n 1986, the newly founded ICP held its second joint meeting in conjunction with the EPA in Oxford, United Kingdom. More than 30 years later, we reunited in Amsterdam for the ICP’s 18th biennial meeting and the EPA’s 43rd annual conference.

Between September 4th and 7th, some 900 delegates from 50 countries representing all continents of the planet gathered for an intense program. The day before, the ICP Board had spent the day in their deliberations recommending their work. The so-called “quiet” year between conferences had been far from passive, including a meeting with the Italian Prosthodontic Association and the establishment of new grants and prizes together with the production of standard operating procedures for the Board. Co-Presidents Creugers and Zitzmann paid tribute to the Board’s hard work.

A period of wet Dutch weather could not dampen the warm ambience of the gathering as delegates attended the packed scientific program compiled by Dr Baba from Tokyo and Dr Chvartszaid from Toronto, with additional speakers provided by Dr Phoa representing the EPA. The theme of the conference was “Art and Science in Prosthetic Dentistry,” covering a wide spectrum of topics including digital technology, implant applications and research, and maxillofacial prosthodontics. The needs of the aging population were not ignored. The President of the American College of Prosthodontists, Dr Baba, introduced its Digital Education Program.

There were 11 oral sessions, including 7 keynote lectures, 31 invited speakers, and 62 oral presentations. Of the 147 abstracts that were submitted, 62 were presented. Procter & Gamble sponsored 2 additional speakers on denture-related topics, while there were also 8 case presentations by graduate students.

The Beurs van Berlage is a historic building in central Amsterdam. It provided sufficient accommodation for three concurrent scientific sessions, a record-breaking number of poster presentations (252!), and a huge trade show, of which more than 90% was of ICP origin.

The social activities were all fully subscribed. These included walking tours around the historic city, an enormous banquet with the now familiar Roll Call of Nations, and the almost mandatory canal tour that every visitor to Amsterdam must take.

Worldwide interest in the activities of the ICP continues to expand, and a significant participation from colleagues in mainland China is welcomed. We look forward to our next Biennial Meeting to be held in Shanghai in October 2021 that promises to be yet another landmark occasion.

Our thanks are due to our co-presidents, program chairs, and to RES Seminars for an outstanding meeting that has contributed significantly to the progress of the ICP.

Harold W. Preiskel
Past President, ICP

Note: The first half of the abstracts are presented herein; the second half will appear in issue 1 of 2020.

INVITED SPEAKERS

Three-Dimensional Engineering in Dentofacial Rehabilitation
Wael Att, Professor, Chairman
Department of Prosthodontics, Tufts University School of Dental Medicine, Freiburg, Germany
The progressive shift toward implementing digitally driven 3D engineering tools in reconstructive dentistry is obvious. Compared to conventional methods, the ultimate goal of digital technologies is to improve the quality and capabilities in examination, diagnosis, and treatment of the dental patient. It is still questionable, however, whether such digital tools facilitate improved accuracy in data acquisition and assessment, superior efficacy in treatment planning, and a more controlled and faster manufacturing process. This presentation will provide an overview of 3D engineering in comprehensive dentofacial rehabilitation and discuss different possibilities and advantages when using a conventional vs a digital approach.

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Implant Dentistry in Frail Elderly: Blessing or Burden?
Anita Visser, Maxillofacial Prosthodontist
University Medical Center Groningen, Groningen, the Netherlands
Healthy aging is something one would like to wish for every citizen on this planet; however, aging is often a complex process. The older one gets, the higher the chance of developing comorbidities and becoming frail. In the next decade we will have more and more elderly, and most of them will keep their own dentition until death. From the literature, we know that keeping one’s own dentition healthy and functional during aging is a challenge. Many elderly individuals face severe oral health problems, which in turn is a threat for social wellbeing and general health. Maintaining good oral health is therefore a priority for the dental care professional. Treating frail elderly, however, is complex.
How Can We Implement the Result of the Clinical Trial in the Prosthodontics Practice?
Yasuhiro Kawai, Professor, Chair
Department of Removable Prosthodontics, Niho University School of Dentistry, Chiba, Japan
For two decades, my colleagues and I have been running RCTs in prosthodontics. We are not complacent, but are pleased with the work we have done. On the other hand, we have learned many lessons in various aspects, notably that “the proof of the pudding is in the eating.” The implementation of results in clinical settings is essential. Our first RCT compared the simplified and traditional methods in the fabrication of a complete denture. Our results revealed that there were no significant differences between the two arms, with no negative consequences that detract from the cost savings (Kawai et al, 2005, 2010). Also, the 10-year follow-up indicated that the simplified method remained more cost-efficient than the traditional method over 10 years (Kawai et al, 2018). However, in this trial, we failed to show who would be happy with the simplified method, and the lesson was to design the future trial by seeking a practical decision-based baseline examination item. The second RCT included the assessment of mandibular bone height as a baseline item and analyzed the influence of bone height on the selection of the occlusal scheme. The results indicated that the lingualized occlusion is more efficient for patients with severely resorbed mandibular ridges (Kawai et al, 2017). The third RCT focused on the difference between the conventional and resilient denture liner for a mandibular complete denture, focusing on the pain threshold as a diagnostic item to decide which remedies to apply (Ito et al, 2014; Kimoto et al, 2019). Our most recent RCT on denture adhesives is the collaboration of 10 centers. This trial not only looked at the difference in outcomes, but also sought diagnostic items on which to base the recommendation to use or not use the adhesives. This, in this case, was a prior subjective assessment. This presentation would like to mention the pitfalls and important issues before and during the clinical trial to make the results of the RCT more practical in the clinical settings of prosthodontics.

On the Search for Better Oral Health (Care) for Frail Older Persons
Joke Duyck, Professor
Department of Oral Health Sciences, KU Leuven, Flanders, Belgium
Improving oral health and oral health care for frail older persons is highly desirable if we want to assure good oral and general health, function, and quality of life for care-dependent older persons. In order to achieve this, there are different issues that need to be addressed. The relevance of the impact of oral health on a person’s general condition is often underestimated or ignored. This urges the need to include oral health in the overall assessment that defines what kind of health care and other care is required for an individual care-dependent older person. The latter could be facilitated by including oral health in the interRAI suite of instruments, designed to assess an older person’s health and need for care. The interRAI suite of instruments helps those involved in care planning consider major issues triggered by the assessment and, consequently, possible prevention and treatment options. It also helps the assessor to evaluate whether a referral for further evaluation is needed. In her lecture, Joke Duyck will first introduce the research aiming to validate and optimize the oral health part of the interRAI assessment tool. Secondly, she will elaborate on the initiatives that are embedded in the Flemish health care policy aiming to improve oral health and professional help with maintenance to preserve good oral health. Presentations offers a variety of treatment alternatives in place of the conventional ways of treating patients.

Current Approaches for Adhesive Luting of CAD/CAM Restorations
Bart Van Meerbeek, Co-Editor-in-Chief, Journal of Adhesive Dentistry
Department of Oral Health Sciences, KU Leuven
BIOMAT Research Group, Leuven, Belgium
Digital technology is indispensable in modern dental practice. The first digital revolution occurred several years ago with the introduction of CAD/CAM technology for the production of semi-direct (chairside) and indirect (via dental lab) restorations. Currently, most CAD/CAM systems are based on subtractive manufacturing processes, where restorations are milled out of printed Wax or metal blocks. Various types of ceramic, resin-based composite, and polymer-infiltrated ceramic CAD/CAM blocks are today available for semi-direct and indirect partial and full crown restorations. This lecture will address the different clinical approaches for (adhesive) luting of CAD/CAM restorations, thereby focusing on both the cement-tooth and the cement-to-restoration interfaces. Inevitably, one may expect that adhesive manufacturing processes, or so-called “3D printing,” will soon find more applications in restorative dentistry.

Current and Future Trends in Prosthodontics
Carlo Poggio, Adjunct Assistant Professor, Division of Prosthodontics, Eastman Institute for Oral Health, University of Rochester, Rochester, New York, USA; Professor a c, Scuola di Specializzazione in Ortognatodonzia, Università degli Studi di Milano, Milan, Italy; Professor a c, Corso di Laurea In Odontoiatria e Protesi Dentaria, Università degli Studi di Siena, Siena, Italy
The field of prosthetic dentistry is undergoing a deep transformation. Techniques and protocols that have been unchanged for decades are currently undergoing disruptive changes. Current trends and challenges include the following issues:
- Minimally invasive dentistry
- Digital workflows and monolithic materials
- Interdisciplinary integration
- Evidence-based treatments
- Long-term prognosis
To face these ongoing changes, clinicians should focus on strategic objectives of treatment, achieving from every innovative technique the best available advantages for patient-centered outcomes.

