GOCE DELCEV UNIVERSITY - STIP
FACULTY OF COMPUTER SCIENCE

The journal is indexed in
EBSCO

ISSN 2545-4803 on line
DOI: 10.46763/BJAMI

BALKAN JOURNAL OF APPLIED MATHEMATICS AND INFORMATICS (BJAMI)

BALKAN JOURNAL
OF APPLIED MATHEMATICS AND INFORMATICS

YEAR 2023

VOLUME VI, Number 2

AIMS AND SCOPE:
BJAMI publishes original research articles in the areas of applied mathematics and informatics.

Topics:
1. Computer science;
2. Computer and software engineering;
3. Information technology;
4. Computer security;
5. Electrical engineering;
6. Telecommunication;
7. Mathematics and its applications;
8. Articles of interdisciplinary of computer and information sciences with education, economics, environmental, health, and engineering.

BALKAN JOURNAL
OF APPLIED MATHEMATICS AND INFORMATICS
(BJAMI), Vol 6

ISSN 2545-4803 on line
Vol. 6, No. 2, Year 2023

EDITORIAL BOARD

CONTENT

Sonja Manchevska, Igor Peshevski, Daniel Velinov, Milorad Jovanovski, Marija Maneva, Bojana Nedelkovska
APPLICATION OF GEOSTATISTICS IN THE ANALYSIS AND ADAPTATION OF GEOTECHNICAL PARAMETERS AT COAL DEPOSITS…….. 7

Darko Bogatinov, Saso Gelev
PROGRAMMING APLC CONTROLLER WITH A LADDER DIAGRAM..…… 19

Dalibor Serafimovski, Stojce Recanoski, Aleksandar Krstev, Marija Serafimovska
ANALYSIS OF THE USAGE OF MOBILE DEVICES AS DISTRIBUTED TOOLS FOR PATIENT HEALTH MONITORING AND REMOTE PATIENT DATA ACQUISITION……..... 31

Sasko Dimitrov, Dennis Weiler, Simeon Petrov
RESEARCH ON THE INFLUENCE OF THE VOLUME OF OIL IN FRONT OF THE DIRECT OPERATED PRESSURE RELIEF VALVE ON ITS TRANSIENT PERFORMANCES ……43

Violeta Krcheva, Marija Cekerovska, Mishko Djidrov, Sasko Dimitrov
IMPACT OF CUTTING CONDITIONS ON THE LOAD ON SERVO MOTORSAT A CNC LATHE IN THE PROCESS OF TURNING A CLUTCH HUB……...……... 51

Samoil Malcheski
REICH-TYPE CONTRACTIVE MAPPING INTO A COMPLETE METRIC SPACE AND CONTINUOUS, INJECTIVE AND SUBSEQUENTIALLY CONVERGENT MAPPING…..….. 63

Violeta Krcheva, Mishko Djidrov, Sara Srebrenoska, Dejan Krstev
GANTT CHART AS A PROJECT MANAGEMENT TOOL THAT REPRESENTS A CLUTCH HUB MANUFACTURING PROCESS……..…….. 67

Tanja Stefanova, Zoran Zdravev, Aleksandar Velinov
ANALYSIS OF TOP SELLING PRODUCTS USING BUSINESS INTELLIGENCE…… …... 79

Day of Differential Equations
THE APPENDIX……...……..…….. 91

Slagjana Brsakoska, Aleksa Malcheski
ONE APPROACH TO THE ITERATIONS OF THE VEKUA EQUATION ……..….. 93

Saso Koceski, Natasa Koceska, Limonka Koceva Lazarova, Marija Miteva, Biljana Zlatanovska
CAN CHATGPT BE USED FOR SOLVING ORDINARY DIFFERENTIAL EQUATIONS ... 103

Natasha Stojkovic, Maja Kukuseva Paneva, Aleksandra Stojanova Ilievska, Cveta Martinovska Bande
SEIR+D MODEL OF TUBERCULOSIS ……..... 115

Jasmina Veta Buralieva, Maja Kukuseva Paneva
APPLICATION OF THE LAPLACE TRANSFORM IN ELECTRICAL CIRCUITS ...……..... 125

