Schottlander Oral Award Winning Abstract

A Comparison of the Marginal and Internal Fit of Two Novel CAD/CAM Lithium Disilicate Materials; Initial LiSi Block, (GC, Japan) and Amber Mill, (HassBio, Korea) Compared with an Original CAD/CAM lithium Disilicate Material; IPS e.max CAD (Ivoclar Vivadent, Liechtenstein)

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Purpose:

This study presents an experimental investigation of the marginal and internal fit of 2 novel CAD/CAM (Computer Aided Design, Computer Aided Manufacture) lithium disilicate materials; Initial LiSi Block, (GC, Japan) and Amber Mill, (HassBio, Korea) compared to an original CAD/CAM lithium disilicate material, e.max CAD (Ivoclar Vivadent, Liechtenstein).

Method:

An upper premolar typodont tooth (KaVo Dental Ltd, UK) was prepared for a crown and a polyvinylsiloxane impression (Express 2 Light Body Standard Quick, Express 2 Quick Step Heavy Body- 3M, UK) was taken. A resin master die was fabricated (DB Rhino Rock Modelling Resin- DB Lab Supplies, UK) and a Type IV gypsum master model (FujiRock, GC, Japan) was digitalised (Arum Dental CAD/CAM system, Hoil, UK). A crown restoration was designed with pre-set spacer settings (0-116 microns). 17 samples of each of the 3 material groups were milled (Arum SX-300 Pro, Hoil, UK) to this design. Post-firing (Programat EP5000, Ivoclar Vivadent, Lichtenstein) was carried out as required. The silicone replica technique was used and replicas were measured with a stereomicroscope (Leica Microsystems, Germany) at X16 magnification to measure 16 points per sample representing the marginal and internal fit. A separate experimental pilot analysis to assess the maximal thickness and 3D volume air gap was carried out using Micro-CT (Zeiss 620 Versa, Germany) using the master die and one sample of each material.

Results:

A hierarchical ANOVA showed statistically significant differences ($P<0.005$) between all material groups therefore the null hypothesis was rejected. Amber Mill had the greatest median marginal and internal gaps (36.5 and 80.5 µm) followed by Initial LiSi Block (28 and 60 µm) followed by original e.max CAD (22 and 47.5 µm). The median values for all groups remained within clinically acceptable limits (120 µm).

Conclusion:

Within the limitations of the current study, the marginal and internal fits of original lithium disilicate e.max CAD remain superior to the fit of novel Initial LiSi Block and Amber Mill although the average values for all materials fall within clinically acceptable limits.

The Effect of Retention Design on the Fracture Resistance of Monolithic CAD/CAM Zirconia Implant-Supported Crowns: Cement-Retained Versus Screw-Retrievable Cement-Retained

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Aim:

The objective of this pilot study was to evaluate the fracture resistance between cement-retained and screw-retrievable cement-retained (SRCR) monolithic CAD/CAM zirconia implant-supported crowns.

Materials and methods:

Ten monolithic CAD/CAM zirconia implant crowns were fabricated and divided into control and test group. The control group was made cement-retained, while the test group SRCR. The crowns were bonded to prefabricated titanium-based abutments with 3M ™ RelyX ™ U200 luting cement. All specimens were subjected to thermal cycling to simulate the ageing process before undergoing a single load facture test on the universal testing machine at a crosshead speed of 0.5 mm/min. Fracture modes were analysed by Scanning Electron Microscopy (SEM). The fracture loads were compared using Mann-Whitney U test, and statistical significance was set at P<.05.

Results:

The mean fracture resistance of the cement-retained monolithic zirconia crowns (3348.28 ± 277.29 N) was higher than the SRCR crowns (3027.24 ± 742.53 N) but the difference was not significant (p=1). SEM examination revealed that all failure originated from the fitting surface of the crowns. The titanium-based abutment remained intact in all specimens.

Conclusion:

Within the limitation of this small sample size pilot study, it may be concluded that the fracture resistance of monolithic zirconia crowns is not affected by its retention design i.e cement-retained or SRCR.

Keywords:

Dental implant; Implant abutment; Cement retained; Screw-Retrievable Cement-Retained; Zirconia crown

Two-Step Ammonium/ Calcium Fluoride Application Provides Protection from Erosion and Attrition *in-vitro*

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Objectives:

Investigate the effects of a two-step Ammonium / Calcium fluoride application on enamel resistance to erosion and erosion/attrition in-vitro.

Experimental Methods:

Polished human enamel samples were randomized (n=8/gp) to surface treatment with 1) deionized water (DIW control), 2) 7700 ppm Ammonium Fluoride (AmF) varnish (Fluor Protector S, Ivoclar Vivadent) and 3) two-step AmF/Calcium Fluoride (CaF) experimental product (A: Water, 5% AmF; B: CaF: Ethanol, 7-10% CaF. Samples were immersed in artificial saliva at 37°C for 24 hours prior to acetone wiping and taping. To simulate erosion, two 1.5 mm Ø exposed areas were immersed in 0.3%, pH 3.8 citric acid solution for 5 minutes. One area that was exposed to the acid was then exposed to 200 cycles of 80 N attrition using a leucite-reinforced ceramic antagonist (IPS Empress CAD, Ivoclar Vivadent) with 0.7 mm sliding component and continuous DIW irrigation (ElectroForce 3300 wear simulator, TA instruments, USA). Lesions were measured using profilometry (step height enamel loss), digital microscopy (Sa surface roughness), and Vickers microhardness at a load of 0.5 N.

Results:

The control group mean (SD) step height enamel loss after erosion and erosion/attrition was 1.97 (±0.14) and 36.55 (±1.79) µm. The AmF varnish reduced erosion and erosion/attrition to 0.58 (±0.08) µm and 32.71 (±2.63) µm ($P<0.05$). The AmF/CaF experimental product reduced erosion and erosion/attrition to 0.41 (±0.06) µm and 24.08 (±3.15) µm. Roughness data of erosion lesions were statistically significantly rougher for both fluorides vs. control: however, erosion/attrition lesions were similar for all groups ($P>0.05$). Fluoride-treated erosion lesions were statistically harder than control ($P<0.05$): AmF/CaF resulted in 7% less hardness change and the AmF varnish 4% less hardness change.

Conclusion:

A two-step AmF/CaF fluoride application reduced erosive and attritive wear on human enamel in-vitro.

Keywords:

Erosion, Attrition, Fluoride, Enamel.

The Effect of Enhanced Personal Protective Equipment on the Quality of Tooth Preparations Performed by Undergraduate Dental Students

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Introduction:

The coronavirus disease (COVID-19) pandemic has impacted worldwide dental practice. Standard PPE (SPPE) has been key in keeping dental workers from infection transmission for many years before the COVID-19 pandemic by protecting eyes, hands, face and body. Since the emergence of COVID-19, new guidelines have mandated enhanced personal protective equipment (EPPE) when performing aerosol generating procedures (AGPs) to protect clinicians from virus contraction. It is currently unknown whether EPPE negatively impacts on the quality of dental prosthodontic preparations, and whether this increases time required to provide these intricate dental procedures. The aim of this pilot study was to evaluate the impact of EPPE compared to SPPE on the quality and time required for a full veneer metal ceramic crown preparation as well as the impact on clinician comfort.

Materials and Methods:

A group of 5th year undergraduate dental students (n=18) were asked to carry out two standard ceramo-metal tooth preparation on an upper right canine tooth (UR3) according to local curriculum guidelines in the dental simulation laboratory. Through random allocation, half the group (n=9) undertook their first preparations in the morning session with Standard Personal Protective Equipment (SPPE) and in the afternoon repeated the procedure with the alternate Enhanced Personal Protective Equipment (EPPE). The other half of the group (n=9) wore PPE in reverse order (i.e. EPPE first, followed by SPPE). Students were asked to focus on quality not speed during the task. The time taken was recorded for each preparation along with assessment of adjacent teeth for damage. At the end of each preparation, students were also asked to complete a questionnaire scoring how they felt during the procedure and the perceived impact of specific items of PPE on their ability to carry out the procedure. All manikin plastic teeth were scanned before and after preparation with an intraoral scanner (CEREC Omnicam; Dentsply Sirona, Bensheim, Germany). Teeth were then superimposed and linear tooth reduction measured using 3D analytical software (3dMDvultus, USA) with axial wall taper measured using software Cloud (UCL, UK). Paired student t-tests and chi-squared were used to statistically compare preparation time, taper angle and linear preparation distances. A p-value of <0.05 was considered significant.

Results:

The level of PPE had no effect on time taken to complete tooth preparation and there was also no difference in the amount of damage observed at adjacent teeth (all $P>0.05$). Preparation taper and amount of preparation was similar between groups ($P>0.05$). Students perceived a more significant impact in comfort, vision, movement, thirst and fine motor control when wearing EPPE compared to the SPPE (P values <0.05).

Conclusions:

EPPE did not increase preparation time and did not affect amount of tooth prepared nor taper. However, students perceived EPPE to have a greater effect in terms of comfort, vision, thirst, movement, and fine motor skills compared to SPPE.

Comparative Analysis of Surface Roughness and Topography of Lithium-Disilicate Glass Ceramics Following Surface Adjustment and Polishing Using Two Chairside Polishing Systems

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Aim:

To evaluate the surface roughness using (Ra, Rp, Rq) of glazed, adjusted and polished monolithic lithium-disilicate glass ceramics (IPS e.max Press, Ivoclar Vivadent) following use of two chair-side polishing systems; OptraGloss (OG), (Ivoclar Vivadent) and DIATECH ShapeGuard (SG), (Coltene). Additionally, to evaluate the surface topography of the polishing wheels and polished specimens using Scanning Electron Microscopy (SEM)

Method:

20 lithium-disilicate discs (8mm ø x 2mm) were pressed in LT A2 IPS e.max and glazed as per standard protocols. Specimens then underwent superficial adjustment with a fine grit high speed diamond bur (25µm). Specimens were then randomly divided into two groups for polishing with either (OG) or (SG) systems. Roughness values (Ra, Rp,Rq) were measured using white light profilometer (Proscan 2000). Baseline measurements of the glazed specimens were taken as the control. Roughness measurements were then taken after adjustments of the surfaces and following polishing with either of the polishing systems. Surfaces of the specimens and the polishing wheels were then evaluated using SEM. Statistical analysis was conducted using one-way ANOVA and Tukey tests at a significance level of $p \leq 0.05$

Results:

Glazed specimens showed the lowest roughness values (Ra 0.07µm, Rp 0.41µm, Rq 0.11µm) when compared to the adjusted (Ra 0.86µm, Rp 4.58µm, Rq 1.13µm) and polished specimens OG (Ra 0.31µm, Rp 1.44 µm, Rq 0.43µm) SG (Ra 0.21µm, Rp 1.38µm, Rq 0.33µm), ($p<0.001$). Roughness values significantly reduced after polishing with either of the polishing systems when compared to the adjusted specimens ($p<0.001$).

Conclusion:

Despite that neither polishing systems used in the study produced similar initial surface roughness compared to glazed specimens, both systems decreased the surface roughness considerably. Therefore, both OG and SG systems could be considered as suitable chair-side polishing systems for lithium disilicate glass ceramics. Conversely, chair-side adjustments without further polishing demonstrates significant increase in surface roughness that is considered clinically not acceptable.