Partial Ceramic in Compromised Situations
Marco Gresnigt, Dentist, Lecturer, Researcher
University of Groningen Center for Dentistry and Oral Hygiene, Groningen, the Netherlands
In treating complex cases and special care patients, we sometimes face failures (eg, debonding, fractures, and marginal discoloration) when using partial ceramic restorations. These failures often lead to a more aggressive approach, thereby leading to the use of full crown preparations. However, due to improvements in surface conditioning and adhesive technology, we can overcome these failures. This lecture is a combination of clinical treatments and esthetic outcomes with their own long-term scientific background. We will address some of these discoveries, which will change your way of treating patients.

Dilemma of Developing Dentistry in the Super-Aging Population:
How Can the Burden of Prosthodontic Treatments be Handled?
Sayaka Tada, Assistant Professor
Discipline of Operative Dentistry, Endodontics & Prosthodontics, Faculty of Dentistry, National University of Singapore, Singapore
Advances in modern society have succeeded in extending life spans across the world. More nations have come into the super-aging era. However, the prolonged years of life in a significant proportion of older adults are unfortunately associated with a rapid decline in physical and mental capacity. For many older adults, life ends generally with a dependent stage ranging over a period of 5 to 10 years long. These dependent older people are more likely to have complex, compromised, and chronic systemic conditions. This demographic change is a great threat, since the health care demands and costs of managing chronic disease will increase alarmingly. In dentistry, remarkable progress has been made over the past several decades. Older adults are retaining more natural teeth longer in life, requiring a higher level of maintenance. The evolution of prosthodontics, such as dental implants, offers a variety of treatment alternatives in place of the conventional ways to replace missing teeth. These accomplishments have brought in substantial benefits to the well-being of people with tooth loss. However, at the same time, it creates a number of disadvantages. The oral environment is becoming more complicated, so there is a heavier burden of self-care and professional help with maintenance to preserve good oral health. Prosthetic treatment increases this burden, and there may be unexpected complications as a patient becomes more dependent because of chronic illness.

Analog to Digi-log, Digital in Implant Dentistry
Jongyub Kim, Boston SMART Dental Private Practice, Seoul, South Korea
As all we know, location, depth, and angulation of a dental implant is important. After the placement, most of the time it is impossible to change the location, which affects the final result, long-term success, and maintenance. Recently, many clinicians are using CB-based static surgical guides not only for implant placement but also for simulation before implant placement during the planning phase. Static guides still have some errors and limitations, but are better than freehand placement and can also be used for the flapless approach and immediate loading in limited cases. Intraoral scanning devices have become more accurate and popular, so intraoral scanning, or so-called “digital impressions,” of implants has been widely used. There are many different ways to perform intraoral scanning of implants. We can use scan bodies instead of impression copings or
prefabricated abutments directly in the oral cavity that have already been registered in CAD/CAM software library in simple cases. Impressions using a coded healing abutment have also been introduced. The advantage of this method is that it is possible to make the prosthesis during the period of osseointegration because the timing of the impression scan of the coded healing abutment is more free than other methods. In this presentation, I would like to introduce and share a digital implant workflow from clinical cases of guided implant placement and various intraoral scanning procedures of dental implants.

Has the Evolution of the Implant-Abutment Interface Improved Long-Term Clinical Outcomes?
Terry Walton, Professor Affiliate in Clinical Dentistry University of Sydney, Sydney, Australia

In a two-piece implant design, the abutment or a single-piece restoration attaches to the implant via the implant-abutment interface. This interface is a critical transition zone that has received significant research attention in an effort to improve joint stability, minimize physiologic and pathophysiologic osseous changes, and maintain soft tissue levels and esthetic outcomes. Specifically, changes in implant-abutment interface design involve variations in the level of transition from the implant to the abutment or restoration (bone-level design vs soft tissue-level design); geometry of the implant-abutment connection (internal vs external); a smooth polished collar or textured implant surface up to the implant-abutment interface; modification of implant surfaces adjacent to the interface; platform switch; microgrooves; material composition of abutment and restoration; and method of abutment/prosthesis retention (cement- vs screw-retained).

The presence or absence of bacteria in the implant-abutment transition zone—the so-called microgap—has been a particularly hotly debated aspect, with much effort devoted to supposedly eliminating, or at least minimizing, this source of bacterial contamination. But have these developments significantly improved long-term clinical outcomes, especially from the patients’ perspective? And who is driving them—the patient, the dentist, or big business? This presentation will present data that questions the associated science, especially related to assessment of marginal bone levels, and identify several unintended consequences.

A Bite of Bruxism: Shifting Paradigms
Frank Lobbezoo, TMD/Orofacial Pain, President of the Dutch Dental Society (NTG)

Brief summary: Bruxism is a phenomenon that is well-known to dentists and about which knowledge has accumulated for many decades. Over the past years, however, new insights have emerged that represent a true paradigm shift. Where in the (recent) past, bruxism was considered the patient’s and the dentist’s enemy, being responsible for a host of dental problems such as premature tooth wear and internal pain in the masticatory muscles and TMsJs, nowadays evidence is piling up on the possible positive health outcomes for bruxers, thus making bruxism not only a foe but also a friend!

Emerging Approaches for Regenerative Prosthodontics
Hiroshi Egusa, Professor and Chair
Division of Molecular and Regenerative Prosthodontics, Tohoku University Graduate School of Dentistry, Sendai, Japan

Historically, the field of prosthodontics originated from the idea of managing missing or decayed teeth with replacement prosthodontics using artificial materials, such as removable dentures and fixed prosthetics. In the 1980s, the requirements of alveolar ridge preservation/augmentation associated with aesthetic prosthetic/implant treatments gradually expanded the clinical concept to include tissue engineering and regenerative medicine. Currently, bone augmentation techniques using scaffolds and growth factors are widely used in clinical practice; however, they are not always effective at maintaining the augmented bone height and volume, particularly in challenging bone defects. Solutions to overcome these limitations may include stem cell-based regenerative medicine, which provides a more robust concept of regenerative prosthodontics for our field. We have successfully fabricated osteoconductive bioengineered bone grafts using induced pluripotent stem cells, which possess high bone regeneration capacity even after lyophilization as a freeze-dried bone graft material. We have also found that titanium implants with nanosurfaces mimicking properties of tooth cementum generate periodontal ligament–like structures around the implant. It is thus expected that periodontal ligament–hybrid implants will provide a future alternative to current osseointegrated implants. In this presentation, progress in regenerative dentistry in the field of prosthodontics will be overviewed, with an emphasis on cutting-edge research approaches using stem cells and nanotechnologies.

How the Brain Controls Everything: From Bone Remodeling to Chewing Efficiency to Cognition
Limor Avivi-Arber, Assistant Professor Department of Prosthodontics, University of Toronto, Faculty of Dentistry, Toronto, Canada

The brain controls most, if not all, of our body’s physiologic functions, including our thoughts, feelings, ability to learn and remember information, and complex motor actions, including our heartbeat, breathing, walking, chewing, and swallowing. Recent advances in neuroscience have opened up unique opportunities for research that promise to advance prosthodontics into different and unique directions that have not been thought of until now. This presentation will introduce new hypotheses on the inter-relationships between brain functions and chewing, bone remodeling and healing, and cognitive functions.

Integration of Functional Occlusion Using Virtual Articulation in CAD/CAM Full Mouth Prosthetic Rehabilitation
Bassam Hassan, Prosthodontist, Acibadem International Medical Center, Amsterdam, the Netherlands
Modern CAD/CAM 3D-designed and manufactured monolithic zirconia restorations have conquered the dental market in recent years for full mouth reconstructions owing to their excellent material properties, reduced costs, and the ability to fully integrate in a digital workflow. However, a major drawback of monolithic zirconia is the lack of a realistic teeth mimetic Trying and the difficulty in chairside occlusal adjustments. Therefore, an exact digital record of static and dynamic maxillary-mandibular relationship is mandatory, especially in full mouth advanced prosthetic cases. This lecture will examine state-of-the-art approaches for digitally recording the maxillary-mandibular arch relations and CAD/CAM manufacture of full mouth reconstructions using digital functional occlusion concepts.

