin is efficient in the preservation and augmentation of the alveolar ridge and it reduces the morbidity coming from the unfavorable characteristics of autologous bone.

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Image References:

Fig 1: 9- Kim, Y. et al., 2013. tooth-derived bone graft material. *J Korean Assoc Oral Maxillofac Surg*, 39, pp.103-11.
Figs 2 and 3: 5- Kim, E., Lee, I., Kang, J. & Lee, E., 2015. Various autogenous fresh demineralized tooth forms for alveolar socket preservation in anterior tooth extraction sites: a series of 4 cases. *Maxillofacial Plastic and Reconstructive Surgery*, 37(27).