"I've Lost More Than My Dentures": Denture Loss in the Community

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Introduction:

Denture loss results in patients' losing the ability to eat, smile, speak and socialise which leads to deteriorating systemic health and well-being. The specific impact and incidence of denture loss in community settings is previously unreported. In 2015, a West Midlands care home survey identified more than half of residents wore dentures. Previous data has identified at least 9,500 dentures are lost in hospitals annually, however no figures exist to highlight this issue in community residential settings. Results gathered were used to inform national guidelines on minimising denture loss which prosthodontist should be aware of due to their fundamental role as a stakeholder in supporting minimisation and rehabilitation of patients who have experienced denture loss.

Method:

An online survey was distributed nationally through professional networks to community residential settings. The surveys remained active between December 2021 to January 2022. The results were shared at a multidisciplinary working group meeting, including varied stakeholders, to determine potential solutions to minimise denture loss.

Results:

Of the 156 responses from community residential settings, 69% of settings experienced at least one denture lost in the last two years. 60% of responders reported no dentures were labelled, only 64% had received training about how to care for dentures, and 86% felt they would benefit from further mouth care training. 68% of staff found arranging dental care for their residents challenging.

Discussion:

Extrapolated data suggests that more than 10,205 dentures are lost annually in community residential settings, costing the NHS more than £3 million. A high incidence of denture loss in community residential settings is likely due to residents experiencing multiple comorbidities and frailty. Remaking dentures poses financial, logistical, and patient challenges. Four solutions have been identified to minimise denture loss within the national guidelines: storage, education, policies, and denture labelling.

Conclusion:

The incidence of denture loss within community residential settings needs to be understood to encourage targeted interventions, inform stakeholders, and encourage collaborative workflows that will improve service delivery and patients' oral health-related quality of life.

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Conventional Removable Prosthodontic Rehabilitation of a Patient Following Ablative Surgery to the Anterior Mandible

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KCL

A 63-year-old lady was referred to the Restorative Dentistry Department at Kings College Hospital by her general dental practitioner for prosthetic rehabilitation of an atrophic mandibular following mandibular rim resection.

The patient's primary complaint was that she had noticed her existing lower denture which was constructed approximately 8 years ago had gradually become loose over the past year. The patient reported she was struggling to function and was embarrassed to eat publicly.

Medically she was fit and healthy and a non-smoker. The patient reported history of surgery in the anterior mandible approximately 20 years ago, but was unsure of her diagnosis.

Examination revealed mild generalised tooth surface loss on the bucco-cervical and occlusal surfaces of the teeth which was of multifactorial aetiology. She was partially dentate in the mandible and the only remaining teeth were the LR8,7,6 and LL7,8. These mandibular molars were lingually inclined. The anterior mandibular had an acquired defect due to surgery and was lacking bone volume in both height and width. There was limited alveolar mucosa which lacked keratinised tissue in this region and the soft tissues was mobile as the floor of the mouth was tethered to the lower lip.

The patient was wearing a mucosal borne mandibular partial acrylic denture which lacked retention, support and stability.

The clinical findings were discussed with the patient regarding the difficulties in denture provision due to the denture bearing area, unfavourable tooth inclination and limited bone volume which meant rehabilitation with dental implants would be challenging.

A treatment plan was agreed for provision of a mandibular cobalt chromium partial onlay denture.

Clinical stages included primary impressions, guide plane preparation and master impression. A jaw registration was completed at the proposed occlusal vertical dimension. A try in was completed with a self-curing acrylic resin replicating the metal framework to verify the OVD and demonstrate to the patient the extent of metalwork covering the posterior teeth to aid in the consent process. The patient was accepting of this and the metal framework was constructed and tried in prior to delivering the denture.

Some minor adjustments were required at the review appointment but the patient reported the denture felt more secure and that she could eat more comfortably.

This case demonstrated the successful rehabilitation of a patient who has undergone ablative surgery using conventional removable prosthodontics techniques. Due to the limited bone volume and challenging inclination of the mandibular teeth much thought was placed on the design of the framework to facilitate a successful outcome. A self-curing acrylic resin framework was used to verify the proposed occlusal scheme, to ensure appropriate thickness of metal on the posterior teeth for rigidity of the framework prior to definitive metal framework construction. It was also a useful aid in the consent process to explain to the patient how the coverage would help facilitate a functional, aesthetic and phonetic rehabilitation.

Rehabilitation of a Severely Worn Dentition using Fixed and Removable Prostheses

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Rehabilitation of a severely worn dentition is a challenging clinical issue, especially when there is insufficient space for restorations. The long-term success of full mouth rehabilitation therapy often requires a comprehensive examination, diagnosis and treatment planning along with patient-satisfaction factors. The present case report is intended to demonstrate the combination of different treatment modalities that resulted in a successful prosthodontic treatment. This case report describes the rehabilitation of a 71-year-old female patient with severe loss of anterior tooth structure predominantly caused by external dental erosion and attrition. Upon examination, she has partial edentulous dentition with loss of occlusal vertical dimension and multiple non-vital maxillary posterior teeth. As an intervention, oral hygiene instructions and dietary modifications were given to reduce the risk of dental erosion. Later, the maxillary arch was restored using the integration of surveyed fixed dental prosthesis and cobalt chrome removable partial denture, while composite buildups were fabricated on the mandibular anterior teeth at increased occlusal vertical dimension. She adapted well to the new occlusal vertical dimension of the new prosthesis delivered. The treatments had successfully improved the patient's function and appearance.

In-Vitro Biological Effect on Mechanical Properties of Zirconia Implant Materials

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Background:

Although Zirconia Implants were approved by FDA in 2011, the biological effect of surrounding tissue on the mechanical properties of these materials remains largely unknown. This study was designed to characterize the mechanical and physical properties of two sandblasted zirconia materials, 3 mol% yttria stabilized zirconia (3Y-TZP) and alumina toughened zirconia (ATZ) when cultured with normal human osteoprogenitor cells.

Methods:

The disks were fabricated by die-pressing at 34 MPa for 5 mins, sealed in vacuum, and Isopressed for 2 hours at chamber pressure of 146.4 MPa. They were subjected to 2-step sintering, followed by sandblasting with 125-micron alumina particles at 10mm distance for 30 seconds. Characterization was done using Scanning Electron Microscopy (SEM), Energy Dispersive X-ray Spectroscopy (EDS). The experiment was divided into three groups for both materials – a. Control (DISC), b. Disc with Culture media without Cells (CM) and, c. Disc with Culture media with Cells (CELL). The groups were evaluated at 7 days, 14 days, and 21 days for Biaxial Flexure Strength using Universal Testing Machine at 10kN load. There were total of 9 samples in each group, i.e., 3 samples for each time point (7d, 14d, 21d) for 2 materials [3Y-TZP(27) and ATZ(27)]. One-way ANOVA was used to analyze Biaxial Flexure Strength between groups, between time points. Student t-test was used to analyze the results between materials. Comparison between pairs was done using Tukey-Kramer HSD tests.

Results:

Statistically significant difference (p-value <0.01) was observed between materials, 3Y-TZP (685.734 MPa) and ATZ (546.774 MPa). No significant difference in biaxial fleuxure strength values (p-value=0.37) was observed between time points 7d (641.4 MPa), 14d (614.3 MPa), 21d (592.9 MPa). Intergroup analysis was insignificant (p-value=0.63) with mean biaxial flexure strength values of DISC group, CM group and CELL group reported as 597.3 MPa, 625.9 MPa, and 625.4 MPa respectively. Tukey-Kramer HSD comparison between materials and time points revealed that the materials differed in biaxial flexure strength values at all time points.

Conclusion:

Flexure strength values of two sandblasted zirconia materials, 3Y-TZP and ATZ, differ significantly, suggesting that 3Y-TZP may be the better alternative Implant material.

Quality Improvement: Assessing Labwork Quality from the Clinician's Perspective

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Aim:

This poster will outline the factors to consider when assessing labwork quality according to clinician's prescription and how these can be improved to raise the quality of the work received and improve patient care.

Objectives:

By facilitating improvement in labwork quality, this would mean less need for changes to labwork through adjustments, repairs or remakes and in return reduce the chairside time. The total patient treatment time would be minimised, including reducing possible delays in the treatment journey therefore Improving patient satisfaction. Ultimately this would reduce the cost and demand on trust resources.

Method:

This was a two-cycle prospective audit which took place over a nine month period. The standard was based on restorative departmental meetings and determined to be: 90% of all labwork to be returned within two weeks without any lab repairs or remakes. Both cycles consisted of collection of 100 forms over a four-to-six-week period, assessing the features of dentures, crowns, bridges and wax-ups from a clinician's perspective. This included Consultants, Prosthodontic Specialists, Specialty Restorative Registrars, Post-Graduate Trainees and Dental Core Trainees. We worked closely with the lab manager and technicians to include them in the quality improvement process.

Results:

Our first cycle showed that 70% of our labwork was returned within two weeks without any lab repairs or remakes. This increased to 81% for Cycle two, however there were overall increases in the percentage of lab repairs and chairside repairs. The percentage of missing labwork was reduced from 5% to 1% as well as in labwork delays, from 13% to 2%.

Discussion/Action Plan:

Having issues with labwork is a frustration most clinicians have encountered, however it was recognised that drastic improvements cannot be made overnight. Based on the results from our first cycle, it was clear that miscommunication played a large role in some of the issues encountered and approaching this could significantly improve the flow of labwork. Our action plan consisted of: presenting results from the data collection at departmental audit meeting, discussing suitable changes in procedures/education, meeting with the lab manager and audit lead to discuss findings and implementation of changes, re-audit after implementing educational and procedural steps to assess the impact our changes have made, and finally presenting the data to the restorative department with inclusion of lab technicians. Improvements can continue to be made through re-audit with an action plan focusing on specific areas to ultimately improve patient care.

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A Review of Methods Used by Clinicians to Optimise Removable Prosthodontic Treatment Outcomes

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Introduction:

The British Society of Prosthodontics Annual Conference 2022 'Challenging the Dogma in Prosthodontics', hosted an interactive plenary session lead by Raelene Sambrook and Sam Rollings. This sought to establish what techniques, treatments plans and materials conference attendees and members of the prosthodontic community used in their daily practice to optimise prosthetic treatment outcomes. This poster aims to present the findings from this session regarding removable prosthodontics.

Methods:

Data collection was facilitated by the Poll Everywhere App which attendees were instructed to download on their smart phones or electronic devices at the start of the session. As part of the session, participants were asked a series of questions relating to removable prosthodontics, both complete dentures and partial dentures. Question type varied between multiple choice or open ended. Following each question, the poll results were presented to the audience, facilitated via the Poll Everywhere App. The rationale behind each question posed to the audience was then discussed in an open forum, with the expert panel contributing a researched evidence base to support their chosen prosthetic management option.

Results:

124 participants registered to use the app within the plenary session and each question posed to the audience had an average response rate of 71 participants. The (mean) average year since graduation of attendees was 15. The attendees worked in various clinical settings including: hospital (44%), university (26%), mixed practice (11%), NHS practice (8%), private practice (7%), private specialist practice (3%) and community/public dental service (1%). A total of 18 questions were related to removeable prosthodontics, 12 for complete dentures and 6 for partial dentures. The question which had the highest level of agreement related to denture design, with 90% of respondents indicating they almost always prescribe a denture design to their dental technician. In contrast the question with the lowest level of agreement was the material choice for working impressions for complete dentures, which included alginate, zinc oxide eugenol, compound, poly vinyl siloxane and polyether.

Conclusion:

The plenary session was an innovative approach to gaining attendee engagement and opinion on a broad range of prosthodontic topics. Furthermore, the data collected from this plenary session stands as a value source of expert opinion regarding the rationale for the methods of treatment to optimise prosthetic management of patients. It highlights that the majority of respondents practice in an evidence-based approach. The data collected from the responses within this poll provides a key learning tool for the prosthodontic community, which we hope to formalise through academic publication.