Dental Treatment Planning for Older Adults: Issues, Process, and Success
Christopher Wyatt, Professor, Chair
Division of Prosthodontics and Dental Geriatrics, Faculty of Dentistry, University of British Columbia, Vancouver, British Columbia, Canada

The world’s population is aging, and an increasing number of people are presenting to dental clinics with the positive and negative effects of old age. A growing number of older adults are successfully aging at home and living active lifestyles. The prevalence of chronic conditions and disabilities has declined over the past 70 years due to improvements in diet, an increase in physical activity, and reduction in smoking. In addition, medical advances in orthopedics, implants/transplants, and cardiac pacemakers have helped people live longer and healthier. However, many older adults suffer from chronic disease and disabilities, including cardiovascular disease, cancer, arthritis, and senile dementia. In addition, the provision of dental care for older adults is affected by polypharmacy and the xerostomic effects of many medications. Older adults are retaining teeth longer and have experienced sophisticated dental care over their lifetimes. They have invested a considerable amount of time and money in their mouths and expect to retain their teeth, implants, and dental prostheses. However, for many older adults, poor oral hygiene predisposes them to gingivitis, periodontitis, denture stomatitis, and especially dental caries. Poor oral health and tooth loss often result in discomfort, poor esthetics, halitosis, compromised mastication, and the combined decreased quality of life. The consequences of missing teeth are compromised esthetics, phonetics, mastication, and occlusion. The loss of a maxillary incisor is just as much an esthetic concern for an older adult as a younger adult. The options for replacement of teeth are no different than in those who are younger; however, frailty (physical and cognitive) poses a significant limitation on a patient’s ability to undergo a complex dental treatment and comply with maintenance recommendations. The provision of dental care for older adults sometimes involves consent for treatment from others (family and guardians), determining the best environment to provide services, and the support from others for daily oral hygiene and maintenance of the dental prostheses. Increasingly, dental professionals must work with fellow health care providers (physicians, social workers, and community nurses) to better serve their elderly patients.
Interdisciplinary Management of Complex Dental Cases—
The Orthodontic Perspective

Sandy van Teeseling, VU Medical Centre and the Academic Medical Centre, Department of Oral and Maxillo-Facial Surgery, Vrije Universiteit, Amsterdam, the Netherlands

In the treatment of complex dental cases, a paradigm shift from multidisciplinary treatment to interdisciplinary treatment is taking place. This treatment philosophy is already common throughout the profession in the management of surgical-orthodontic patients. Interdisciplinary teamwork with a focus on restorative treatment outcomes defines the steps necessary for successful treatment involving a top-down treatment plan. Orthodontic movement of teeth in the treatment of complex dental cases to provide (more or less) space in the three dimensions will facilitate the creation of effective restorations with or without the use of implants. It is apparent that implants can be used to improve treatment outcomes in teeth movement. Through the use of implants as temporary anchorage devices during orthodontic treatment, more predictable and efficient tooth movements are possible. The session will demonstrate that through careful planning, the best of all treatment options can be used to achieve an optimal starting point for restorative dentistry.

Digital Dentistry: Just Because We Can, Should We?

David Gratton, Associate Professor
Maxillofacial Prosthodontics, University of Iowa, Iowa City, Iowa, USA

Technology is desired in our personal and social lives, but what about our professional lives as prosthodontists? Clinical dentistry (well, at least the dental laboratory industry) is embracing the application of digital technologies to replace the analog techniques with which we are so comfortable. While this is especially true in the realm of impression-making processes, manufacturing processes can be digitized at each phase of treatment, resulting in the virtualization of the patient from diagnosis through treatment delivery. These digital dentistry platforms not only allow patients greater access to a variety of treatment modalities, but also allow clinicians access to treatment modalities they otherwise would not have considered providing directly for their patients. With the adoption of these technologies, the role of the center of the care team may change, the role of some players may be enhanced while others may be minimized, and, ultimately, new members may be recruited. Critically, the clinician is correct to ask: Does the scientific evidence support the routine clinical use of these emerging technologies for the evolving virtual dental patient? And what impact does the adoption of digital dentistry have on patient care? These clinical outcomes should always be a primary consideration. Just because we can, should we? This course will trace the integration of digital dentistry into clinical practice and the resulting disruptions. Course objectives: Upon completion of this course, the participant will: appraise current and emerging technologies for each phase of treatment; the clinician can design the treatment plan, and restorative pretreatments can be integrated in this period. The transfer of CAD/CAM—fabricated polymers is occurring in all aspects of dental care, especially digital intraoral impression systems; describe the disruptive impact that technology is having on the specialist/generalist practice model; and recognize the implications of a digital workflow on the patient's involvement in his/her treatment.

Maxillofacial Reconstruction: Contemporary Approach and Application

Thomas Salinas, Mayo Clinic, Department of Dental Specialties, Rochester, Minnesota, USA

The increasing demand for surgical reconstruction of the jaws has prompted a heightened synergy between prosthodontists and surgical specialists. The approach taken in recent years is of a digital perspective, placing osseous flaps in an optimal spatial orientation, likewise with the use of dental implants. Outcomes of these patients will continue to serve as a reference to determine the efficacy of these modes of therapy. Objectives: At the conclusion of the lecture, the participant will be able to:
1. Identify factors that are integral to reconstruction of the maxilla and mandible based on biomechanical/physiologic needs.
2. Understand the rationale and advantages of using 3D virtual planning for reconstruction of maxillary and mandibular defects.
3. Understand the steps needed for imaging and spatial requirements to create surgical guides and specific products that facilitate maxillofacial reconstruction.
4. Compare the advantages of using 3D reconstructive planning over traditional techniques for optimal outcomes.

Science and Art in the Prosthetic Rehabilitation of Patients Affected by Severe Periodontal Disease: A Critical Analysis

Alberto Fonzaer, University of Triest and Modena, Italian Academy of Prosthetic Dentistry, Campoformido, Italy

Combined prosthetic-periodontal treatment with construction of a fixed partial prosthesis has been used for over 50 years in the treatment of patients affected by severe periodontitis in order to restore dentitions to good health, function, and esthetics. The literature has proven the biologic capability of teeth with reduced but healthy periodontium to successfully support a fixed partial prosthesis over time. The control of infection (elimination of pocket and furcation defects) and secondary occlusal trauma, as well as facilitation of self-performed oral hygiene, are the basic principles of the treatment. Are all prostheses a scientific tool? And are the concepts still valid? How have they been changed by the use of implants in the treatment of patients affected by severe periodontal disease? The aim of this lecture is to highlight the benefits but also the limits of periodontal prosthetics therapy by carefully analyzing the literature (science?) and presenting several clinical cases and the personal data (art?) in an attempt to find the best solution for our patients.

Science and Art in Maxillofacial Prosthetics.

How to Derive Functional Rehabilitation?

Harry Reinstema, Maxillofacial Prosthodontist
Department of Oral and Maxillo-Facial Surgery, University Medical Center Groningen, the Netherlands

Maxillofacial prosthetics encompass dental/prosthetic care for patients with congenital or acquired defects/anomalies in the head and neck region. Reconstructive form and function are the main goals and are in general achieved in multidisciplinary cooperation with several other (medical) disciplines. Especially in restoring defects of the jaws and/or the face in head and neck oncology patients, proper (digital) prosthetic planning is a prerequisite for an optimal result and needs to be attuned to oncology treatment planning. Gross changes in anatomy, functional impairment, and increased vulnerability of the remaining tissues need to be taken into consideration to achieve proper functional rehabilitation. The later use of implants to retain resection and facial prosthesis and refined plastic surgical techniques in using free vascularized grafts have been most helpful in this process. Also, new technologies trying to spare sound tissues from the devastating (side) effects of (chemo-)radiotherapy are being slowly accepted and will change the rehabilitation options. Digital technology has entered workflows and can ease treatment changes. Treatments in change and treatment planning will be elucidated, especially the combination of specific prosthetic skills still needed and the added use of digital technology to help patients overcome the consequences of head and neck oncology treatment. Careful evaluation of these treatments, however, are still needed to establish best practices.