Biljana Zlatanovska, Boro Piperevski
ABOUT A CLASS OF 2D MATRIX OF DIFFERENTIAL EQUATIONS …….....……..... 135

ETIMA
THE APPENDIX……..……147

Bunjamin Xhaferi, Nusret Xhaferi, Sonja Rogoleva Gjurovska, Gordana J. Atanasovski
BIOTECHNOLOGICAL PEOCEDURE FOR AN AUTOLOGOUS DENTIN GRAFT FOR DENTAL AND MEDICAL PURPOSES……..……..149

Mladen Mitkovski, Vlatko Chingoski
COMPARATIVE ANALYSIS BETWEEN BIFACIAL AND MONOFACIAL SOLAR PANELS USING PV*SOL SOFTWARE……..…… 155

Egzon Milla, Milutin Radonjić
ANALYSIS OF DEVELOPING NATIVE ANDROID APPLICATIONS USING XML AND JETPACK COMPOSE……..……. 167

Sonja Rogoleva Gjurovska, Sanja Naskova, Verica Toneva Stojmenova, Ljupka Arsovski, Sandra Atanasova
TRANSCUTANEOUS ELECTRICAL NERVE STIMULATION METHOD IN PATIENTS WITH XEROSTOMIA……..……. 179

Marjan Zafirovski, Dimitar Bogatinov
COMPARATIVE ANALYSIS OF STANDARDS AND METHODOLOGIES FOR MANAGE-MENT OF INFORMATION-SECURITY RISKS OF TECHNICAL AND ELECTRONIC SYS-TEMS OF THE CRITICAL INFRASTRUCTURE …….. 187

The Appendix

The Faculty of Electrical Engineering at Goce Delcev University (UGD), has organized the Second International Conference Electrical Engineering, Informatics, Machinery and Automation - Technical Sciences Applied in Economy, Education and Industry-ETIMA on September, 27th-29th 2023.

ETIMA has a goal to gather scientists, professors, experts, and professionals from the field of technical sciences in one place as a forum for exchanging ideas, strengthening multidisciplinary research and cooperation, and promoting the achievements of technology and its impact on every aspect of living. Conference ETIMA was held as an online conference. More than sixty colleagues contributed to this event, from five different countries with more than thirty papers.

The Organizing Committee selected five papers that will be published in this number of the BJAMI.

Balkan Journal of Applied Mathematics and Informatics Online ISSN 2545-4083
Volume VI Number 2 Year 2023 UDC: 616.314-089.843

BIOTECHNOLOGICAL PROCEDURE FOR AN AUTOLOGOUS DENTIN GRAFT FOR DENTAL AND MEDICAL PURPOSES

BUNJAMIN XHAFERI, NUSRET XHAFERI, SONJA ROGOLEVA GJUROVSKI AND GORDANA J. ATANASOVSKI

Abstract. Teeth that have been extracted are still regarded as clinical waste and are therefore not deemed usable. Autologous dentine graft is currently produced from extracted teeth using a Smart Dentin Grinder (SDG), a specialized equipment. The aim is to present a new protocol and a new method for getting a mineralized autologous dentine graft from recently extracted teeth. In this paper, the method is applied to maintaining the alveolar ridge and has the potential to be used to fill in defects in the jawbones and the entire skeleton system. The autologous dentin graft (ADG) has a strong potential for repairing bone and soft tissue components in the jawbones, while retaining the alveolar ridge's vertical and horizontal dimensions is another goal of the study. It was done using a device known as a Smart Dentin Grinder (SDG), which only needs three seconds to grind the extracted tooth into dentin grains that range in size from 300 to 1000. With the aid of the chemical reagents employed, the produced dentine particles go through chemical processing. The complete treatment was carried out in accordance with Itzhak Binderman's (2014) protocol. The obtained ADG has enough quantity of solid, pure graft material for use in oral surgical operations. It is put to use right away and is more patient-friendly financially. Due to its potential for osteogenetic, osteoinductive, and osteoconductive properties, dentin particles employed as graft material need to be regarded as the gold standard. In several areas of medicine and dentistry, directed bone regeneration can be carried out using the acquired and prepared ADG.