A Study into the Impact of Socioeconomic Determinants and Geographical Location on the Incidence of Head and Neck Cancer

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Head and neck cancer is a group of cancer diagnoses which can involve the oral cavity, pharynx, larynx, paranasal sinus, and salivary glands. This heterogeneous group of cancers have variable aetiologies, prognosis and treatments depending on the extent of the cancer, its regional distribution, and its histological characteristics.

Head and neck cancer has historically been reported to occur more commonly in areas of increased social deprivation, reduced social mobility, and reduced access to health care services. These broader societal factors correlate with an increased prevalence of the common risk factors for these cancers: smoking and alcohol consumption. More recently HPV has also been associated with the development of head and neck cancer, a virus that in areas of lower socioeconomic status is found more widely and vaccinated against less.

Access to dental care services is of paramount importance to the long-term health and quality of life of this group of individuals. Dental support is the second most requested care from cancer patients, and deterioration in dental health may result in profound negative health outcomes including osteoradionecrosis.

We undertook a population analysis of head and neck cancer patients attending the West Yorkshire Head and Neck Cancer MDTs in 2021 to evaluate several factors associated with access to dental care, as part of a larger project to provide a "safe discharge network" of dental practices trained in the long-term dental care of these patients.

We assessed the distance from the patient's home to the Leeds Dental Institute (LDI), their index of deprivation, their dental health status at pre-ablative assessment, pre-existing registration with a primary dental care provider, and their pre-ablative treatment oral health status. 44% of individuals received a dental assessment before cancer treatment with 82% requiring dental extractions. 73% of individuals were registered with a dentist, and 50% lacked a shortened dental arch or greater, suggesting the need for prosthetic rehabilitation. The median distance to attend treatment at the LDI was 8.49 miles. The cohort deprivation scores were skewed towards increased deprivation: 44% of individuals lived in an area with an index of multiple deprivation scores in the three most deprived deciles. Increased deprivation was not associated with distance from the LDI but was associated with access to primary dental care.

The findings of this study can inform the allocation of resources to increase the distribution of support services in primary care and provide an example of leveraging socioeconomic patient data to inform similar efforts across other healthcare provision systems.

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Comparison of Flexural Strength and Scan Electron Microscopy (Sem) Analysis Among Conventional, Milled, and 3D-Printed Provisional Materials

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Aim:

The aim of this study was to compare the flexural strength among various materials used for provisional prostheses (Polymethyl methacrylate (PMMA), Polyethyl methacrylate (PEMA), Bis-acryl composite resin, Visible light-cured urethane dimethacrylates) and different fabrication methods (conventional, milling, and 3D-printing). These findings may allow clinicians to select relatively more suitable provisional materials from a range of fabrication methods and materials in different clinical scenarios and from their available resources.

Materials and methods:

The bar-shaped specimens were prepared according to ISO 10477:2020 (25 x 2 x 2 mm.). Two types of fabrication methods were applied: conventional and computer-aided design and computer-aided manufacturing (CAD/CAM) methods. The specimens prepared from the conventional methods included Polymethyl methacrylate (PMMA) resin (Unifast III, GC EUROPE, Leuven, Belgium), Polyethyl methacrylate (PEMA) resin (Trim®, The Bosworth Company, IL, USA), Bis-acryl composite resin (Protemp 4, 3M Deutschland GmbH, Seefeld, Germany), and Urethane dimethacrylate (UDMA, Unifast LC , GC DENTAL PRODUCTS CORP, Aichi, Japan). The specimens prepared by CAD/CAM method included milled PMMA (Ceramill A-Temp acrylic, Amann Girrbach AG, Koblach, Austria) and 3D-printed UDMA P pro Crown and Bridge resins (DeltaMed GmbH, Friedberg, Germany). The specimens were then stored in water at 25 ± 1 °C (room temperature). The specimens (N=20) from each study group (total of 120 specimens) were tested with a universal testing machine with 1mm/min. crosshead speed with a three-point bending test for flexural strength (MPa). Afterwards, two representative specimens from each group (intact and fractured surfaces) were examined under Scan Electron Microscope (SEM) analysis at 40X and 200X magnification (Sigma 300 VP, ZEISS, Germany). The result was recorded for analysis.

Results:

All tested interim specimens from each group showed higher mean flexural strength than the minimum flexural strength (at least 50 MPa) according to ISO 10477 (British Standards, 2020), except PEMA (conventional) group, which did not fracture and yielded an inconclusive result. PMMA (Milled) yielded the highest mean flexural strength 94.8 MPa, followed by 3D-printed UDMA (91.4 MPa), conventional Bis-Acryl (89.4 MPa), and conventional PMMA (71.2 MPa). The lowest mean values were found with conventional UDMA which yielded 59.3 MPa. The scan electron microscopy (SEM) analysis showed different surface topography patterns from different materials and fabrication methods.

Conclusions:

The mean values of all groups were higher than the minimum flexural strength (at least 50 MPa) according to ISO 10477 (British Standards, 2020), except PEMA (conventional), which only distorted but not fractured. However, some individual conventionally fabricated specimens showed flexural strength below 50 MPa, whereas all individual CAD/CAM fabricated specimens showed flexural strength above 50 MPa. This may indicate a larger variability of the conventionally fabricated specimens. The overall results showed that the interim bar-shaped specimens for fixed dental provisionalisation fabricated with different fabrication methods and biomaterials showed statistically significant differences in the mean flexural strength between groups ($P < 0.05$). CAD/CAM fabricated (milled and 3D-printed) interim specimens yielded relatively higher and statistically different mean flexural strength compared to the conventionally fabricated interim specimens ($P<0.05$), except the conventional bis-acryl group.

A Comparison of the Accuracy of Facial Prosthesis Design Using a 3D Morphable Model Approach, Traditional Computer-Aided Design, and Conventional Manual Sculpting Techniques

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Background:

Conventional facial prosthesis manufacturing will typically involve manually sculpting a wax pattern. This can be time, skill and resource intensive particularly in cases with limited preoperative information. Various computer-aided design (CAD) technologies have been used during facial prosthesis manufacture such as digital sculpting, facial feature databases, and mirroring techniques. However, many approaches still have high technical or artistic requirements. 3D Morphable Models (3DMMs) and photographic landmark fitting techniques could support the semi-automated design of facial prostheses to simplify CAD processes, enhance reproducibility, and improve efficiency.

Objective:

To compare the accuracy of replacing participants' facial features with different methods of facial prosthesis design involving a) a 3DMM approach, b) traditional CAD methods, and c) conventional manual sculpting techniques.

Materials and Methods:

Ethical approval was obtained. Fifteen participants without facial defects were scanned using a structured light scanner (Artec Space Spider, Artec 3D). The participants' facial meshes were manipulated to generate artificial orbital, nasal or combined defects using open-source mesh editing software (Meshmixer, Autodesk Inc; MeshLab; http://meshlab.sourceforge.net/). The artificial defects were based upon the cone beam computed tomography scans of historical plaster casts of oncology facial defects. All artificial facial defects were reviewed by an independent maxillofacial prosthetist to ensure they were realistic. Participants provided facial photographs (e.g. from social media) to support all prosthesis design methods.

Three methods of facial prosthesis design were compared for the 15 participants. For the 3DMM approach, the Leeds Face Model (University of Leeds) informed the facial prostheses designs in a statistically meaningful way based upon the related facial features. For the traditional CAD methods, facial prostheses were designed by a maxillofacial prosthetist using either mirroring techniques or a nose model database in commercial 3D design software (Geomagic Freeform, Oqton). For the conventional manual sculpting, full face baseplates were 3D printed (Model Resin V2, FormLabs) using a stereolithographic desktop 3D printer (Form 3, FormLabs) and wax patterns were manually created by a maxillofacial prosthetist. The wax patterns were fitted to the printed baseplates, scanned using the structured light scanner, and aligned to the artificial facial defect meshes based upon the iterative closest-point algorithm.

Analysis:

The original unedited facial feature was considered the gold standard. This was cropped using the Hausdorff distance to remove any vertices within 2mm of the artificial facial defect and hence exclude any overcontoured margins from the analysis. The unsigned distance was calculated from each vertex on the gold standard to the closest point on the target mesh (external surface of each prosthesis design). The mean global absolute deviation was calculated.

Results:

The mean global absolute deviation of the facial prosthesis designs from the unedited facial features was 1.28mm (SD 0.48mm) for the 3DMM group, 1.59mm (SD 0.80mm) for the traditional CAD group and 1.62mm (SD 0.62mm) for the manual sculpting group.

Conclusion:

The 3DMM approach shows potential as a semi-automated method of designing facial prostheses. Further research is underway to explore its use in a clinical environment through a multicentre feasibility randomised controlled trial.

Acknowledgements:

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Evaluation of the Anatomical Characteristics of Fibular Bone in the Indian Cohort Through Computed Tomographic Analysis to Guide in Dental Implant Placement

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Introduction:

Vascularised free fibular flaps are considered as a gold standard for reconstruction of complex oromandibular defects. It is anastomosed with face and neck vessels to get a vital bone. Osseointegration is possible in these vital bone flaps and thus, an implant-retained prosthesis is an added advantage.

Ideally, a CT-based (computed tomographic) planning of the fibular bone is needed to decide the fibular cuts and to determine the perforator position. However, in resource-constrained countries like India, a CT- scan of fibula is an additional financial and logistic burden. A lower limb CT-scan is not a standard protocol. In absence of the scan, it is difficult to determine the dimensions of implants to be placed in a primary set-up. The present study is an attempt to note age and gender-based topographical variations among the Indian cohort by using the data obtained from CT scans. This would help in in choosing the right dimension of the implant and identify fibular segments that allow satisfactory position and angulation of implant placement.

Objectives:

To evaluate the anatomical characteristics at various cross-sectional points of the fibular bone in an Indian cohort.

Methods:

A cross-sectional, observational analysis of retrospective data was done. An analysis of 50 fibulas was conducted from the CT component of PET-CT scan. Each fibula was divided into 6 equal segments (A,B,C,D,E, and F) between the head of fibula and the lateral malleolus and assessed for several morphological parameters (i.e., the available length, width, shape of the cross-section, cortical thickness, radiodensity). Age-based variations (<20, 20-40, >40 years) and gender-based variations (male vs female) were noted. Descriptive and inferential statistics were done using SPSS (Version 25.0). P <0.05 was considered statistically significant.

Results:

The mean fibula length was 35.58+ 2.80 cm. The mean length amongst males (N=31) was 35.63 +2.93 which was significantly higher than females (N=19) which was 35.6 + 2.9 cm. (Unpaired T-test, P= 0.023). Fibular section 'E' demonstrated the most favourable cross-section of "triangular with apex-down" in 70% of the fibulas. The analysis showed, that of all widths (after bone reduction to accommodate for a 3.5 mm diameter dental implant), anterior border to posterior surface was the largest dimension for all the sections {Section D and E = 1.16+ 0.17cm (maximum)}. Radiodensity (measured in HU) was maximum for section E (1302.52+ 197.36). Statistically significant difference was observed in the mean fibular lengths between the <20 years and 20-40 years group. (One-Way ANOVA with post-hoc Tukey's HSD, Q = 4.16, p = .013).

Conclusion:

Within the limitations of this interim analysis, it can be concluded that the mean fibula length of Indian men and women in all age groups is adequate for installation of dental implant without risk of fracture. Fibular section E is the most favourable segment to be harvested from a prosthetic aspect. The findings are congruent with the studies conducted in other ethnic populations.