Facial Reconstruction to Facial Transplantation: Success Through a Team Approach

Lawrence Brecht, Institute of Reconstructive Plastic Surgery, New York University Langone Medical Center, Jonathan & Maxine Furencz Advanced Education Program in Prosthodontics, New York, New York, USA

The art and science of reconstruction of the mandible and maxilla has rapidly progressed due to the advent of virtual surgery. The development of computer-aided 3D planning along with computer-fabricated surgical splints and cutting jigs now allow for a prosthetically driven, occlusally based rehabilitation in combination with unprecedented precision in surgical reconstruction of form and function. The culmination of technology employed in an active multidisciplinary team setting has resulted in the ability to deliver an implant-supported prosthetic rehabilitation for the mandibular or maxillary resection patient during a single reconstructive surgical episode. This presentation reviews the evolution of the collaborative effort of our team of an oral and maxillofacial surgeon, a microvascular plastic surgeon, and a maxillofacial prostodontist in optimizing the outcomes in our mandibular resection patients.

CAD/CAM Polymers as Innovative Pretreatment Option for Complex Reconstructive Treatments

Daniel Edelhoff, Director and Chair
Department of Prosthetic Dentistry University Hospital, Ludwig-Maximilians-University, Munich, Germany

Digital technologies offer access to more diagnostic information and enable higher predictability. With the transfer into monolithic polymer materials, innovative options for the clinical evaluation of esthetics, phonetics, and function are available. Tooth-colored CAD/CAM—fabricated full anatomical splints allow exploration of the final treatment goal in reversible test drives. Based on the removability of the splints, surgical, periodontal, and restorative pretreatments can be integrated in this period. The transfer into definitive restorations can be divided into multiple treatment steps, minimizing risk factors of complex rehabilitations. Attendees will learn:
1. To differentiate pretreatment options with CAD/CAM—fabricated polymers.
2. To understand material selection criteria to ensure durable CAD/CAM—fabricated temporaries.
3. To identify the treatment steps for the transfer into definitive restorations.

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The Science and Art of Patient Satisfaction
Leonardo Marchini, Assistant Professor
Department of Preventive and Community Dentistry, University of Iowa College of Dentistry and Dental Clinics, Iowa City, Iowa, USA
Objective: Attendees should be able to (1) recognize the need for complete dentures among a growing elderly population; (2) understand the differences between dentists’ and patients’ perspectives about dentures; (3) recognize key factors for patient satisfaction; and (4) be able to apply current evidence-based knowledge to improve their patients’ satisfaction with complete dentures.

The need for complete dentures among a growing elderly population:
- Edentulism prevalence is on decline.
- High-income households experienced a greater relative decline.
- The prevalence of edentulism is predicted to decrease even more from now to the year 2050.

Denture satisfaction rates:
- Patients usually present high satisfaction levels; however, a small number of patients are not satisfied with their dentures.

Differences among dentists’ and patients’ perspectives about dentures:
- Patients had higher expectations about their denture treatment than dentists.
- Patients expected more benefits from dentures than dentists did, but patients’ perceptions of the posttreatment benefits exceeded dentists’ expectations.
- Dentists should be fully aware of a patient’s expectations before treatment and provide the patient with detailed explanations about the limitations and possibilities of complete denture therapy to improve the dentist-patient relationship.

A good relationship between dentist and patient is more important than prosthodontic factors for a positive outcome.

Recognizing key factors for patient satisfaction:
- The factors presenting reasonable evidence of influencing patient satisfaction are the kind of therapy chosen (implant-retained overdentures rated more favorably than conventional dentures), patient personality and psychologic factors, patient oral conditions, patient perceptions of the dentist and dental care, and patient-dentist communication issues.

How can I apply this to my practice?
- Methods to improve patient-dentist communication
- The interpersonal factor
- Understanding body language

Prosthodontic Therapy for a Super-Aging Population
Sreenivas Koka, Koka Dental Clinic, Loma Linda University, UCLA (Advanced Prosthodontics), San Diego, California, USA
Improvements in health care implicate human longevity as a necessary consequence. The aging patient presents special challenges to oral health care providers, focusing on the special importance of improving the quality of life of the elderly patient and by oral health care providers, focusing on the special importance of improving the quality of life of the elderly patient.

Objectives: Attendees should be able to (1) recognize key factors for patient satisfaction; (2) understand the differences between dentists’ and patients’ perspectives about dentures; (3) recognize key factors for patient satisfaction; and (4) be able to apply current evidence-based knowledge to improve their patients’ satisfaction with complete dentures.

Immediate Provisionalization of an Implant Placed in Fresh Socket
Denture satisfaction rates:
- Patients usually present high satisfaction levels; however, a small number of patients are not satisfied with their dentures.

Immediate Loading of Mandibular Overdentures Retained by Two Mini-Implants: 3-Year Follow-Up Results
Elisabetta Bellia, Laura Carossa Cereser, Manzella Massimo, Giulio Carlo Menicucci
University of Turin, Turin, Italy
Purpose/Aim: To evaluate the efficacy of a clinical protocol of immediate loading mandibular overdentures supported by two mini-implants.

Methods:
- A sample of 11 patients was recruited, and the clinical protocol consisted of immediate loading of two mini-implants (Locator Overdenture Implant (LODI), Zest Dental Solutions; 10 mm long and 2.4 mm or 2.9 mm in diameter) by means of a mandibular overdenture connection with Locator attachments. Each patient completed a satisfaction questionnaire and underwent masticatory cycle recordings and masticatory efficiency tests.
- Implant-related evaluations were carried out by assessing PD, P1, BOP, mobility, and pain. All tests and evaluations were carried out seven times: before implant surgery (T0); before implant insertion under anesthesia (T1) and following implant insertion while still under anesthesia (T2); 3 months (T3); 6 months (T6); 1 year (T12); and 3 years (T36) after implant insertion.

Results:
- The implant survival rate was 95%, and statistically significant increases (P < .05) in masticatory cycle patterns, masticatory efficiency, comfort, stability, and boneone were also recorded. Conclusions:
- Based on these preliminary data, the presented protocol could be considered a viable treatment option for the edentulous patient with resorbed ridges, providing improved prosthesis stability, comfort, and function while decreasing surgical invasiveness and clinical time.

Seventeen-year Follow-up of 26 Implant-Retained Removable Partial Dentures
Alessandro Bianchi, Sergio Bortolini, Raul Frugone-Zamba, Marco Giavatto, Natali Aurelio, Goncalves Alfredo, Marques Thais, Ugo Consolo
University of Modena and Reggio Emilia, Modena, Italy
Purpose/Aim: The purpose of this 17-year retrospective study was to evaluate the long-term outcomes of implant-retained removable partial dentures (IR-RPDs). The strategic placement of one or two implants per arch is a well-established method to avoid clasps, obtaining better esthetics and the preservation of residual teeth, thereby preventing dangerous forces. Nevertheless, the long-term clinical behavior of IR-RPDs could be controversial.

Materials and Methods:
- A total of 32 partially edentulous patients (mean age 58.2 years) received 64 dental implants (SET, Mech&Human), from 1 to 3 two-stage fixtures each, and the relative ball attachments to retain RPDs. Surgeries were performed by three independent operators and required 3 months of healing for mandibular and 6 months for maxillary implants. After prosthetic fabrication and insertion, patients underwent an annual recall program consisting of (1) implant cleaning and check-up; (2) a component of the patient-dentist relationship (regardless of wear); and (3) relining if needed after evaluation of the bases with pressure-indicating paste. Failures and maintenance were recorded during the follow-up (207.3 ± 2.4 months).

Results:
- Of the original 32 patients, 6 dropped out during follow-up, and of the remaining 26 patients and 51 fixtures, 3 patients and 4 fixtures were lost: 2 did not osseointegrate, and 2 failed during the follow-up due to excessive bone resorption. The 17-year implant survival rate was therefore 92.15%. Implant failures did not lead to prosthesis

Implant Prosthodontics
Immediate Provisionalization of an Implant Placed in Fresh Socket for the Replacement of Maxillary Incisors
H. Arikan, M.B. Günsü, G. Aktas, E. Dursun
Hacettepe University, Ankara, Turkey
Background: The aim of this case report was to evaluate the clinical outcome 2 years after treatment with placement of an immediate implant in a fresh socket and immediate provisionalization. Technique/Case Report:
- A 40-year-old female patient was referred for replacement of the maxillary left central incisor. An intact buccal bone plate and apical pathology were observed. CT. Atraumatic tooth extraction (a flapless surgical approach) was performed as described previously to preserve the buccal plate. An implant (4.1-mm width, 12-mm height, Straumann Bone Level, SLActive) was inserted in the cingulum position. The gap between the implant and buccal plate was filled with xenograft (Bio-Oss) to preserve bone integrity and soft tissue. Primary stability was measured, an ISO of 77 and placement torque of 40 Ncm were noted. The clinical conditions were suitable for immediate implant loading. A one-stage impaction was made with polyvinylsiloxane. After model fabrication, a screw-retained prosthesis was fabricated on the implant 4 months after initial surgery. ISQ values, periodontal parameters, and PES and WES scores were observed during follow-up. Results: Radiographic examination showed 0.7 mm of mesial and 0.8 mm of distal bone loss after 2 years. CT examination revealed the buccal plate was preserved. Midfacial recession was not observed. PES and WES scores (8 and 10, respectively) showed an almost perfect outcome.

