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About this project

The purpose of the EDSA Lecture Competition is to stimulate research by dentistry students, to provide a venue to share innovative scientific data, to showcase unique research projects, and to encourage networking among dentistry students with similar interests. The authors of the top 10 abstracts are invited to give a presentation during EDSA meeting onsite for peer review. Best authors get prizes and certificates for participation. This project has been highly valued and attended by students in last meetings.

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Treatment of internal disorders of the TMJ using plasma rich in growth factors on hyaluronic acid substrate.

NAME: Anton Sharapo

YEAR OF STUDY: 2nd year graduated

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AUTHORS: A.S. Sharapo, D.V. Shipika, A.Y. Drobyshhev.

AFFILIATION: A.I. Yevdokimov Moscow State University of Medicine and Dentistry

INTRODUCTION:

The aim of our study was to evaluate the effectiveness of the use of plasma rich in growth factors on hyaluronic acid substrate carrier in the treatment of internal disorders of TMJ.

MATERIALS AND METHODS:

For the study, a group of 30 patients was formed. The inclusion criteria: consent to participate in studies, presence of a triad of symptoms (pain, restricted mouth opening, presence of internal disorders according to MRI-diagnosis), age from 18 to 55 years. Exclusion criteria: refusal to participate voluntarily in the study, presence in the anamnesis of decompensated forms of cardiovascular insufficiency. The main indicators on which the result of the treatment was evaluated included: the extent to which mouth opened, laterotrusive movements of the lower jaw, the degree of pain on the visual analogue scale of pain (VAS). All patients underwent surgery in succession: arthrocentesis, arthrolavage of both TMJs with the injection of hyaluronic acid and plasma rich in growth factors (PRGF) into the joint according to the protocol developed by the Department of Maxillofacial and Plastic Surgery. In addition, electron microscopy of the drugs was conducted.

RESULTS:

Assessment of the main indicators was conducted: immediately after treatment, 2 weeks and one month after treatment. The extent to which mouth opened one month after the operation increased by 11.38 mm (33% $p \geq 0.05$), the value of laterotrusive movements to the right increased by 3.54 (42.1% $p \geq 0.05$) to the left increased by 2 mm (23% $p \geq 0.05$), pain reduction according to the VAS is 4.34 (74.3% $p \geq 0.05$)

CONCLUSIONS:

This study proves that the protocol developed by us is highly effective and can be successfully used as a primary or auxiliary surgical stage in the complex treatment of internal disorders of the TMJ of varying severity.

ACKNOWLEDGEMENTS:

I submit my heartiest gratitude to my respected teachers p.h.d. Shipika D.V. and prof. Drobyshhev A.Y. for their sincere guidance and help for completing this project.

KEY WORDS:

PRGF, TMJ disorders, TMJ surgery, internal disorders.

Biocompatibility of Titanium scaffolds realised by Selective Laser Melting Technique (SLM)

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INTRODUCTION:

The complex pathology of the oral and maxillofacial areas leads to even more complicated repercussions affecting the patient in functional aspects and, also, at a psychological level, considerably reducing the quality of life. The bone reconstruction of the defects occurring in these areas is an old and at the same time very topical issue, giving the fact that an ideal material to re-establish all the lost functions is yet to be found.

The aim of this study was to assess the osseointegration of two series of titanium scaffolds manufactured by Selective Laser Melting with different cell size in the internal structure. Half of the scaffolds were coated with nanohydroxyapatite on the surface and the influence of nanohydroxyapatite in the osseointegration process was evaluated.

MATERIALS AND METHODS:

The scaffolds were surgically implanted in the femur of six White Californian male rabbits: three animals received 0.8 mm cell size scaffolds and the other three received 1 mm cell size scaffolds. To minimize the number of subjects included in the study, each one received two scaffolds, one with the titanium surface unmodified, and the other one coated with nanohydroxyapatite on the surface. Two, four and respectively six months after the placement of the scaffolds, a general anaesthesia was induced and the euthanasia of the subjects was carried out for the harvesting of the bone fragments containing the scaffolds. After bone decalcification and the separation of the two structures, the bone fragments were histologically analysed using conventional light microscopy (LM) and the surface of the scaffolds was analysed using scanning electron microscopy (SEM) for the qualitative evaluation of the osseointegration.