Minimally Invasive Full Mouth Rehabilitation of Generalised Severe Tooth Wear with Composite Resin Restorations

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Introduction:

Pathological tooth wear is an ever-increasing issue among our ageing population as demonstrated by the national Adult Dental Health Surveys. Since 1998, adults under the age of 65 years old have an increasing prevalence of moderate (large areas of exposed dentine) and severe (exposed secondary dentine or pulp) tooth wear. Therefore, it is critical for general dental practitioners and prosthodontic specialists alike to be well versed in the prevention and management of such tooth wear. This poster presentation aims to share the successful minimally invasive full mouth rehabilitation of generalised severe tooth wear for a patient with a class III incisal relationship and the management of associated complications.

Report:

A 57 year-old male, with a medical history of acid reflux and dental history of bruxism attended the Birmingham Dental Hospital's Restorative Division for management of his generalised severe tooth wear. A three-phased treatment plan was undertaken to address his tooth wear: prevention and stabilisation, restorative rehabilitation, and maintenance.

Prevention and stabilisation of his gingivitis and attritive and erosive tooth wear aligned with the British Society of Periodontology's Implementation of Treatment of Stage I-III Periodontitis guideline, and the British Society for Restorative Dentistry's Tooth wear guideline.

The restorative rehabilitation phase involved treatment planning with articulated study casts, a diagnostic wax up and intra-oral mock up. The occlusion was reorganised in centric relation to an increased occlusal vertical dimension with a mixed class I and III incisal relationship. This was achieved through indirect composite resin restorations in the maxilla and direct composite resin build ups of the mandibular anterior and premolar teeth. The maxillary indirect restorations included palatal veneers and adhesive onlays on the anterior and posterior teeth, respectively. To optimise aesthetics direct buccal composite resin veneers were placed onto the maxillary anterior dentition.

Maintenance involved continued gingivitis and tooth wear preventive measures this included a Michigan hard occlusal guard. At 4-months post-rehabilitation the UR1's composite resin indirect palatal veneer and direct buccal veneer had fractured. This was repaired twice with two differing techniques. At 6-months post-rehabilitation the patient remained free from further complications.

Discussion/Conclusion:

Full mouth rehabilitation can be demanding of the clinician's and laboratory technician's technical skills, and of the patient's time. The maxillary and mandibular arches were restored within separate single appointments to minimise the number of patient visits. This approach educated the clinical team on how to accurately communicate the desired occlusal vertical dimension to the laboratory and that of the benefits of a digital laboratory workflow. Such benefits include extremely accurate replication of the desired smile design in the definitive restorations, and future proofing the restorative work. Should complications arise, identical indirect restorations would rapidly be fabricated using the digital records.

Although minimally invasive, rehabilitation of generalised tooth wear using composite resin restorations is not without a high maintenance cost. Careful and pragmatic consideration of the occlusal scheme and knowledge of the restorative materials' limits are crucial in planning to minimise complications. This presentation demonstrates such consideration and the management of complications.

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Whose Denture is this Anyway?

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Royal London Dental Hospital

Introduction:

Denture labelling is an underutilised tool which can be a useful adjunct to help reduce denture loss and support misplaced dentures being returned to their owners. This research aimed to identify the current denture labelling practices during denture fabrication employed by technicians. These results were then used to inform national guidelines relating to minimising denture loss.

Method:

An electronic survey was distributed nationally between January to March 2022 through professional networks and social media platforms to dental technicians working in hospital and private practice settings. The questions aimed to ascertain details of denture labelling including methods, trends, and cost.

Results:

Of the 56 dental technician responses, 62% of responders expressed it took less than 15 minutes to label a denture, with the most popular labelling technique being incorporation of the patient's name on laminated paper. 37% of dental technicians report never labelling dentures, even though 36% noted a trend in labelling more dentures over the last 5 years than previously. Technicians reported a highly variable reasonable charge for the denture labelling process, with 55% suggesting costs within £10-30, with one outlier suggesting as high as £95.

Discussion:

Consent needs to be gained from a patient prior to the labelling process, and clinicians are responsible for communicating labelling on the laboratory prescription. Labelling dentures is likely to be an effective method of minimising denture loss and confusion among residential setting staff as to the ownership of a set of dentures. Buy in is required from all stakeholders to standardise the practice of denture labelling for vulnerable patients, especially those living within community residential settings.

Conclusion:

There was huge variability reported for denture labelling techniques, methods and costs amongst dental technicians which will need to be overcome to support patients receive a standardised level of dental care.

A Digitally Constructed Maxillary Obturator

Oliver Jones*, Abdulrahman Elmougy

Charles Clifford Dental Hospital, Sheffield

Introduction:

Acquired and developmental defects of the maxilla can leave patients with debilitating side effects including difficulty with eating and speaking, adversely affecting their quality of life. Treatment options for such defects include either surgical reconstruction or prosthetic obturation, each with their own indications, advantages and disadvantages.

Examination:

A patient presented with a Browns classification 2a low-level maxillary defect after the resection of a mucoepidermoid carcinoma of the left hard palate. The patient wished for prosthetic obturation as opposed to reconstruction.

Treatment Plan:

A tooth and mucosal borne Cobalt-Chrome framework was created both conventionally, and via digital CAD-CAM methods after capturing an intra-oral scan of the defect.

Once the scan had been obtained, a computer aided design of the metal framework was created which was milled in an investable and castable material. A soft bulb was used at the patient request for reasons of comfort. Support for the framework was gained from the residual palate and rest seats on the molars, and retention from clasping the molars and engagement of the defect undercut.

Discussion:

Whilst there is little high-quality evidence for the use of intra-oral scanning to construct removable prostheses, there are a number of case reports outlining its use.

The patient reported the intraoral scanning procedure to be more acceptable compared to the conventional impression technique, and the obturator itself was found to be more comfortable.

From a clinician's point of view the technique eliminated the risk of impression material becoming stuck or lost in a small defect. As there was no need to protect the defect with gauze, the true height of it could also be captured. If the defect was larger, or the prostheses required accurate capture of muscular movements, greater challenges would have been encountered. There was also a reduction in the number of clinical visits required with the scan acting as a master impression.

From a laboratory technician's point of view, there was a challenge related to the scan not detecting the defect undercut. Given how scanners work, the light emitted from the head is unable to capture the air space of the nasal cavity. The technician therefore had to digitally create undercuts on the design software to enable bulb engagement.

In cases with small maxillary defects in which prosthetic obturation is required, digital intra-oral scanning can be shown to create accurate and highly acceptable obturators for patients.

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Full Mouth Rehabilitation of a Patient with Amelogenesis Imperfecta: A Case Report

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The term “amelogenesis imperfecta” (AI) describes a diverse group of hereditary conditions primarily affect the quality and/or quantity of dental enamel during the process of amelogenesis. Each of AI variants related to different stages of enamel development and present differently clinically. This will leave major impact on the appearance, structural and shape of the tooth which posed aesthetic concern to individuals having this condition and dictated treatment options available.

The aim of treatment in patient having AI is to improve the psychological well-being and quality of life through restoration of masticatory function, reducing tooth sensitivity and rejuvenation of the dentition appearance. The treatment requires comprehensive and inter-disciplinary approach which integrate intricate element of AI presentation, intra-oral condition, socioeconomic status, patient expectation and thorough understanding of dental materials in ensuring survival and success of restoration placed in AI patients.

Lithium disilicate ceramics is commonly used in aesthetic rehabilitation mostly from its aesthetic appearance in addition to its etchability properties improving the bonding to tooth structure, at the same time reinforcing its mechanical integrity. Zirconium dioxide-based or zirconia restorative materials was thought to be less aesthetic and its bonding behaviour deemed as unpredictable.

However, until recently zirconia has undergone marked improvement in its optical properties and establishment of proven bonding protocols allow us to expand the clinical usage of this material in challenging cases such as in the AI cases.

This case report will provide an insight of prosthodontic-based management which aims to improve functional and aesthetic appearance of a patient with Amelogenesis Imperfecta.

Combined Method for Full Mouth Crown and Bridge Impression Taking.

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Taking a good impression is very important in prosthodontic treatment. However, taking a full arch crown and bridge impression is a great challenge. Due to the limited working time, full arch impression with impression materials is technique sensitive and difficult to achieve satisfying results. Several methods have been suggested to overcome this limitation: sectional impression taking, sequential treatment of quadrants, and bonnet technique with pickup copings. Such methods require extended patient visits and extra clinical work. Dental impression with intraoral digital scanner has advantages in the aspect of limitless working time and ability to be merged with other information. Intraoral digital scanners have drawbacks in detecting deep margins and distal corners of posterior teeth. In this presentation, we combined conventional sectional impressions with VPS impression materials and an intraoral full arch scan to make a full arch crown and bridge impression model. Individual dies of abutment teeth made from sectional impressions were scanned with laboratory scanner and merged to the full arch scan data acquired from an intraoral scanner. By doing so, a full arch crown bridge model with achievable margin details were fabricated.

Swing Lock Denture: A Traditional Solution after Implant Failure in a Head and Neck Oncology Patient- A Case Report

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Introduction:

Implant supported prosthesis are often regarded the highest level of rehabilitation for head and neck oncology patients (HNP). However, when implant failure occurs it can be catastrophic and challenging to provide prosthetic solutions with reliable outcomes. Additionally, there is often a limited amount of abutment teeth of unilateral in distribution where a removable partial denture (RPD) with an alternative design, like a swing lock (SLD) may offer a satisfactory solution.

History:

This is the case of a 90-year-old patient who at age 80 was diagnosed with verrucous cell carcinoma in the right buccal mucosa. The patient underwent a right neck dissection, right hemi mandibulectomy and reconstruction with a radial forearm free flap (RFFF) and subsequent wedge excision of the lower lip. The dental rehabilitation was initially achieved with an implant retained bridge but unfortunately, the implants failed in 2021.

The medical history includes ischaemic heart disease and smoking 20 cigarettes a day.

Key Clinical Findings:

Limited mouth opening as result of scarring tissue in the right buccal mucosa and skin, a deep vertical mandibular ridge defect covered by RFFF. Partially dentated maxilla with bilateral free-end saddles and only LL2 to LL5 present in the mandible, No increased tooth mobility and the oral hygiene was good. Treatment options for replacing mandibular teeth in the right side:

1. Attempt block bone graft and implant retained prosthesis
2. Conventional acrylic denture
3. Swing lock CoCr denture

Treatment provided:

It was agreed with the patient the most predictable and less invasive option was a SLD.

Primary impressions:

Taken using impression compound in the free end saddles and irreversible hydrocolloid for the dentate areas.

Secondary impressions:

A cold cure acrylic special tray was fabricated, modified to adjust extensions including border moulding done with green stick and the final impression taken with medium bodied adhesion silicone.

Denture design:

The labial connector included an acrylic labial veneer, the latch element on the anterior region for ease of access and the hinge on most distal abutment (LL5). The frame was constructed leaving a 5mm space under the right saddle to allow volume for permanent soft lining for comfort. A lingual reciprocating plate and distal rest seat in the LL5 completed the design.

Frame manufacturing:

The definitive model was scanned and designed using the Geometric CAD/CAM software and sent to a third part manufacturer for printing.

CoCr Frame try in and occlusal registration: The metal frame was tried on its own first and acrylic bases with wax rims were added for the occlusal registration which was conforming to the existing intercuspal position and recorded with silicone and shade selected.

Teeth try in and insertion: Along the conventional checks, at try in, the patient started to familiarise with the system and a minor ease was done to the latch. The final result was a very stable and retentive RPD.