Discussion: The 2-year clinical follow-up confirmed that an implant placed into a fresh socket followed by immediate provisionalization in the esthetic zone revealed encouraging results. This may be associated with strict case selection. Moreover, this is considered a complex procedure according to the SAC Classification (straightforward [S], advanced [A], complex [C]) and must be applied by well-educated and experienced dentists.

Conclusion: Immediate implant placement and nonfunctional loading might be a viable treatment choice if a flapless procedure and atraumatic extraction are performed in sites with ideal anatomical conditions, such as an intact facial bone wall. Clinical Implications: Immediate provisionalization in fresh sockets is an attractive approach, and esthetic results may be gained if strict selection criteria are applied.

Immediate Loading of Mandibular Overdentures Retained by Two Mini-Implants: 3-Year Follow-Up Results
Elisabetta Bellia, Laura Carossa Cereser, Manzella Massimo, Giulio Carlo Menicucci
University of Turin, Turin, Italy
Purpose/Aim: To evaluate the efficacy of a clinical protocol of immediate loading mandibular overdentures supported by two mini-implants.

Methods:
- A sample of 11 patients was recruited, and the clinical protocol consisted of immediate loading of two mini-implants (Locator Overdenture Implant (LODI), Zest Dental Solutions; 10 mm long and 2.4 mm or 2.9 mm in diameter) by means of a mandibular overdenture connection with Locator attachments. Each patient completed a satisfaction questionnaire and underwent masticatory cycle recordings and masticatory efficiency tests.

Results:
- The implant survival rate was 95%, and statistically significant increases (P < .05) in masticatory cycle patterns, masticatory efficiency, comfort, stability, and boneone were also recorded. Conclusions:
- Based on these preliminary data, the presented protocol could be considered a viable treatment option for the edentulous patient with resorbed ridges, providing improved prosthesis stability, comfort, and function while decreasing surgical invasiveness and clinical time.

Seventeen-year Follow-up of 26 Implant-Retained Removable Partial Dentures
Alessandro Bianchi, Sergio Bortolini, Raul Frugone-Zamba, Marco Giavatto, Natali Aurelio, Goncalves Alfredo, Marques Thais, Ugo Consolo
University of Modena and Reggio Emilia, Modena, Italy
Purpose/Aim: The purpose of this 17-year retrospective study was to evaluate the long-term outcomes of implant-retained removable partial dentures (IR-RPDs). The strategic placement of one or two implants per arch is a well-established method to avoid clasps, obtaining better esthetics and the preservation of residual teeth, thereby preventing dangerous forces. Nevertheless, the long-term clinical behavior of IR-RPDs could be controversial.

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Rehabilitation of Maxillary Defect with Implant-Supported Screw-Retained Hybrid Prosthesis—A Case Report
Gökhan Çiçekçi, Deniz Yilmaz, Lale Karaağaçlıoğlu
Ankara University, Ankara, Turkey

Case Presentation: When treating implant patients, a clinician may encounter more difficult cases than the ones that can be rehabilitated with standard restorations. Implant-supported hybrid prostheses are an option for larger interocclusal dimensions, higher esthetic expectations, patients who cannot use removable dentures, problematic implant positions due to anatomical limitations, occlusal anomalies, etc. When one or more of these factors are present, hybrid prostheses should be considered. In this report, a 22-year-old female patient who lost nearly half of her maxillary teeth and bone volume due to surgical removal of a large cyst came to the clinic for prosthetic rehabilitation. The patient had no systemic disease and was not a smoker. Considering the four-implant framework-supported porcelain hybrid restoration was fabricated to overcome the increased interocclusal height because of the vertical bone defect. Canine-guided occlusion was achieved. The patient was satisfied with the functional and esthetic results of the restoration, and after an 18-month follow-up period, no complications were observed. This case report suggests that implant-supported hybrid prostheses can be a reliable alternative treatment procedure when a porcelain-fused-to-metal fixed restoration does not satisfy a patient's requirements for esthetics, phonetics, oral hygiene, and oral comfort.

Accuracy of an Intraoral Scanner in Tooth Color Determination
Clinical Evaluation
Julius Dirse, Vygandas Rutkunas, Vytautas Bilius, Agne Gedrimiene
Vilnius University, Vilnius, Lithuania

Purpose/Aim: The aim of this clinical study was to evaluate the accuracy of the measurement of tooth shade with an intraoral scanner and the predictions with the absence of screws. There was no need to switch the rehabilitations to completely fixed prostheses by adding screws inside the threaded head of the abutments that occurred during the observation period. Conclusions: Within the limitations of this clinical trial, the use of Seegers alone turned out to be a successful solution in terms of retention, esthetics, and convenience. Since the Seegers take advantage of the divergence between the implants and each guarantees 8 kg of retentive potential, TS could be a viable option for fixed restorations on multiple or tilted fixtures, avoiding vestibular screw access holes without cement. In the future, the authors intend to test TS for a longer time in their patients.

Evaluation of Using a Single Implant as a Support Element for the Mandible
Bartosz Bujak, Dariusz Matenko, Elzbieta Mierzwińska-Nastalska
Medical University of Warsaw, Warsaw, Warsaw, Poland

Results: No detachments or complications occurred during these 12 months, and the TS worked properly even in full-arch restorations, similar to conventional screwed implant FPDs. Radiographic examination showed a tight connection between the abutments and the prostheses in all situations. The absence of screws. There was no need to switch the rehabilitations to completely fixed prostheses by adding screws inside the threaded head of the abutments that occurred during the observation period. Conclusions: Within the limitations of this clinical trial, the use of Seegers alone turned out to be a successful solution in terms of retention, esthetics, and convenience. Since the Seegers take advantage of the divergence between the implants and each guarantees 8 kg of retentive potential, TS could be a viable option for fixed restorations on multiple or tilted fixtures, avoiding vestibular screw access holes without cement. In the future, the authors intend to test TS for a longer time in their patients.

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maintenance of the prosthesis, two screw-retained implant restorations were used for the anterior sites and two cement-retained implant restorations were used at the posterior sites. All screw holes were designed to be accessible in the mouth, and the temporary cement was used for the posterior sites so that the prosthesis could be removed easily when the dislodging force was applied. The patient treated with the All-on-Four method—by placing the implants in the anterior part of the mandible and retaining the conventional complete denture for the maxilla—has been maintained for 3 years without complications and was satisfied with the restoration both functionally and esthetically.

Accuracy of Implant Impression Techniques: Comparison Between Conventional and Digital Methods

Jinseon Kim, Jin Suk Yoo, Hyeonjong Lee, Junsuk Lee, Seoung-Jun Cho, Junghyun Paek, Kwantae Noh, Ahran Pae, Hyeong-Seob Kim, Kung-Rock Kwon

Kyung Hee University, Seoul, South Korea

Purpose/Aim: Accurate impressions of implant locations are required for a passively fitting prosthesis. To date, several implant impression techniques—such as the open tray, closed tray, and digital impression techniques—have been investigated regarding their accuracy. Angulated implants may result in inaccurate impressions, and the impression technique may affect the accuracy of the definitive restoration. The purpose of this study was to evaluate the accuracy of different impression techniques, two conventional and one digital, and their effects on various angulations of implants and angulations of teeth.

A 3D-printed cast with guided access holes for accurate impression installation was fabricated, and internal connection–type implants were placed in tooth positions 34, 36, 45, and 46. There were six experimental groups, divided by impression technique (open tray with pickup impression coping; conventional impression technique; intraoral scanning and pick-up impression copings with scan body) and by type of implant angulation (parallel or angulated) (buccal angulation of 10 degrees on teeth 34 and 45, and lingual angulation of 10 degrees on teeth 36 and 46). The accuracy of the experimental groups was compared with the reference group (scanning with scan body using a desktop scanner). In the pickup impression coping and bite impression coping groups, casts were fabricated after the impression; scan bodies were attached to the casts, and data were collected using a desktop scanner.