1. Introduction

The goal of all augmentation methods and materials utilized in oral regenerative surgery is to fill the ensuing bone deficiencies, preserve the alveolar ridge's pre-extraction size, and slow down future progressive bone resorption [1].

Bone substitutes have been studied particularly in orthopedic and dental surgery. Induced bone replacements are a major factor in regenerative augmentation procedures in the fields of medicine and dentistry. Research into biomaterials that promote bone tissue's growth and development, which is largely absorbed and replaced by new bone tissue, is the aim of regenerative surgery [2]. Bone substitutes have been utilized in oral, periodontal, and maxillofacial surgery for more than a century [3], but in the past two decades, they have seen a particularly significant increase in global marketing in the dental and medical industries. Bone substitutes are now available in more than 100 different varieties, each with unique qualities and attributes. The annual cost of all grafts around the globe is 2.5 billion dollars, with 2.2 million dollars going into biotechnological methods for acquiring and processing them [4].

Keywords. Please provide 4 to 6 keywords.

According to the statistics from North America, the majority of bone grafts that are used come from the allograft group (more than 50%), followed by xenograft (22%), autograft (15%), synthetic material (5%), BMPs-Bone Morphogenic Proteins, and EMD-Enamel Matrix Derivate (5%), whereas xenograft is the most popular bone substitute on the European market [5].

The first clinical instance of autologous bone graft use in contemporary medicine was in 1820 conducted on a portion of the cranium by the German surgeon Philips von Walter. The clinical use of one's own extracted teeth (autologous graft) to create dentine graft material that serves as an appropriate replacement for an autologous bone substitute is now sufficiently discussed in scientific articles and protocols. Dentin, enamel, and cementum are used as a foundation for getting autologous graft material in advanced regenerative therapy, which biomedical sciences are actively developing [6]. An alternate concept to avoid the drawbacks of other graft materials is to use one's own extracted teeth to create an autologous transplant that is exactly the same as a bone autologous graft. The dentin graft is referred to by a variety of names-synonyms in professional literature, including Autologeus Dentin Graft (ADG), Whole Tooth Autograft (WTA) [7], Autogeneus Tooth Bone (Bonmaker ® ATB), Autogeneus tooth bone graft material (Auto BT), and Tooth Derived Graft (TDG), terms that encompass all conceivable dental tissue components. Autologeus Tooth Derived Graft (ND-ATDG) [8] and Autogeneus Tooth Bone Grafts [9] are non-demineralized. ***Aim:*** The purpose of the article is to present the use of AMDG (mineralized autologous dental graft) as an alternative to other artificial and autologous bone grafts in bone regeneration surgery, due to the fact that dentin, enamel, and cement have the most similar biochemical characteristics to autologous bone. The aim was also to test and determine the effectiveness of the most modern and safe autologous biological graft material - AMDG. Thus, it proves its clinical features when applied to augmentative techniques in oral surgery.

2. Material and method

The preparation and implementation process varies at different medical centers depending on the type of device used and the type of dental implant we desire. Therefore, the medical industry has produced several types of medical devices that can create different forms of dentin grafts:

1. VacuaSonic® Tooth (Cosmobiomedicare, Seoul, South Korea),
2. BoneMaker® (Busan, Republic of Korea),
3. Transformer Device® (TT Tooth Transformer Srl. Milan, Italy); these types of devices are mainly used to graft demineralized dentin,
4. Smart Dentin Grinder - SDG (Kometa Bio® ltd., Holon, Israel) is a grinding system used mainly in the US and Israel, in order to obtain mineralized dentin grafts and partial demineralization.

The modern protocol (SDG Protocol) for AMDG acquisition was introduced in 2014 by Israeli biologist Itzhak Binderman from the Institute of Oral Biology - Tel Aviv School

of Dentistry - Israel. “SDG” – the procedure refers to taking autologous dentin grafted from one's own extracted tooth.

AMDG is taken from teeth that can be extracted using a special tooth grinding device - Smart tooth grinding machine (SDG device) - from Kometa Bio® company (Israel-Tel Aviv) in a short period of 15 minutes.