Conclusion:

RPDs should not be underestimated in the age of implant dentistry. The SLD design offers additional retention and stability that can be helpful in challenging situations.

Impact of Extraoral Implant Retained Prosthesis in Maxillofacial Patients on Quality of Life - Scoping Review

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Background:

There is limited evidence available regarding patient satisfaction and quality of life assessment with maxillofacial prosthesis.

Objectives:

This scoping review aims to understand the impact of extraoral implant retained prosthesis in maxillofacial patients on improving the Quality of life.

Methods:

An electronic search was performed with the databases and search engines provided by PubMed, EMBASE, Ebscohost, Cochrane Central Register of Controlled Trials, Web of science, Scopus, SciELO, LILACS and Google Scholar up to June 2022 yielded 9 articles which satisfied the inclusion criteria. Two authors extracted information and all the included studies were assessed using a criterion given by David J Pierson for the quality assessment of case reports. A narrative synthesis of the quality of life among maxillofacial rehabilitated patients were performed.

Results:

Due to lack of uniformity of assessment of the outcomes, variation in the maxillofacial defects and comparison, narrative synthesis was performed. As there was clinical and methodological heterogeneity of included studies related to quality of life, the data was further grouped into five domains 1) Biological perspective, 2) Prosthetic factors, 3) Patient's perspective, 4) Clinician's perspective, 5) Technician's perspective based on the information available in the success determination of implant supported prosthesis.

Conclusion:

The add-on of these domains to quality-of-life measurement will design a comprehensive tool in outcome measurement for prosthetic rehabilitation.

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Effect Of Toothbrushing on The Monomer Elution of Shofu HC Block Using A Locally Manufactured Toothbrushing Simulator: A Pilot Study.

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Statement of problem:

Low molecular weight monomers like HEMA and TEGDMA, high molecular weight monomers like BisGMA and UDMA, free radicals as well as photoinitiator molecules could be released by resin composites by several factors which include the degree of conversion, solvent type, molecule structure, filler composition, and microstructure. However, it is unknown whether the toothbrush wear test will lead to the elution of monomers from the Resin Composite Blocks (RCBs) with its known consequences of cytotoxicity and health hazards.

Objective:

This pilot study aimed to identify the type and quantity of monomer elution from RCB, Shofu HC Blocks when subjected to a 3-body wear test using a locally manufactured toothbrushing simulator.

Material and method:

CADCAM resin composite block, Shofu Block HC were sectioned using a diamond saw to obtain 8 samples with rectangular cross-section measuring approximately 5 mm in thickness and divided into 2 groups, No Treatment (NT) group, and Toothbrushing (NT) group. Samples were subjected to either no surface treatment (NT), and a toothbrushing wear test (TB) with soft nylon-bristled toothbrush heads using a load of 2.5 N at 170 cycles per minute up to 10,000 cycles which correspond approximately to 12 months of toothbrushing following immersion in artificial saliva for 7 days. Slurry from the toothbrushing wear test and storage solution after immersion in artificial saliva were subjected to HPLC to measure the concentration of eluted UDMA and TEGDMA. Non-parametric U Mann-Whitney test was conducted to analyze differences between values of concentration eluted monomer and significant differences. A probability of less than 0.05 was considered significant.

Result:

After the toothbrush wear test, 2.41 to 7.09 µg/ml of UDMA eluted from the TB group while UDMA was not detected in the NT group. TEGDMA was not detected in both the NT and TB samples.

Conclusion:

The UDMA was released from Shofu HC Block into toothpaste slurry after being subjected to a toothbrushing wear test.

Keywords:

Elution, monomer, UDMA, TEGDMA, Shofu HC Block.

Minimally Invasive Removable Prosthodontics - A CAD/CAM Approach to the Modified Windowed Partial Denture

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Cardiff University and Cardiff & Vale University Health Board

Computer aided design and manufacturing (CAD/CAM) technology in Digital Dentistry revolutionised the treatment planning and management of missing units in the partially dentate patient. Additionally, windowed partial dentures produced via conventional analogue techniques have been successfully utilised as a restorative option in the partially dentate, where the remaining teeth are lone standing posterior molars. However, CAD/CAM technology has not been used in the treatment planning and fabrication of windowed partial dentures in patients with anterior missing units.

In this case report, we document a novel treatment flow combining analogue and digital CAD/CAM techniques for the treatment planning of a 62-year-old male previously treated for oro-pharyngeal carcinoma. The focus of this case report is to highlight the innovative use of CAD/CAM technology to aid in the treatment planning and subsequent restorative management of multiple missing maxillary units using a novel modified windowed partial denture without any tooth modification/loss.

A 62-year-old male who presented to the Restorative Department at University Dental Hospital Wales, with multiple missing maxillary and mandibular units due to progressive historical tooth loss and erosive toothwear. The patient's presenting complaints were loss of masticatory function and psychological impact of the poor appearance of their teeth.

Initial examination revealed a Kennedy 3 mod 1 maxillary arch with missing anterior units, tooth migration, and a Kennedy 1 mandibular arch with anterior wear faceting, together with multiple small root caries lesions and generalised biofilm induced gingivitis.

Initial stabilisation ensuring optimum oral health of existing dentition was performed consisting of restorations, periodontal therapy, risk factor control, and fluoride therapy. Oral rehabilitation treatment options for the missing maxillary units were discussed involving multiple cantilever resin-retained bridges after either accepting existing tooth position or decompensation orthodontics, extraction and provision of conventional partial denture or implant retained prostheses or maintaining the status quo.

After making analogue impressions, these were scanned digitally, and the proposed restorative treatment options were digitally simulated. Resin 3D-printed stents for each treatment option were created to allow real-world prototyping of each restorative option intra-orally.

Resin 3D-resin printed stents simulating the provision of resin-retained bridges (accepting existing tooth position) and simulating extraction and provision of conventional removable partial denture were tried in and assessed clinically for: aesthetics, positioning, occlusion (static and dynamic), and patients' opinions.

The use of resin 3D-printed stent simulating provision of conventional partial denture following tooth extraction (a 3D resin printed windowed partial denture) – was the preferred option by the patient; the appliance exhibited excellent clinical fit, aesthetics, and patient acceptability. Given the 3D-printed stent functioned excellently with the anterior teeth in situ – the treatment plan was finalised, with the management strategy of choice for the missing maxillary anterior units being the provision of a modified windowed partial denture; no tooth modification or extractions required.

A new standard operative procedure was written for use within the Cardiff & Vale University Health board outlining the use of CAD/CAM designed/printed frameworks and stents for the treatment planning and/or management of missing units and fabrication of modified windowed partial dentures.

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Multi-Disciplinary Restorative Management of a Discoloured Tooth with a History of Trauma and Gingival Hyperplasia

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A 24-year-old patient was referred for root canal treatment and bleaching of the upper left central and lateral incisors (UL1 and UL2). Her presenting complaint was that she disliked the dark appearance of those two teeth. The UL1 and UL2 sustained avulsion injuries when she was 11 years old. They were re-implanted and splinted for a number of weeks. The teeth were root canal treated and restored with composite restorations shortly after the initial trauma. She had undergone fixed orthodontic treatment 2018 to 2021 and been debonded one year prior to presentation. During that time she reported her gums became enlarged. She did not have any medical conditions, was not on any medications, and did not have any known allergies. She never smoked.

Extraoral clinical examination revealed incompetent lips, a high smile line and vertical maxillary excess. Intraoral clinical examination revealed the UL1 and UL2 were discoloured with a dark grey/ black appearance. These teeth had suboptimal, stained composite restorations. The periodontal tissues were locally overgrown, especially palatally where they covered the cingulum of the upper incisors. Periodontal probing depths ranged up to 5mm but these were largely false. The UL1 and UL2 showed no response to cold or electric pulp testing, but otherwise had no clinical signs. Periapical radiographs showed previous root fillings, with both teeth having their canals partially filled with a radiopaque material.

Diagnoses of discolouration of the UL1 and UL2 (both intrinsic and extrinsic in nature) associated with previously root fillings. A diagnoses of gingival hyperplasia was also given, with mouth breathing, plaque and a history of orthodontic treatment given as potential contributing factors. The options were discussed and a treatment plan was outlined.

Management:

Oral hygiene instruction was given, and in particular the use of chlorhexidine gel on the upper anterior teeth in conjunction with brushing and interdental brushing. A course of non-surgical periodontal treatment/ professional mechanical plaque removal (PMPR) was undertaken under local anaesthetic. The patient was reviewed following this and although there was some improvement to the soft tissues, the gingival excess was still present, therefore not allowing access to the palatal surfaces of the upper anterior teeth, and therefore preventing adequate placement of a rubber dam and subsequent root canal retreatments. Crown lengthening surgery was undertaken on the upper anterior teeth (UR3-UL3) for this reason. Subsequently, root canal retreatment was carried out on the UL1 and UL2. Glass ionomer restorative material was placed is the canals just below the level of the gingival margin and intrinsic- extrinsic bleaching of the UL1 and UL2 was carried out. The discolouration improved significantly to the point where the patient was satisfied and the access cavities were then restored with definitive composite restorations.

Developing Biomaterials for Controlled Bone Removal: A Potential Minimally Invasive Approach for Implant Explantation

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Introduction:

Considerable effort is spent on developing materials and processes to regenerate bone, however there are circumstances where the removal of bone is clinically indicated, such as management of heterotopic ossification (1), removal of osteophytes and explantation of osseo- integrated implants (2). Standard approaches for bone removal involve surgeries that are invasive and often associated with considerable tissue morbidity (3). The objective of this study was to develop a biomaterials approach that can be used for controlled bone removal and temporary inhibition of bone growth. From a prosthodontic perspective a minimally invasive approach to removing failing implants that avoids use of trephines is an unmet clinical challenge.

Methods:

Functionalized hydroxyapatite (HAp) nanoparticles (NP) were synthesized. HAp-NPs were generated using controlled coprecipitation methods in solutions of H3PO4, CaCl2 and NH4OH prior to surface modification with a polyphosphate solution (HApP). Functionalized particles were characterized including Zeta potential and size, FTIR spectroscopy, X-ray diffraction (XRD) and Scanning Electron Microscopy (SEM). In-vitro studies of osteoblast and fibroblast behaviours and toxicity screening preceded in-vivo (rodent model) initial bone inhibition studies. Controls included non-functionalized HAp-NPs and commercially available HAp-based graft biomaterials.

Results:

The Zeta potential, size, and FTIR and XRD characterizations showed chemical similarity of the synthesised particles with biological Hap and Bio-Oss particles. Using SEM HAp nanoparticles were shown to be of approximately 130 nm size, and a film was visualized covering the HApP polyphosphate modified particles. Unmodified and modified HAp particles resulted in limited direct toxicity on cultured fibroblasts and osteoblasts. In-vivo studies showed that HApP completely eliminated mineralised tissue in its immediate vicinity, but peripheral bone histologically appeared normal.

Conclusions:

In this study, we demonstrate the potential to use functionalized synthetic HApP nanoparticles to promote localised demineralization and inhibit short-term bone formation with low levels of cytotoxicity and no residual biomaterial. The polyphosphate functionalisation was incorporated to act chemically by solubilising existing hydroxyapatite without significantly lowering pH from physiological conditions. Limited impact of osteoblast and fibroblast viability was demonstrated prior to preliminary in-vivo bone inhibition studies. Tomographic imaging of calvarial defects combined with histological characterization demonstrated the inhibitive effect as early as 7 days post-application. The findings of this study support the need for follow-up studies to demonstrate the efficacy in an implant explanation study.