Data of the experimental groups and reference group were superimposed, and the distances between each scan body at the same implant position in the experimental group and reference group were measured. Results: In parallel-placed implant groups, there were no statistically significant differences among the three impression technique groups on teeth 36, 45, or 46 (P < .05). In parallel-placed implant groups, the bite impression coping technique group was statistically significantly lower than the intraoral scanning and pickup impression coping technique groups in accuracy on teeth 34, 36, 45, and 46 (P < .05). Conclusions: Within the limitations of this study, the accuracy of implant impressions using intraoral scanning and the bite impression coping technique were comparable, and the bite impression coping technique showed lower accuracy than the above two techniques, especially in the angulated implant position.

Treatment Outcomes of Mandibular IARPDs in Kennedy Class I Patients: A Systematic Review and Meta-Analysis

Jeong-Yol Lee, Jin-Hong Park, Sang-Wan Shin, Sang-Wan Korea University, Seoul, South Korea

Purpose/Aim: The aim of this study was to evaluate treatment outcomes of conversion from a conventional removable partial denture (CRPD) to an implant-assisted removable partial denture (IARPD) in mandibular Kennedy Class I partially edentulous patients through a systematic review and meta-analysis. Materials and Methods: Multiple comprehensive databases were used to find literature. This study was based on Cochran review methods, and the focus question was: Does converting CRPDs to IARPDs influence the clinical outcomes in mandibular Kennedy Class I partially edentulous patients? MEDLINE, EMBASE, the Cochran Central Register of Controlled Trials, Web of Science, and Scopus databases were searched up to April 3, 2019. The included outcome parameters were patient-reported outcome measures (PROMs), objective parameters for the evaluation of functional performance, and complications. A search, to date, has identified 19 relevant studies were identified. In 8 of the 19 studies, PROMs were evaluated compared with the CRPD and after conversion to an IARPD. In 6 of the 19 studies, the functional performance was presented using objective methods. There were 11 studies reporting biologic and mechanical complications, including failure of implants and peri-implant marginal bone loss. According to the results of the meta-analysis, patient satisfaction and oral health–related quality of life were significantly higher, and maximum bite force, active occlusal contact area, and mandibular arch movement were improved, after conversion from a CRPD to an IARPD (P < .05). Conclusions: Within the limitations of this study, treatment outcomes were significantly improved after conversion from a CRPD to an IARPD in mandibular Kennedy Class I partially edentulous patients, covering a wide range of aspects that reflect the effects of the dental implant treatment.

Acknowledgments: This research was supported by a grant from the Korea Health Technology R&D Project through the Korea Health Industry Development Institute (KHIDI), funded by the Ministry of Health & Welfare, Republic of Korea (grant number: HI17C2218).

A Digitally Optimized Occlusion Concept on Implant Prostheses

Hyeonjong Lee, Jung-Bo Huh, So-Hyong Lee, Mi-Jung Yoon, Chang-Mo Jung, So-Yuen Kim, Do-Yeon Park

Pusan National University, Busan, South Korea

Purpose/Aim: There are various factors that influence the stress of an implant. Among them, the stress level on implant components is highly influenced by the direction of occlusal loading. Designing a digitally optimized occlusion of an implant prosthesis can be performed by analyzing the mean of vectors from the occlusal contact points during a CAD process. The purpose of this study was to analyze the stress of an implant based on the various factors to prove the digitally optimized occlusion concept for integration in daily practice. Materials and Methods: Four different connections of implants were modeled in 3D for finite element analysis under vertical and 30-degree oblique loading on a mandibular first molar to prove the relationship between the type of connection and stress level of implants. Results: The stress values of the bone-level implant showed twice that of the cemented implant, and the stress value increased as the loading between vertical and 30-degree oblique showed 3.5-times differences. The direction of loading was one of the most important factors of stress. The mean vector from multiple occlusal contacts was analyzed with the designed STL file for the implant crown through digitally optimized occlusal concept software. Conclusions: The stress value was the least when the mean vector from multiple occlusal contact points headed to the center of the implant connection. It seems that a digitally optimized occlusion concept can significantly decrease and control the stress value of an implant.

Screwed Framework with Abutments for Cemented Prostheses in Complex Implant Cases

Cesar Luchetti, Alicia Kitrilakis

National University of La Plata, La Plata, Buenos Aires, Argentina

Background: A hybrid screwed prosthesis over implants is a valid approach, especially in extremely atrophic maxillary arches. However, the screw access channel affects the occlusion, and the implants are usually exposed on the other hand. Cemented prostheses usually compromise esthetics in cases where a severely affected ridge is present, with long unnatural crowns resulting in patient discontent. Aim: To develop an alternative option for extremely atrophic maxillary arches, combining the benefits of both hybrid screwed and cemented prostheses. Materials and Methods: Ten patients with extremely atrophic maxillae were selected to try this approach. Six to nine implants were placed in each case. Following the osseointegration period, impressions were made and models were placed in an articulator. A metal substructure was made to fit over the implants by means of screws. This structure was like a bar, joining all implants, but also included abutments for cemented crowns in the coronal part. After a clinical try-in of this structure to confirm an adequate fitting, pink porcelain was added in the buccal aspect that reflect the effects of the dental implant treatment. It seems that a digitally optimized occlusion concept can significantly decrease and control the stress value of an implant.
Are Digital Impressions as Accurate as Traditional Dental Impressions? Sunyoung Ma, Stephen Atkin, Joanne Choi University of Otago, Dunedin, Otago, New Zealand

Purpose/Aim: The aim of this in vitro study was to investigate the accuracy of digital impressions using intraoral scanners compared to traditional impression-making protocols. Materials and Methods: A total of 142 impressions were obtained by using hydrocolloid or polyvinylsiloxane impressions, either poured in type III stone or allowed to set at room temperature. Deviations were viewed by means of a color-coded rendering. An independent-samples Kruskal-Wallis test was performed to compare the differences between the groups, with significance set at P < .05. Wilcoxon signed-rank tests were performed to assess the precision of each group. Results: The average trueness of complete maxillary and mandibular impressions (CEREC Omnicam, GC, Tokyo, Japan) was significantly better than the maxillary alginate impressions scanned using the laboratory scanner (-96.8 μm ± 27.9). The average trueness of the two intraoral scanners (CEREC Omnicam [-25.2 μm ± 17.0]; TRIOS 3 [-26.2 μm ± 6.8]) did not differ significantly. While the partial scans had lower mean deviations from the complete arch scans, this was not significant. Intraoral scanners had the highest level of precision compared to the other test groups. Conclusions: Within the limitations of this study, intraoral scanners can be recommended as a good alternative way of taking impressions, considering their performance in trueness and precision.

Fit and Microleakage of Implant-Supported Abutments
Pedro Molinero Mourele, Walter Lam, Edmond Pow, Rocio Ortega, Miguel Gómez-Polo, Jaime Del Rio Highsmith Complutense University of Madrid, Madrid, Spain
Purpose/Aim: The objective of this preliminary study was to compare the degree of microleakage and the fit at the abutment-implant interface of different cobalt-chromium abutments, depending on manufacturing technique, compared to zirconia abutments. Materials and Methods: In this transversal in vitro study, the fit and microleakage of a total of 60 titanium implants screwed to 45 cobalt-chromium abutments (15 cast, 15 sintered, and 15 milled abutments) and 15 zirconia abutments were compared. A standardized methacrylate cylinder block contained the implants and abutments. The blocks were put under occlusal load cycles in an axial direction toward the implants by means of a dynamic fatigue system. The number of occlusal cycles was 300,000 per sample, under a 200-kg load, at a speed of 0.5 mm per minute. The blocks were divided into two groups: for two sessions of 10,000 underwater cycles at 5°C at 1 cycle every 5 seconds and afterwards at 50°C for another 5 seconds. Following these two processes, the marginal fit was assessed under SEM. After SEM, all samples were stored in distilled water for 24 hours, followed by submersion in a 0.2% methylene blue (methylene blue chloride) solution at 37°C for 24 hours, which was used as the staining agent for this study. Results: Descriptive statistics of marginal fit and microleakage values will be presented. Conclusions: Within the limitations of this preliminary in vitro study, it can be concluded that the least fit was associated with sintered and cast cobalt-chromium abutments.