Figure 1. *Equipment - Smart dentin grinding machine - SDG (Kometa Bio® - Israel) and chemical reagents (Red cup- 20% basic alcohol and Green cup-PBS wash).*

Figure 2. *Surgical instrumentation for the preservation of the alveolar ridge using AMDG*.

The full process of treating the dentin particles to produce the final sterile graft material, AMDG (Autologous Mineralized Dentin Matrix), is described in the sections that follow.

1. Preparation of the tooth (donor):

- Tooth extraction and dentin graft are performed at the same stage (immediately).
- Removal of all types of artificial materials including: canal fillings (cement, gutta-percha), restorative material (composite, polymers, ceramics, amalgam, etc.). Simultaneously remove calculus and soft tissue using an implanted instrument and a carbide burr or manually with a curette and an excavator. This phase lasts 1-3 minutes.
- Dry the extracted tooth with sterile gauze and an air purifier.

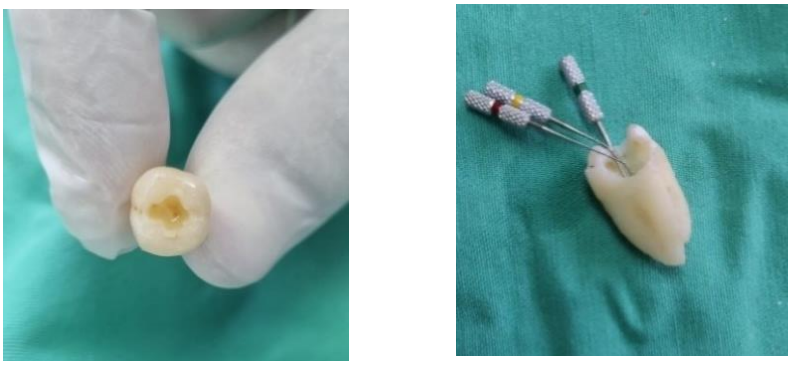

Figure 3. *Preparation of tooth for grinding*.

2. Preparing the tooth grinding tool (Smart Dentin Grinder):

- Seal each individual chamber with the top of the device.

3. Placing teeth into individual chambers:

- Can grind up to 4 teeth at the same time,
- Set the grinding time to 30 seconds and the grading time to 20 seconds, if necessary, the process can be repeated twice.

Figure 4. *Tooth position in individual grinding chamber*.

4. Classifying according to vibration and storing the grafting material obtained in the compartment:

- The resulting dentin particles (about 95-98% of the total volume of ground teeth) in the upper drawer are 300-1200 microns in size, while in the lower drawer, they are less than 300 microns in size. About 90% of dentin particles accumulate in the upper tray. The augmentation process is of no consequence because particles smaller than 300 microns are inert and can be phagocytosed by tissue macrophages [10]. Larger particles, usually hydroxyapatite crystals from dental enamel, and sometimes soft tissue structures like pulp tissue or connected gingiva, from each chamber still stay in the sieve. For guided bone regeneration (GBR), the resultant dentin particles could substitute for bone.

5. Cleaning the dentine particles (chemical treatment):

- Using Dentin Cleanser solution for 5-10 minutes at room temperature can remove all possible pathogenic microorganisms (bacteria, viruses, and fungi). It is also possible to decrease dentin particles (opening the dentinal tubules). This mixture contains 20% ethanol (C2H5OH) and the fundamental alcohol NaOH. hydration and pH neutralization using a buffer system (PBS - WASH), buffered phosphate solution. The grafting material is then immersed in the solution for a few minutes. In order to neutralize the pH value (acid-base characteristics) and clean the remaining Dentin Cleaner solution, the same operation is carried out twice. According to a numerical analysis, this results in an acid-base value of 7.2. As a result, the dentin graft is ready (sterile) to be applied to the bone defect.

3. Results

As a result of the use of the SDG-apparatus for the preparation and obtaining of a dentinal graft, a solid amount of purified dentin particles will be obtained, depending on the tooth used as the source for dentin graft extraction, in volume from 0.8 to 2.5 g. The smallest amount of graft material comes from the mandibular incisors, while the largest amount comes from the molars.