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A Multidisciplinary Approach to the Management of Hyperplastic Maxillary Tuberosities

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Introduction:

A 79-year-old female presented via GDP referral with unsatisfactory dentures with several unsuccessful predecessors. Over the years, she had noticed slowly growing bimaxillary soft tissue lesions in the premolar and molar regions which had provided significant difficulty in constructing prostheses for her by the GDP. The patient was retired, a non-smoker and rarely drank alcohol. Medical history included well controlled hypertension, a heart murmur, asthma, COPD, borderline diabetes type II, hiatus hernia and osteoarthritis.

Case summary:

The patient had had multiple dentures over the years, and presented with an unstable, poorly retentive and under extended maxillary partial acrylic denture with poor aesthetics, with UR12 only remaining in the dentition. This was complicated by bilateral hyperplastic fibrous tuberosities which extended from the region of the first to the third molar. The lower full acrylic denture was also unstable, poorly retentive and under extended.

The fibrous lesions were removed surgically using a wedge excision undermining the bulky palatal tissue and, crucially, preserving the sulcus depth. Immediately post operatively the partial acrylic denture was relined in the surgical area using tissue conditioner. Pre-operatively, a clear acrylic healing plate was constructed to an estimated alveolar ridge shape post-surgical reduction of the soft tissue. This was relined in hard acrylic chairside in the healing phase to view and allow for even pressure over these sites, and included the upper anterior dentition, to relieve pressure over the surgery site. This was then modified with the addition of the remaining two upper anterior teeth which were extracted. Following healing and remodelling, a new set of complete upper and lower dentures were constructed which were retentive, stable and appropriately extended.

Discussion:

Excess tissue in the region of the maxillary tuberosity can enlarge such that it interferes with denture construction, speech and mastication by impinging on the interocclusal space and creating undercut; they can also cause pain if traumatised or ulcerated. Prosthesis stability and retention are compromised as the mobile tissue is easily displaced. Treatment is usually with surgical excision and the lesions are unlikely to recur.

In some cases, the maxillary sinus can extend into the tuberosity, therefore radiological imaging is an important aid to surgical planning particularly if bony reduction is also required. In this case a CBCT was taken prior to the surgery, which confirmed fibrous hyperplasia.

The tissue was unusually large and mobile, proving challenging to plan and execute removal and the construction of a new prosthesis, ensuring the patient had a reasonable solution for replacing her teeth during treatment phases. The excised tissue was sent for histopathological analysis.

Conclusion:

This case demonstrates the collaboration between oral surgery and prosthodontic specialities to effectively manage this patient and deliver a well-fitting and functional prosthesis and highlights the benefit of pre-operative planning and thoughtful discussion as to providing streamlined and efficient care. Prior to removal of the enlarged tissue, the patient was unable to eat, speak without her denture dislodging and had lost confidence; these issues are now resolved, improving her quality of life.

Prevention of Peri-Implant Mucositis Following Placement of Reused Healing Abutments: A Non-Randomised Study

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Background and objective:

The reuse of implant healing abutments is common in dental practice. Effective elimination of bacteria and viruses is accomplished by conventional sterilisation. However, studies suggest that significant amounts of bioburden still remain adhered to the titanium surfaces in spite of sterilisation procedures, especially prions. Another source of prions could be bovine bone substitutes used widely for bone regeneration before or simultaneously to the dental implant placement. Moreover, the implant healing abutments are fitted over the upper part of the implant to promote the soft tissue seal formation exposing the surrounding oral epithelium as well. Subsequently, this may either affect cell adhesion and the effective soft tissue surrounding the dental implant, or promote inflammatory processes in a hypothetical re-receptor. The proteins and amino acids that can remain adhered to titanium surfaces are extremely difficult to remove. Therefore, it is beneficial to enhance the healing process by decreasing the percentage of the bacteria and other pathologic microbes in the near proximity of the biomaterial.

Application of Ledermix intracanal medicament over the healing abutment prior to placement over the implant fixture could be a clinically viable solution to reduce the inflammation of peri-implant tissues. Its formulation consists of an antibiotic component, demeclocycline calcium, which is a tetracycline derivative, and a steroid component, triamcinolone acetonide. Evidence suggests that tetracycline derivatives are a potent therapeutic drug against prion diseases. In addition, the triamcinolone enhances bone formation and reduces inflammation. Despite that, there is no available evidence suggesting the use of this antibiotic paste over the implant abutment surfaces to enhance peri-implant tissue health.

Materials and methods:

Among a group of 40 dental implant placement cases, during the second stage surgery, after exposing the implant attachment surface, the healing abutments were coated with a thin layer of ledermix paste using a sterile flat instrument tip and placed over the implant fixture. The patients were recalled after 4 weeks for review, 2 weeks for abutment level impression, 2 weeks for the cementation of prosthesis. At all times, the data related to the degree of clinical inflammation were recorded. Bleeding index was recorded at the end of the evaluation period. A total of three inflammation assessments were performed over four consecutive weeks and a single plaque evaluation at the end of the study period. During this stage patients' soft tissue health was assessed to rule out any changes of mucositis. In order to avoid selection bias, the operator, the implant brand chosen, and sterilisation protocols were the same. The included patients were either ASA I or II, older than 18 years, an oral hygiene index of < 2 and willing to participate in this study. Fifty percent of included patients received ledermix coated healing abutments based on a non-randomised selection process. Others underwent conventional technique without ledermix coating over healing abutments.

Research outcome:

Patients who obtained ledermix coated implants show speedy mucosal healing surrounding implant fixtures.

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Management of Anterior Cleft Palate

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Background:

Cleft lip and palate (CLP) is the most common congenital craniofacial anomaly occurring in 1:700 live births. These patients present with several physical and psychosocial challenges and a centralised multi-disciplinary team is involved in their management. The role of the restorative dentist is important in treatment planning and oral rehabilitation. This has improved outcomes particularly for the younger cohort. Older adult partially dentate patients with residual palatal defects often present with complex challenging restorative treatment needs due to various methods of management in the past.

Presenting Problem:

A 72-year-old male presented with a loose 35-year-old obturator after the UR8 fractured.

He had a history of cleft lip and palate of which an anterior palatal cleft remained. He had experienced significant dental treatment to date. He previously smoked 30 cigarettes a day for 20 years and quit in 1985. He was otherwise fit and well.

The salient clinical findings were a high smile line, anterior palatal cleft, hypodontia within the cleft region, large edentulous saddles, rotated, microdont UR4 and UR3 and arch-width discrepancy between the maxilla and mandible. He was partially dentate in the maxilla and his current obturator overdenture covered the remaining teeth, some with telescopic crowns, apart from the UL7 and UR8 which were clasped. The UR8 had fractured leaving a short clinical crown height <2mm. The obturator had moderate retention, stability and seal.

Within the mandible, he was dentate. The LR6 had a buccal sinus which was not tender to percussion. He had a Class III incisor relationship.

He had 5mm periodontal probing depth on the UL7 and LL7, and grade II furcation involvement with the UL6 buccally. There was no mobility.

Radiographs confirmed clinical findings.

The principal diagnoses were:

1. Cleft (lip and) palate
2. Localised periodontitis, stage III, grade C, currently unstable
2. Fractured UR8
3. Asymptomatic apical periodontitis with a sinus LR6
4. Suboptimal obturator overdenture

Clinical Management:

The patient followed a preventive regime including oral hygiene instruction, high fluoride delivery and dietary advice. He was provided with full mouth professional mechanical plaque removal and reassessed at 3 months, demonstrating stabilised periodontitis. On discussing the options including the risks and benefits for the LR6, the patient chose no treatment. The UR8 was sealed with a Nayyar core and retained as an overdenture abutment and a new obturator overdenture was provided.

Discussion:

CLP patients with larger edentulous saddles are best managed with an obturating removable partial denture. This increases plaque accumulation and evidence suggests that CLP patients have a higher risk of caries due to increased levels of cariogenic bacteria therefore, prevention is key. A metal-based prosthesis is less bulky and more hygienic. The challenge was the inadequate number of abutment teeth to clasp, and this was overcome with CAD/CAM fabricated obturator framework. The fit, retention and stability were very accurate and precise with only one clasp on the UL7, as supported by available literature. This case demonstrated the importance of prevention, accuracy of CAD/CAM prosthetics and improving patient experience with minimally invasive dental treatment.

Guided Flapless Implant Placement Simultaneous to Rhinectomy and Partial Maxillectomy in an Oncology Patient to Support Oral Rehabilitation with an Obturator

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Aim:

To report the planning and surgical delivery of fully guided flapless implants placed in an edentulous patient simultaneous to resection of an extensive nasal carcinoma surgically treated with a rhinectomy and partial maxillectomy to optimise oral rehabilitation during obturator construction.

Objectives:

To describe the clinical and prosthodontic factors involved in assessing and planning pre-surgical obturator patients and the digital planning protocol for fully guided implant placements.

Abstract:

A 62-year-old male diagnosed with T4N0M0 squamous cell carcinoma (SCC) of the nasal cavities was referred to the Restorative Dentistry department by ENT for pre-surgical planning. The oncology plan was a complete rhinectomy and partial anterior maxillectomy with likely post-operative radiotherapy.

On assessment, the patient had been edentulous for over five years with a failed attempt at wearing complete dentures provided by his GDP due to lack of stability. Examination revealed a bulbous nose with erythematous skin and raised lesion extending down the philtrum with good mouth opening. The maxillary alveoli were resorbed with a flat palate and limited sulcus depth, particularly anteriorly. The Cawood and Howell's classification was class IV-V for maxilla and class III-IV for the mandible.

At initial visit, an upper primary impression was taken with putty and lower in compound. Due to lack of time pre-surgery, no aesthetic demands from patient and no current dentures to follow traditional steps in denture-provision; a direct chairside putty jig was made of the labial aspect of the maxilla to establish the volume of material required to provide adequate lip support for post-surgical obturation and to plan for future upper anterior tooth positioning. A clear heat cured base plate with lip support was planned.

Implants in this case were considered due to the history of poor denture wear, planned extension of resection which would compromise the anterior seal of the obturator as well as to brace for future bone loss and functional needs. The medical CT was used in combination with implant planning software to plan for fully guided placement of four maxillary tissue level implants posterior to the estimated resection site.

The patient was seen jointly with ENT under general anaesthetic. A putty index of the nose was taken prior to resection for future prosthesis. Following removal of the tumour, which spared the vermillion border, the surgical guide was secured with a mid-palatal fixation pin and the implants were placed using manufacturer protocols; all achieved good primary stability. The cover plate was subsequently relieved at the sites of implant placement to prevent early loading prior to addition of silicone bung into the defect and temporarily screwing this into the palate. The healing plate will stay in situ for 6-8 weeks whilst the implants integrate following which prosthetic planning for an implant-retained maxillary removable obturator opposing a complete mandibular denture will commence.

This case highlights the challenges in planning of complex oncological dental rehabilitations within a limited time and the advantages in digital planning in delivering precise implant placement which can significantly improve the quality of life of patients undergoing extensive resections.

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Reducing our Carbon Footprint in the Prosthodontic Unit at the Eastman Dental Hospital (UCLH) By Modifying Our Instrument Kits

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Introduction:

The NHS accounts for 25% of public sector carbon dioxide emissions in the UK. The NHS has a bold ambition to reduce its carbon emissions to zero by 2040. UCLH, as one of the largest NHS Trusts in London, has a Green Plan (2020-25) which aims to reduce the environmental, social and financial impacts from its operations.