Retrospective Analysis of Implant-Prosthetic Rehaibilitation
Enrico Montaldo, Giovanni Dedonato, Simone Forzan, Massimiliano Carossa, Giannino Scibato, Stefano Carossa University of Turin, Turin, Italy
Purpose/Aim: The aim of this study was to investigate the implant survival and bone resorption of implant-prosthetic rehabilitations during a period between 2 and 27 years of follow-up performed at the C.I.R. Dental School and bone resorption of implant-prosthetic rehabilitations during a period of 1 cycle per 0.5 seconds. The blocks were also placed in a thermal cycler standardized methacrylate cylinder block contained the implants and abutments. The blocks were put under occlusal load cycles in an axial direction toward the implants by means of a dynamic fatigue system. The number of occlusal cycles was 300,000 per sample, under a 200-kg load, at a speed of 0.5 mm per minute. The blocks were divided into two groups: for two sessions of 10,000 underwater cycles at 5°C at 1 cycle every 5 seconds and afterwards at 50°C for another 5 seconds. Following these two processes, the marginal fit was assessed under SEM. After SEM, all samples were stored in distilled water for 24 hours, followed by submersion in a 0.2% methylene blue (methylene blue chloride) solution at 37°C for 24 hours, which was used as the staining agent for this study. Results: Descriptive statistics of marginal fit and microleakage values will be presented. Conclusions: Within the limitations of this preliminary in vitro study, it can be concluded that the least fit was associated with sintered and cast cobalt-chromium abutments.

Epithelial and Connective Tissue Sealing Around Titanium Implants with Various Typical Surface Finishes
Ikue Narimatsu, Yasunori Ayukawa, Ikitsu Atsuta, Wakanas Oshiro, Noriyuki Yasunami, Akihito Furushashi, Kiyoshi Koyano Kyushu University, Fukuoka, Japan

Purpose/Aim: The success of dental implants is dependent on a soft tissue barrier that protects the underlying hard tissue structures. Numerous surface modification techniques have been introduced to enhance bone contact on the implant surface, but there has been little research on the peri-implant soft-tissue (PS) seal. This study aimed to investigate the “bio-logic width” of epithelial and connective tissue seals around implants with various surface finishes. Materials and Methods: Testing surfaces were machined (Ms), roughened by sandblasting and acid etching (Rs), treated anodically with carbon (CaC), and oxidized (Os). (1) Cell culture study: rat oral epithelial cells (OECs) and fibroblasts were cultured on Ms, Rs, Cs, and As titanium plates. (2) For the in vivo study, implants with Ms, Rs, Cs, and As surfaces were placed in the rats’ oral cavities. Results: (1) There was less cell adherence of OECs and more collagen expression when cultured on Ms compared to Cs. (2) There was no proliferation on Rs and As plates that was significant. Although the PS structure including the epithelial attachment and connective tissue binding was similar to that around natural teeth (NT), there was divergence in the ratios of the lengths of each component. In addition, a horseradish peroxidase assay revealed that the sealing ability around the Ms and Rs implants was weaker than around Cs implants, which was almost identical to NT. After 16 weeks, Rs implants exhibited peri-implant epithelial apical downgrowth and had lost bone support, presumably because their resistance to penetration by epithelial attachment was low with this surface type. Conclusions: Although a smooth surface (Ms, Cs) showed better epithelial attachment, rough surfaces (Rs, As) are more suitable for binding to connective tissue. Strong epithelial attachment to the implant surface seems to be a fundamental first line of defense against foreign body penetration. Thus, selecting suitable surfaces to ensure strong sealing is important for implant success.

Managing Angulated Implants in an Atrophic Fully Edentulous Maxilla with Implant-Supported Overdenture
Shiu Fong Ou, Li-Deh Lin, Tong-Mei Wang National Taiwan University, Taipei, Taiwan, China

Case Presentation: Top-down treatment planning is a critical factor for successful implant rehabilitation. Top-down planning was performed in a threestage procedure: diagnostic wax-up, diagnostic impression, and occlusal surgery. The final treatment plan was a maxillary single overdenture and an atrophic fully edentulous ridge will be reported. Some guidelines for predictable outcomes will also be reviewed. Case Description: A 61-year-old woman was referred for full-mouth reconstruction. She presented with three implants in a maxillary fully edentulous ridge, and only three teeth 35, 34, and 33 remained in the mandible. Clinical examination revealed a small maxilla, shallow vestibule, and three angulated implants. Severe attachment loss was found in tooth 43, and tooth 33 was severely lingually tilted. The patient did not want to receive any further implant surgery. The final treatment plan was a maxillary single overdenture and mandibular Kennedy Class I removable partial overdenture. Pickup impression with polyvinyl siloxene was used for the implant analog model, and the double-tray technique was used for the mandibular analog model. Determination of vertical dimension, bite registration, mounting the casts on an articulator, and diagnostic wax-up were performed. Because the angles between the three implant axes were too large to use separate Locators, a maxillary milled titanium bar was designed with CAD/CAM technique based on the wax-up. Three implants were connected by the milled bar, and two Locators were attached to the bar to provide support, stability, and retention. Computerized tomography revealed that accurate 3D positions of angulated implants is very important for passive fit of a milled bar. Using pickup technique, individual tray, polyvinyl siloxene, and overdenture. A further division was made in relation to the period elapsed since implant placement, into less than 10 years or more than 10 years. Results: Mean implant survival for the entire follow-up period was as follows: single crowns 94%, partial dentures 94%, total dentures 95%; mean crestal bone loss was as follows: single crowns 1.43 mm; partial dentures 2.68 mm; total dentures 3.12 mm; and overdentures 1.96 mm. Conclusions: Implant-prosthetic rehabilitations performed at the University of Turin seem to have good medium- and long-term survival rates and radiographic bone resorption according to the data reported in the literature for the different types of rehabilitations.
and a verification jig to confirm the implant position should be performed before designing the bar. For malpositioned or angulated implants, connection with a bar provides support, stability, and retention of the overdenture. In the fully edentulous maxilla, splinted anchorage for implants showed a higher survival rate than non-splinted anchorage. Clinicians should consider whether the patient will pay a much higher laboratory fee for a milled bar. To prevent unexpected expenses and complicated clinical procedures, prosthetic-driven implant therapy should be carefully executed. Conclusion: For unexpected angulated implants in a fully edentulous maxilla, a splinted milled bar and overdenture is a good solution. An accurate implant analog model is critical to success.

Peri-Implant Soft Tissue Healing Using Provisional Restorations After Flapless Postextraction Socket Implant Placement Mehmet Can Yilmaz, Funda Bayindir Ataturk University, Erzurum, Turkey
Background: The use of a provisional restoration after immediate implant placement may promote peri-implant soft tissue healing. Provisional restorations encourage and support soft tissue, preventing collapse. This situation presents an aesthetic advantage for the patients and brings immediate psychologic relief. Case Report: A 19-year-old female patient was admitted to the clinic with Class 3 mobility in both central incisors. In the anamnesis, it was learned that the patient experienced dental trauma at the age of 10 years. In the radiologic and clinical examinations, endodontic treatment and extraction of the mandibular central incisors were found. The mobile maxillary central incisors were extracted. Apical broken pieces of the roots were not extracted to protect the bone tissue. After extraction, implants were placed in the sockets immediately, and then the impression was taken. Provisional restorations were prepared and attached to the implant analogs. Gingival recontouring was followed by direct incisional coronoplasty. After the gingival reshaping, custom impression copings were prepared. Zirconia abutments on a titanium base were used. After the preparation of maxillary lateral incisors, four full-ceramic restorations (three crowns and one lamina restoration) were applied to the patient to ensure adequate esthetics. Discussion: The extraction of apical broken pieces of roots and maxillary central incisors could be done with a flap protocol, but the tissue healing process would surely be badly affected. Bone augmentation could be preferred before the implant placement, but it would have to wait an extra 4 to 6 months for bone healing, and the result would be questionable. Custom impression copings could be prepared with different techniques. In a study by Chu et al, they had stated that a prefabricated polymeric methacrylate (PMMA) shell device was developed to replicate the shape and dimensions of the extracted root at the cervical area and properly support the subgingival mucosal tissues. Conclusion: To obtain esthetic results in the anterior region, methods that will cause minimal damage to the tissues should be selected. Immediate implant and provisional restorations can provide acceptable tissue healing and avoid tissue collapse. Clinical Implications: Some anatomical formations, such as the buccal frenulum, may prevent adequate formation of the dental papilla.