4. Conclusion

AMDG, as an advanced graft material, has a simple and rapid preparation process and it has excellent application and processing properties when filling bone defects. Extracted teeth are no longer considered medical waste because in a short time an extremely safe graft material can be obtained by exploiting its own biological potential to the fullest. Hence, the possibility of building a “bone bank”, collection from extracted healthy permanent teeth and the possibility of using AMDG in bone defects will open up. Dentin grafts have many indications for use in oral and reconstructive surgical practice as well as in the skeletal system in general.

References

[1] De Risi, V.; Clementini, M.; Vittorini, G.; Mannocci, A.; De Sanctis, M. Alveolar ridge preservation techniques: A systematic review and meta-analysis of histological and histomorphometrical data. Clin. Oral Implants Res. 2015, 26, 50–68, doi:10.1111/clr.12288.

[2] Rabelo GD, de Paula PM, Rocha FS et al., Retrospective study of bone grafting procedures before implant placement. Implant Dent, 2010;19(4):342-350

[3] Kao ST, Scott DD. A review of bone substitutes. Oral Maxillofac Surg Clin North Am. 2007;19(4):513-521.

[4] Giannoudis PV, Dinpoulos H, Tsiridis E, Bone substitutes: An update, Injury 2005:36 (suppl. 3)

[5] Miron RJ, Zhang YF, Osteoinduction: A review of old concepts with new standards. J Dent Res 2012; 91:736-744.

[6] Young-Kyun Kim 1, Su-Gwan Kim 2, Pil-Young Yun 1, In-Sung Yeo 3, Seung-Chan Jin 4, Ji-Su Oh 5, Heung-Joong Kim 6, Sun-Kyoung Yu 7, Sook-Young Lee 8, Jae-Sung Kim 8, In-Woong Um 9, Mi-Ae Jeong 10, Gyung-Wook Kim 11. Autogenous teeth used for bone grafting: a comparison with traditional grafting materials.Oral Surg Oral Med Oral Pathol Oral Radiol 2014 Jan;117(1):e39-45

[7] Chaitanya Pradeep Joshi, Cynthia Bernardo D'Lima, Urmila Chandrashekhar Samat, Prerna Ashok Karde, Agraja Ganpat Patil, and Nitin Hemchandra Dani Comparative Alveolar Ridge Preservation Using Allogenous Tooth Graft versus Free-dried Bone Allograft: A Randomized, Controlled, Prospective, Clinical Pilot Study. Contemporary Clinical Dentistry.

[8] Snjezhana Pohl; Hari Parasad; Sanjana Parasad; G, A, Kotsakis 2022. Human Histologic Analysis of Implant Osseointegration in a Heald Site Grafted with Nondeminerilazed Autologeus Tooth-Derivated Graft Material. The international Jurnal of Periodontics & Restasvrative Dentistry

[9] Omer Sefvan Janjua 1, Sana Mehmood Qureshi 2, Muhammad Saad Shaikh 3, Ahmad Alnazzawi 4, Francisco J. Rodriguez-Lozano 5*, Maria Pilar Pecci-Lloret 5 and Muhammad Sohail Zafar 6, Autogenous Tooth Bone Grafts for Repair and Regeneration of Maxillofacial Defects: International Journal of Environmental Research and Public Health

[10] TAabatabaei FS, Tatari S., Samadi R., Moharamzadeh K. Different methods of dentin processing for application in bone tissue engineering: a systematic review. J Biomed Mater Res A 2016;104(10(October)):2616–27

Bunjamin Xhaferi
Faculty of Dentistry
Department of oral surgery and Implantology
St. Cyril and Methodius University of Skopje, N.M
E-mail: Em.dent@yahoo.com

Nusret Xhaferi
Medical Faculty, TOARILUC – Ortopedic department
St. Cyril and Methodius University of Skopje, N.M
E-mail: nusretxh@hotmail.com

Sonja Rogoleva Gjurovski
Faculty of Medical Sciences
Goce Delcev University, Stip, North Macedonia
E-mail: sonja.rogoleva@ugd.edu.mk

Gordana J. Atanasovski
Policlinic "Dr. Xhaferi" Em-Dent – Skopje
E-mail: gordana_j@hotmail.com