RESULTS:

Titanium scaffolds with the cell size of 0.8 mm showed a higher osseointegration compared with 1 mm scaffolds.

LM revealed that the bone formed in the proximity of nanohydroxyapatite coated scaffolds was better organized than the bone associated with unmodified ones.

SEM images at 6 months revealed that the bone developed not only in contact with the scaffolds, but also inside the cells of the structures. Nanohydroxyapatite coated titanium implants with 0.8 mm scaffolds were completely covered and filled with new bone.

CONCLUSIONS:

The titanium scaffolds were well received by the animal organism and the osseointegration process depended on the cell size and the surface properties. The 0.8 mm scaffolds had a better interaction at the bone-implant interface inducing the development of a more condensed tissue.

The presence of the nanohydroxyapatite on the surface of the scaffold augmented the process of bone development and helped forming a stronger structure.

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KEY WORDS:

Titanium, Scaffolds, Osseointegration, Nanohydroxyapatite, Selective Laser Melting.

Microbiological and SEM evaluation of root canals final irrigation: A comparative in-vitro study between Qmix and Sodium Hypochlorite activated with EndoUltra system

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INTRODUCTION:

The main purpose of the endodontic treatment is to perform a proper shaping and cleaning of the root canal system. The aim of the present study was to assess the effect of the QMix irrigant in comparison with the classic sodium hypochlorite irrigant activated with the EndoUltra System.

MATERIALS AND METHODS:

The study was conducted on 40 extracted monoradicular teeth, prepared using One Curve System (MicroMega, France). After finishing the mechanical-antiseptic treatment, the already prepared specimens were subjected to a wet sterilization process.

Each tooth was inoculated with *E. faecalis* ATCC 29212 .The inoculation was made using an insulin syringe and each tooth was placed in a well of a 12 wells plate in a Brain Heart Infusion (BHI) for 14 days.

On the 14th day the teeth apex was sealed with a resin (Herculite, Kerr, Germany) to prevent the retrograde infiltration. After the apical sealing, the root canals were irrigated 3 times with a buffer solution until 1 microlitre of the inoculum was obtained. The colonies were scored on a Petri dish counting the CFU (colony forming units) prior to the treatment, in order to confirm the teeth infection.

For the final irrigation of the endodontic canals ,the teeth were divided into 2 categories , as follows: 1) 3 ml of Sodium Hypochlorite 5,25% (Cerkamed, Poland) for 1 minute, improved using the EndoUltra System (MicroMega, France); 2) 1 ml Qmix 2in1 (Dentsply, Tulsa, USA) for 1 minute using an irrigation needle.

Twenty prepared teeth were assigned to each group. (n=20)

After the final irrigation was done inoculation of 1 microliter per Petri dish with blood agar was done , then incubation at 37 °C 24 hours. After incubation the CFU post-treatment (colony forming units) were counted.

In order to evaluate the specimens by Scanning Electron Microscopy (SEM) (magnification of 45x-2000X),

6 random specimens were selected from each category. The teeth were sectioned lengthwise, using sterile instruments.

RESULTS:

The highest CFU mean value was observed for the second group (20), where the irrigation and the disinfection of the canals was performed using only a manually activated Qmix (Densply, USA). The lowest mean value was obtained from the first group (2,85), where the EndoUltra System (MicroMega, France) was used to activate the irrigation solution in the canal.

When the CFU mean value of the 2nd group was compared to the one from the 1st group, statistically significant differences ($p=0.001$ and $p<0.01$) were detected.

CONCLUSIONS:

Given the microbiological tests and SEM results, final irrigation protocol using sodium hypochlorite activated with EndoUltra system is superior compared to the protocol that used manually activated Qmix.

KEY WORDS:

Endodontic Irrigation , EndoUltra , Qmix , E.Faecalis , SEM.

The effect of electronic cigarette vapour on aesthetic characteristics of direct and indirect composite resins

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INTRODUCTION:

Today vaping industry is in rise. As of 2018 3,5 million high- and middle-schoolers were using e-cigarettes. Since 2014 e-cigarette use has overtaken traditional smoking among children. As vaping is trending it is important, more than ever, to know its effects on health, oral tissues and materials we use in dentistry. It is well known that esthetic properties of composite materials are susceptible to changes when influenced by various factors. The external factors are of special interest since composite fillings are under their constant influence in oral cavity. Although the effect of some of these factors on different composite resins has been well documented, there is lack of data on their effect on novel group of composite materials with improved aesthetic characteristics and innovative shade concept.