Any vision from an organisation requires its staff members to engage and seek what they can do to support these goals. In July 2022, an audit was undertaken to review the restorative instrument kits in the prosthodontic department, their current environmental impact and how modification of these kits could support the organisations environmental goals

Materials and methods:

The audit was comprised of two parts. The first part assessed the current kits. All clinicians in the department were invited to participate in a survey to inform which instruments in the kit they use (always, occasionally, rarely, never). The current kit was weighed. Based on the results of the survey a 'modified' kit was created. This 'modified' kit was also weighed in comparison.

The second part of the audit reviewed the sterilisation process. The capacity of the sterilization machines in the central sterilizing department (CSSD) was identified. The average number of current kits sterilised per week was determined. This was projected to a yearly amount. It was then determined the number of sterilizing cycles required for the 'current' kits versus the number of cycles required for the 'modified' kits. Lastly the cost of sterilizing the 'current' kit versus the 'modified' kit was determined.

Results:

Twenty-six (26) surveys were completed. Thirteen (13) of the 30 instruments in the current kit are rarely or never used. A new modified kit was created. The current kit weighs 1,412g compared with the modified kit weigh ining at 801g.

For the sterilization process, the projected annual number of current kits sterilized was 6000, requiring 187.5 sterilization cycles, costing £24,000. In contrast, the same number of modified kits would require 133.3 sterilization cycles costing £12,000.

Additional CO2 emissions were reduced in the weight and space reduction for transportation to CSSD. Also, there was a reduction in the packaging waste generated by the reduced size of the modified kit.

Conclusions:

Reviewing aspects of current practices can highlight where unnecessary waste occurs. Modifying current practices can not only have an important impact on reducing carbon emissions and waste but also significant financial implications.

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The Impact of Finishing Procedures on Dental Zirconia

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Introduction:

Provision of an indirect restoration may require chairside adjustment. It is generally accepted that chairside adjustment will introduce surface roughness and this can be reduced by polishing.

Monolithic tooth supported zirconia restorations are becoming increasingly popular as they are conservative, tooth coloured, strong and can be fabricated using a digital workflow. Many different brands and formulations of dental zirconia are now available on the market.

It is unclear what impact adjustment will have on any one zirconia material, similarly, it is not clear if polishing using a universal ceramic polishing system is effective.

This study will investigate and analyse the impact that finishing and polishing procedures have on a high translucent 3Y-TZP zirconia material. Specifically, it will be analysed if the zirconia ceramic under investigation experiences any changes in (1) surface roughness, (2) phase transformation, and (3) flexural strength after adjustment and, adjustment and polishing.

Materials and Methods:

Thirty Argen Z Esthetic zirconia discs (12mm diameter, 1.2mm thickness) were randomly divided into three groups. The control (C) group (n=10) consisted of polished specimens as received by the manufacturer. The other two groups were then subjected to different finishing procedures, such as grinding (G) (n=10) with a red diamond bur (grit 45 m) to simulate occlusal adjustment and grinding and polishing (GP) (n=10) with a red diamond bur (grit 45 m) and OptraGloss polishing system. All specimens were analysed for surface roughness, phase changes, and biaxial flexural strength.

Results:

Both finishing procedures were found to significantly increase the surface roughness of the zirconia when compared to the control group ($p<0.05$), with polishing insignificantly improving the surface roughness after grinding. All three groups (C, G and GP) produced mean surface roughness measures greater than the desired level of <0.2 µm. All specimens in all three groups had cubic and tetragonal phases present, but no monoclinic phase was detected. There was no evidence to suggest a significant difference in the flexural strength between the three groups ($p>0.05$). The null hypothesis was thus rejected in the case of surface roughness and we failed to reject the null hypothesis in the case of phase transformation and flexural strength.

Conclusions:

Chairside adjustment such as grinding or grinding and polishing produced rougher zirconia surfaces compared to the un-adjusted specimens in the present study. The marginal improvement in surface roughness provided by polishing after grinding was negligible.

For the zirconia material used, no phase changes were detected after the finishing procedures nor any significant differences in the flexural strength.

This study raises some questions about the effectiveness of commercially available polishing systems, the technique employed to polish a restoration post chairside adjustment and the influence of the zirconia material itself.

Multiple Idiopathic Cervical Root Resorption: A 22-year Follow-Up Case Report

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Introduction:

Multiple Idiopathic Cervical Root Resorption (MICRR) is a rare phenomenon which can result in the loss of affected teeth and give rise to difficult prosthodontic situations to manage. The resorptive lesions initiate circumferentially at the cemento-enamel junction and are often first evident as an incidental radiographic finding. These lesions may spontaneously arrest or alternatively progress resulting in decoronation of the affected teeth. The literature suggests no correlation with other medical or dental conditions however a genetic predisposition may be likely from a familial pattern of presentation. This case describes a 22-year follow up of the management and prosthodontic rehabilitation of a young male affected by MICRR.

Case Report:

A 14-year-old male patient was referred to the Cardiff University Dental Hospital Paediatric department in 2000 for root resorption of the LL45. The patient was medically fit and well and undergoing a course of fixed orthodontic treatment. Clinical examination revealed associated Grade II mobility and pink discolouration at the buccal cervical aspect of the LL4. Further radiographic examination revealed multiple cervical resorptive lesions affecting UR6 LL7 LL6 LL5 LL4 LR2 LR3 LR4 LR5 LR6. A multidisciplinary approach was undertaken to manage this patient involving Restorative, Paediatric, Oral Surgery, Oral Pathology and Oral Maxillofacial departments. Haematological and endocrine investigations revealed no abnormalities.

Over the course of two years, several restorative interventions were attempted to arrest the resorptive process and manage the symptoms. These included direct restorations, endodontic treatment and surgical curettage, however all were unsuccessful at arresting the condition. By 16 years of age, UR6 was extracted and LL6 LL5 LL4 LR2 LR3 LR4 LR5 had decoronated. By 18 years of age, six implants were placed in the anterior mandible to provide the patient with fixed bridgework and by 20 years of age the maxillary arch had become edentulous and restored with a further six implants. Peri-implantitis resulted in progressive loss of the initial mandibular implants until 35 years of age where the patient is now transitioning to a lower implant-supported removable prosthesis.

Discussion:

One of the main difficulties with managing young MICRR patients is trying to delay the extraction of the affected teeth until alveolar bone growth completion. Bisphosphonate medication, surgical curettage and direct restorations have all been documented in the literature as attempts to arrest the resorptive process. However, these techniques have only provided palliative management along with the risk that bisphosphonates may provide unfavourable conditions for future implants. The endodontic treatments carried out were focussed on managing symptoms rather than arresting resorption lesions.

Conclusion:

The rare nature of MICRR along with limited literature has resulted in early management techniques being based on anecdotal evidence. Long term management of these patients can help to provide a better understanding of the resorptive process and its progression. It is important to manage patient expectations appropriately, understand the psychological impact this condition may have on young patients, and inform patients of likely outcomes associated with the condition including premature loss of the natural dentition and requirement for life-long prosthetic and implant rehabilitation.

A Novel Approach to Assess and Measure the Resorption Rate and Pattern of Allograft Cancellous Blocks Used for Dental Implant Rehabilitation - A Pilot Study

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Leeds Teaching Hospitals NHS Trust

Introduction:

Bone augmentation techniques are used to manage atrophic alveolar ridges for the purposes of implant rehabilitation.

Current augmentation techniques include particulate grafting with barrier membrane (often using xenograft) and extensive augmentation methods using autogenous blocks (iliac crest, ramus, symphysis).

Autogenous bone blocks are regularly utilised in cases requiring extensive grafting. This requires donor site surgery which is associated with morbidity. Alternative techniques include the use of allograft blocks. Cancellous allograft has been reported to provide adequate horizontal ridge augmentation.

Current reported resorption ranges from 0-25% for autogenous grafts and up to 29% for cancellous allograft. High variability suggests imprecise outcome measures; a novel analysis technique was designed to overcome this.

Four patients at Leeds Dental Institute, were treated with a total of six allograft blocks, upon which analysis was completed.

Intervention:

Patients underwent a cone beam CT scan prior to surgery for implant planning.

The resulting DICOM was processed, and 3D planning software was used to digitally design cancellous allograft blocks. These were harvested from femoral heads of adult humans undergoing hip replacement surgery and underwent defatting, sterilisation and lyophilisation (Allotec® process, Botiss, Cells+Tissuebank Austria). These were externally oversized by 20% to accommodate for anticipated resorption.

Surgical Protocol:

1. Pepper-potting donor site.
2. Affixed to recipient site with screws.
3. Additional augmentation with deproteinised bovine bone mineral (Geistlich Bio-Oss®) at peripheries if required.
4. Periosteal release, buccal advancement and closure with non-resorbable sutures.

Prosthodontic loading of the grafts was avoided to prevent wound breakdown. The risk of resorption was present if not loaded within four months.

Post-surgical CBCT scanning was undertaken at a mean of 152 days following block placement.

Method of analysis:

A novel approach was used to assess volumetric changes of the block. DICOM scan data was manually processed

1. CBCT STLs pre- and post-surgery were aligned using a verified and published best fit algorithm
2. Accuracy of alignment was determined by visual assessment.
3. STL files were voxelised using customised software alignment and reassessed, requiring 95% of 25µm voxels to be aligned.
4. Volumetric change was assessed using a per-voxel analysis

Results:

Four cases were assessed in total (with six block grafts). Block volume sizes varied between 614mm to 1674mm. 50% of blocks had soft tissue breakdown at the wound edge during healing. Soft tissue breakdown in all cases was managed with chlorhexidine irrigation and monitoring. One case required antimicrobials. All cases with soft tissue breakdown required a delay to implant planning.

Mean block resorption at implant planning (mean=5 months) was 19.6%. This aligns with published literature on the resorption and soft tissue complications following allogenic block grafts

Qualitative evaluation of block resorption suggests that the pattern of resorption was complex; greater resorption was typically observed over the largest part of the block.

Conclusions:

Further testing is required to validate the process for bone resorption following grafting techniques. There is potential to provide insights into the aspects of the graft most prone to resorption and the biologic limits in block grafting cases.

The Role of Biomarkers in Assessing the Peri- implant Health status of Dental Implants - A Systemic Review and Meta Analysis

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Aim:

The present systemic review and meta-analysis was performed to summarize the current literature of Peri-implant crevicular fluid (PICF) biomarkers in the diagnosis of peri-implant disease and evaluate their validity to predict disease progression

Objectives:

1. To review the current understanding of the influence of biomarkers in Peri- implant diseases.

2. Evaluate their validity to predict disease progression.

Materials and methods:

Considering the inclusion criteria, an electronic search by using specific keywords of three databases PubMed, Cochrane library and EMBASE was done using a combination of MeSH terms and text words. A manual search from 2000 till April 2022 was made. Studies reporting on Peri-implant biomarkers in the PICF, and their relevance in diagnosing Peri implant disease were included. A Systemic review and meta-analysis was conducted following PRISMA guidelines.

Results:

Electronic strategy provided 1816 titles. After screening 53 were included for further analysis. A systematic descriptive review was performed followed by Meta analysis.

Conclusions:

Biomarkers in peri-implant crevicular fluid have shown promising results in differentiating between healthy and diseased Peri-implant conditions. However, additional evidence supported by randomized-controlled trials is needed to validate the reports.

Clinical relevance:

Biomarker identification in PICF, which could differentiate between healthy and diseased dental implant tissue, might represent a valuable non-invasive method suitable for detecting implant pathology.