MATERIALS AND METHODS:

The research was conducted on polymerized composite resin discs which are made with standardized process of pressing composite resin out of tube into the square shape mold with dimensions 10x10 mm and 2mm thickness. One side was exposed to air, and other was made in contact with celluloid tape to ensure that oxygenic layer could not form. There were 10 discs made from Filtek Z250 (3M ESPE, St. Paul, MN, USA) composite of shade A1, 20 discs made of GC Essentia (GC Europe, Belgium) composite of universal shade, 10 discs from GC Gradia Direct (GC Europe, Belgium) composite of shade A1 and 10 discs from GC Gradia Plus Paste Heavy (GC Europe, Belgium) composite.

Experimental groups were formed based on finishing protocol: Two experimental groups from 3M Filtek Z250 each of 5 discs, polished with Sof-lex discs (3M ESPE, St. Paul, MN, USA) and unpolished; three experimental groups from GC Gradia Direct composite, polished with Sof-lex discs, polished with GC Gradia Diapolisher (GC Europe, Belgium) and unpolished; three experimental groups were made from GC Gradia Plus Paste Heavy, polished with GC Gradia Diapolisher and Gradia Plus Lustre Paint (GC Europe, Belgium), and unpolished. All techniques of polishing and polymerization were done as per instruction of manufacturers for respected products.

Only sides that were made with contact with air were polished.

These samples were exposed to simulation of vaping of electric cigarettes. Samples that were exposed to vapor were treated with 200 simulation cycles in specially designed chambers. The number of cycles is equivalent to smoking half of a packet of normal cigarettes. Each cycle would start by simulation of inhaling that would create negative pressure and pull air through e-cigarette into the chamber so that vapor could fill it. After the vape is in the chamber for 3 seconds, the e-cigarette is removed so the vape can exit the chamber. The exposure time in single cycle was 3 seconds. The cycle ended with elimination of vapor from the chamber. The changes of optical properties of the samples were measured by Vita EasyShade (3M ESPE, St. Paul, MN, USA) spectrophotometer. Color change and translucency were calculated before and after exposure to vapor.

RESULTS:

The vapor from e-cigarette showed significant influence on both color change and translucency in polished and unpolished samples. Change in optical properties has been documented in all experimental groups. The change of Filtec Z250 composite resin's optical properties were clinically acceptable, as well as those of Gradia Direct and Essencia. Gradia Plus Heavy Paste saw clinically visible change in its optical characteristics.

CONCLUSIONS:

Vapor of e-cigarettes had led to the change of esthetic and optical qualities of all composite resin discs.

KEY WORDS:

Direct composite resins, Indirect composite resins, Vaping, Translucency, Color.

Assessment of the biocompatibility of 3D-printing polymers in the background of dentistry digitalisation

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INTRODUCTION:

In the background of dentistry digitalisation, minimizing workforce and increasing efficiency, we aim to present additive manufacturing methods for prosthodontic appliances and to assess the biocompatibility of 3D-printing resin-based polymers.

MATERIALS AND METHODS:

Materials were chosen based on the length of usage and commercial success, taking into account both widely used for over 30 years PMMA, as well as polymers available for less than nine months. For the assessment of biocompatibility, type hs27 human fibroblast cell cultures were used, in which disks of the chosen materials were placed. The cell cultures were observed for reactions to the presence of these materials. For biocompatibility measuring, two types of essays were chosen. We took into account the release of lactate dehydrogenase and the metabolism of MTS tetrazolium to formazan dye.

RESULTS:

After observing cell reaction to the range of materials some differences were seen between usual polymers and modern ones, the practitioner's choice largely taking into account the ease of usage, the higher precision and the considerable lowering of manufacturing costs for 3D-printing polymers. Even so, the results point out that current 3D-printed resins are not suited for long term usage and should only be considered when the contact time with the tissue is limited.

CONCLUSIONS:

3D printing is a future solution with the potential to revolutionise dental practice through numerous applications. Among these, prosthodontic appliances are in full development and require further research for the study of resistance to wear. Moreover, research into new polymers is to be considered, taking into account the amount of time spent in contact with oral tissues.

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KEY WORDS:

3D-printing, additive manufacturing, prosthodontics, polymers, biocompatibility