Keywords:

biomarkers; dental implants; inflammation; peri-implantitis;

Implant Rehabilitation in an Osteoblastoma Patient Reconstructed with a Non-Vascularised Fibula Bone Graft

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Introduction:

Osteoblastoma (OB) is a rare benign slow-growing bone tumour, which represents less than 1% of all tumours in the maxillofacial region. They are infrequent in children and tend to be diagnosed in the fourth or fifth decades of life, which commonly arises on the cranial vault surfaces, jaws, paranasal sinuses, and orbit. OBs tend to present asymptomatically, although when large may result in a painless swelling, facial asymmetry, symptoms related to nasal or paranasal sinus obstruction and ocular abnormalities. Excision is the treatment of choice relative to the tumour extent and may require maxillofacial reconstruction. A multi-disciplinary team approach is required in the management of these patients, with the common goals of restoration of function, aesthetics and quality of life.

Case:

A 19-year-old female was referred to the Royal London Dental Hospital for replacement of teeth in the right maxillary quadrant. She previously had en bloc resection of an OB from the right maxilla in Italy at the age of 13 followed by a non-vascularised fibula bone graft reconstruction. She was unhappy with her removeable partial prothesis due to aesthetics and fit. After discussing different treatment options, two tissue level implants were digitally planned to achieve bicortical fixation within the fibula graft in the UR3 and UR5 positions. Due to the hollow structure of the fibula bone a mixture of autogenous bone scrapings and bovine-derived bone graft material were inserted through the implant osteotomy sites to help achieve stability and osteointegration. A connective tissue graft to improve thickness and keratinisation of the peri-implant soft tissues was performed 6 months post-surgery and subsequent restoration with an implant-supported bridge. Meticulous digital planning to facilitate guided implant surgery and bone grafting techniques were essential to enable precise and predictable execution of treatment.

Conclusion:

This case demonstrates implant rehabilitation coupled with bone grafting techniques within the non-vascularised fibula bone graft can achieve good primary stability to help restore function and aesthetics

An Evaluation of the Differences in Implant Treatment Planning and Confidence of Postgraduate Specialist Trainees when Using Panoramic Radiographs Compared to Cone Beam Computed Tomography

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Aims:

To determine if dental implant treatment planning by postgraduate specialist trainees using panoramic (DPT) radiographs changes with access to cone beam computed tomography (CBCT) data. To determine if postgraduate specialist trainees' confidence with treatment planning, changes with access to CBCT data.

Methods and Materials:

Clinical records for twelve partially dentate patients who had been successfully treated with dental implants by two experienced clinicians were prepared for assessment, and treatment planning by eleven examiners (postgraduate dentists). The examiners assessed these clinical records over three separate sessions, with two weeks apart of each session. Study models were provided for each of the three sessions along with the following radiographical information: (session 1) DPT only, (session 2) CBCT only, and (session 3) DPT and CBCT. Details of the treatment plan were recorded by a written questionnaire and confidence in treatment planning was recorded using a 5-point scale for each case. Inter and intra-examiner agreement was determined. Descriptive analysis and inferential analysis was undertaken using Kappa's concordance index. A 95% confidence interval was estimated. A McNemar's test was used to test symmetry within the data.

Results:

Using a CBCT scan led to significant changes and enhancements to implant planning. Significant changes included: the assessment of available bone volume ($p<0.001$), changes to the type of prosthesis planned ($p=0.053$), the ability to locate the incisive canal ($p=0.022$), significantly more likely to plan for bone augmentation ($p=0.039$), especially horizontal augmentation procedures ($p=0.052$), and to plan for wider implant diameters ($p=0.021$). It was more likely to plan a shorter implant length with a CBCT ($p=o.021$). A DPT significantly led to more uncertainty of the maxillary sinus floor position ($p=0.001$) and an expectation of problems with the final 'pink aesthetics' and associated length of the implant restoration ($p=0.058$). Trainees were more likely to plan a cement retained restoration ($p=0.053$) and regular sized implants with a DPT ($p=0.064$). Implant angulation was not planned significantly differently with a DPT or CBCT ($p=0.701$). Access to CBCT data significantly improved the examiners confidence in their treatment plan ($p=<0.001$).

Conclusion:

Access to CBCT data significantly impacts upon many aspects of implant planning when compared to plans created using a DPT. CBCT enabled improvements in the ability to assess the available bone volume which in turn improved ability to assess the need and plan for bone augmentation procedures. Access to CBCT data significantly increases the level of confidence of specialist trainees in their implant planning, compared to when only a DPT is used. The results of this study support the use of a CBCT examination by less experienced implant surgeons when planning dental implant treatments.

An Evaluation of Dental and Craniofacial Implants Placed to Facilitate Rehabilitation of Head and Neck Cancer Patients with up to 10-Year Survival Analysis

Joshua A Twigg*, Alice Rigby, Zaid Ali, Jaymit Patel

Leeds Teaching Hospitals Trust

Introduction:

Endosseous implants are frequently used to provide retention and support in the prosthetic orofacial rehabilitation of head and neck cancer patients. However, information about the survival of implant-supported restorations, the burden of care on patients in maintaining and replacing such restorations, and the frequency and types of complications associated with such restorations is limited. This service evaluation aimed to evaluate the survival and success of implant-supported restorations in patients with head and neck cancer with up to 10 years of follow up.

Objectives:

Evaluate the survival of implants and implant-supported restorations in patients with head and neck cancer.

Evaluate the time from cancer treatment to completion of implant-supported restorations.

Characterise the complications associated with implant-supported restorations in this cohort.

Methods:

This retrospective service evaluation conducted in a single major oncology centre included all patients receiving implant-supported restorations between 2008-2022, identified from a departmental implant log used to order components. Data collection included patient demographics, key comorbidities, time and modality of cancer treatment, implant system and restoration type, time of restoration delivery and complications.

Results:

We identified 114 patients who received 385 implants in total. The mean age was 64.15 (SD 12.4), with approximately 50% of patients being female. Twelve percent of patients were current smokers, while a further 34% had a positive smoking history. 41% of participants received radiotherapy, while 18% received chemotherapy. The mean number of implants per patient was 3.4 (SD 1.7). Overall, the mean time from HNC treatment to restoration provision was 36.1 months (SD 33.6). For primary implant placement, this was reduced to 10.9 months (SD 5.6) compared with 48.8 months (SD 33.8) for secondary placement. Implant complications and failures were infrequent, while prosthetic complications such as screw loosening, loosening of denture locator housings and acrylic/porcelain fractures were common, but usually repaired on the same day as presentation.

Conclusions:

Implant-supported restorations are a reliable and successful option in the management of post-treatment head and neck cancer orofacial defects. Primary placement of implants at the time of oncological resection reduces the treatment time for patients by over 2 years on average. As cancer survival is benchmarked at 5 years, this represents a significant portion of patients' lifespans that can be improved by earlier rehabilitation. Further work is needed to improve case selection and integration of primary implant placement into HNC care.

Performance of Fully Sintered Yttrium-Niobium-Tetragonal Zirconia Polycrystal ((Y, Nb)-Tzp) Ceramics as a Single Prosthodontic Restoration and a Dental Implant

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Seoul National University, Korea

Background:

Fully sintered zirconia ceramics are necessary to realize single-visit restoration. However, machinability has remained unsolved for fully sintered zirconia. Addition of yttria (Y_2O_3) and niobia (Nb_2O_5) into tetragonal zirconia polycrystal (TZP) increases both the machinability and the fracture toughness although this addition decreases the strength and hardness of TZP. Increased fracture toughness helps to lower the fracture rates of zirconia crowns during function and of zirconia implants during installation.

Purpose:

This study aimed to evaluate the clinical survival rates of single zirconia crowns and the in vivo histomorphometry of zirconia implants, which were made of (Y, Nb)-TZP.

Materials and methods:

Fifteen participants received a total of 15 monolithic single restorations made from fully sintered (Y, Nb)-TZP block. The restorations were clinically evaluated for a survival rate after two years of crown delivery. (Y, Nb)-TZP dental implants, which were 3.4 mm in diameter and 7 mm in length, were inserted into the rabbit tibiae, compared to the sandblasted, large-grit, acid-etched (SLA) titanium implants made of grade 4 commercially pure titanium. After four weeks of implant surgery, the experimental animals were sacrificed and undecalcified specimens were prepared for light microscopy. The outcome measure was bone-to-implant contact (BIC). Wilcoxon's signed rank test was used to compare means at the significance level of 0.05.

Results:

The survival rate of the (Y, Nb)-TZP singe crowns was 100% for 2-year clinical service. The median values (interquartile range) of BIC were 44.4% (10.8%) for the (Y, Nb)-TZP implants and 67.7% (6.9%) for the SLA titanium implants. However, no significant difference was found in BIC between the implants (P = 0.25).

Conclusions:

The fully sintered (Y, Nb)-TZP single-unit restoration showed successful clinical performance for two years. Also, dental implants made of (Y, Nb)-TZP were biocompatible in bone response, based on the results of this in vivo experiment. However, topographical modification of this zirconia surface might be required, considering the median BIC values and interquartile ranges of this zirconia and the SLA titanium implants.

Implant Based Prosthetic Management of the Aesthetic Zone - A Case report

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Introduction:

Traumatic dental injuries (TDIs) occur frequently in children and young adults, comprising 5% of all injuries. Twenty-five percent of all school children experience dental trauma and 33% of adults have experienced trauma to the permanent dentition, with most of the injuries occurring before age 191. This case report highlights the impact of traumatic injuries to the anterior region of the mouth and the challenges a restorative dentist is presented with regarding treatment planning, formulating a "plan of treatment "and delivering predictable outcomes in tandem with patient expectations. This case provides an overview of treatment that led to significant improvement in function and aesthetics in the aesthetic zone with series of photographs of all phases of treatment

Background of the problem: This case report discusses the journey of a 26-year patient with hypodontia (Missing UR1) who suffered dental trauma resulting in avulsion of Upper left central and lateral incisor teeth (UL1, UL2). The teeth were reimplanted a few hours later. Within the first week she developed an acute episode of pain from the UL1 and attended with her general dental practitioner who extracted the UL1, and provided a provisional bridge splinted with composite from UR2-UL3 replacing the UR1, UL1, UL2 teeth. The patient had a class 2 div 2 occlusion which further complicated management. No further treatment was provided and the unesthetic provisional bridge remained in situ for several years until her GDP referred her Leeds Dental Institute for treatment. Implant based management to improve aesthetics and function was considered. Due to extensive bone resorption following trauma and loss of teeth, Bone grafting using an iliac crest graft was performed in the anterior maxilla region. Upon healing, 3 dental implants (Xive - Dentsply Sirona) were placed. 2 separate implant supported bridges on Xive MP abutments replacing the UL3, UL2 and UR1, UR2 of a Fixed- cantilever and a fixed-fixed design respectively. A high smile line with soft tissue recession posed a challenge to meet aesthetic demands. 5 years later, she presented with chipped acrylic buccally resulting in show of the underlying metal substructure. This patient was assessed again and, on this occasion, a single fixture level implant bridge replacing the UR3, UL2, UR1, UR2 was fitted with the aim of reducing maintenance burden, improvement in oral hygiene and optimising aesthetic outcomes. The treatment has had a significant impact on the patient's aesthetics and self-confidence.

Conclusion:

1. Careful consideration of patient and treatment factors is mandatory whilst considering complex restorative treatment

2. Every treatment has a survival time, and this must be clearly conveyed to the patient as part of the consent process to enable them in making an informed decision regarding their treatment options

3. Working at abutment level or fixture level have their potential advantages and disadvantages/risks and the decision should be based on the angulation of the implants, patient's ability to maintain a reasonable level of oral hygiene, soft tissue height and biotype and in view of a need for refurbishment in the future2.

References:

. International Association of Dental Traumatology Dental Trauma Guidelines;2012

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