Does Probiotic Lactobacillus Have Therapeutic Effect on Peri-Implant Diseases? A Systematic Review and Meta-Analysis Dandan Pei, Jinxia Gao, Shuchen Yu, Yuchen Zhang Xi’an Jiaotong University, Xi’an, Shaanxi, China
Purpose/Aim: The success of implantation can be affected by biologic complications of peri-implant diseases (ie, peri-implant mucositis and peri-implantitis). Recently, there has been an increasing interest in using probiotics as an adjunctive treatment for peri-implant diseases. However, evidence from available clinical studies (RCTs) has shown controversial results on this topic. The present systematic review with meta-analysis aimed to evaluate the adjunctive efficacy of Lactobacillus in the management of peri-implant diseases. Materials and Methods: Six databases (PubMed/Medline, EMBASE, Cochrane Library, Web of Science, Wiley, and Elsevier) were searched up to May 2019 without time or language restrictions. Study selection and data extraction were conducted independently by two reviewers. The inclusion criteria applied to this review were found on the PICOS format. RCTs comparing nonsurgical treatment combined with probiotic Lactobacillus or a placebo agent in patients with peri-implant diseases were included. The methodologic quality of retrieved studies was assessed according to the Cochrane Collaboration Risk of Bias tool. Odds ratios (ORs) and 95% CIs were used to estimate the odds ratios and construct 95% CIs, while the standard mean difference (MD) and standardized mean difference (SMD) with 95% CI were applied for continuous variables. Results: Seven RCTs with 296 implants were involved in this meta-analysis. Lactobacillus showed a greater effect than placebo in peri-implant mucositis. The MD of pocket probing depth (PPD) immediately after treatment testing was –0.05 (95% CI [–0.15 to –0.009], P = 0.02), –0.05 (95% CI [–0.10 to –0.002], P = 0.009) at 3 months after treatment termination. It showed no significant differences for the secondary outcomes of bleeding on probing (BOP) or plaque index (PI) (P > 0.05). In a narrative synthesis of peri-implantitis, the effect of Lactobacillus on PPD and BOP remains controversial. Conclusions: The systematic review showed that probiotic Lactobacillus did not provide additional benefits to the nonsurgically treated patients in the management of peri-implant mucositis or peri-implantitis when compared with placebo agents except for PPD. Well-designed RCTs are warranted in the future to identify better choice of probiotic strains, local and/or systemic use, and the frequency of intake.

Three-Dimensional Accuracy of Implant Analogos in Three-Dimensional Printed Resin Models Maria Rahmat, M.Y. Tan, K.M. Wong, B. Lee, V.A. Chia, K.B. Tan National University of Singapore, Singapore
Purpose/Aim: To study the effect of system, model orientation on printing platform, analog holder radial offset setting, and time after printing on 3D linear and absolute angular distortions of implant analogs in 3D-printed resin models. Materials and Methods: A sectional master model simulating a two-implant, three-unit fixed prosthesis in a partially edentulous jaw was fabricated. Three digital analog systems—Strüaum (ST), Core 3D Centres (CD), and Medentika (MD)—were tested. The corresponding scan bodies were secured onto the implant fixtures and scanned using an intraoral scanning device (3Shape Trios). Each system had two print orientations (transverse [X] and perpendicular [Y] to the printer door) and two radial offset settings (0.04 mm and 0.06 mm), for a total of 60 models (n = 5 in each group). The physical positions of the implants in the master model and the analogs in the printed resin models were directly measured with a coordinate measuring machine (CMM). The measurements were done at two times: within 5 days (T1) and 1 month (T2). 3D linear and absolute angular distortions (ΔR and ΔAbs) were calculated for each model. Results: Mean ΔAbs for ST (-0.156 ± 0.0606 mm), MD (-0.125 ± 0.0650 mm), and CD (-0.059 ± 0.4796 mm) were significantly different. Mean ΔAbs per T, was not significant between ST (0.571 ± 0.4804 degrees) and CD (0.414 ± 0.2690 degrees), but both were significantly different from MD (2.114 ± 1.1392 degrees). Model orientation and analog holder radial offset setting had no significant effect on ΔR or ΔAbs. Time had no significant effect on ΔR or ΔAbs. Conclusions: 3D linear distortion in printed resin models was found to exceed values reported for conventional type IV dental stone implant models (+18 μm to +84 μm). System choice appears to result in either positive or negative linear distortion of final implant positions. System scan body, analog, and printed model receptacle design may be factors that contribute to overall distortion. Printed models were found to be dimensionally stable for up to 1 month.

Biomechanics of Immediately Loaded Implants Based on All-on-Four Concept: An In Vitro Study Padmini Rani, Aswini Kumar Kar, Purna Chandra Mishra Kalinga Institute of Dental Sciences, Bhubaneswar, Odisha, India
Case Presentation: The present study aimed to identify the stress generated after load application on tilted distal implants in an All-on-Four system in the edentulous mandible, comparing three different degrees of angulation and three different implant thread designs with the same implant material and same cantilever length. Three implants with different thread designs, namely V-thread, buttress, and reverse buttress, with similar dimensions will be considered. The site of distal implants will be the mandibular premolar-molar region and the site of anterior implants will be the buccal canine region, with cortical and trabecular bone assumed to be isotropic and homogenous. All finite element models will have implants placed according to the All-on-Four concept. Only the distal two implants will be angulated; 15 degrees in the first model, 30 degrees in the second model, and 45 degrees in the third model. The angulations will be repeated in all three designs. ANSYS program, version 13 will be used to analyze the biomechanical behavior of implants.

Laser Surface Texturing to Guide Implant Roughness: A Preliminary Survey of Osteoblast Adhesion Alberto Regazzoni, T. Genova, D. D’Angelo, M. Carossa, F. Mussano University of Turin, Turin, Italy
Purpose/Aim: Laser surface texturing (LST) may be conveniently used to generate definite patterns on an implant fixture. The aim of the present study was to compare the ability of surface patterned implants to elicit a bone response compared to control implants. Methods: Three different degrees of angulation were applied in three implants with different thread designs, arranged in three designs. ANSYS program, version 13 will be used to analyze the biomechanical behavior of implants.
manufacturing conditions is reproduced in Fig 1) and then measured with the profilometer (Fig 3) (Table 1). As reported in the graphs (Fig 2), a clear correlation could not be established between the number of adherent cells and the roughness, although an interesting trend may be noted for Sal and Biofilm: Oropharynx. Here, the number of adherent cells on Sal are systematically compared to early osteoblast adhesion in order to assess whether a correlation could be established. Noteworthy was Sal, representing the horizontal distance in the direction in which the auto-correlation function decays to the value assigned (0.2 by default) the fastest. The possible role of Sal is well known in triloby, but it is unprecedented, to the authors’ knowledge, as for the biologic interfaces, and it may deserve further investigation.

The Assessment of Different Gingival Management Materials for Immediate Implant Treatment in the Esthetic Zone
Bahar Sayin, Zekeriyad Tasdemir, SHaydar Albayrak
Erciyes University, Kayseri, Turkey

Purpose/Aim: Implant dentistry has been improving steadily since the 20th century, and studies about the biologic interaction between the surrounding soft and hard tissues have been extensively conducted to the present time. In addition, research on soft tissue management in the esthetic zone after restoration with interim implant-supported fixed prostheses have become quite popular. However, data on the prosthetic material selection is still limited in the literature. This study therefore aimed to observe the effect of different prosthetic materials (polymethyl methacrylate [PMMA] and flowable composite [FC]) that could be used in interim implant-supported fixed crowns on marginal bone loss, cytokine levels (RANKL, OPG), and pink esthetic score (PES). Materials and Methods: A total of 47 patients (33 women and 14 men) were treated with immediate implant therapy after tooth extraction. For standardization, only the premolar tooth of each patient was restored, and both of the adjacent teeth were present in the dental arch. Patients then received an interim implant-supported fixed dental crown chairside. Biotype and gap values were recorded in the surgery session. Interim crowns were prepared with two different materials (26 PMMA, 21 FC) before the surgery on patient’s models. Following the surgical procedure, interim crowns were adjusted on PEEK abutments as nonfunctional in centric and eccentric movements. After the surgery, patients were evaluated monthly for 3 months. At each follow-up session, photographs were taken, and periapical radiography was obtained with the parallel technique. Peri-implant crevicular fluid (PCF) samples were also collected regularly. Five patients (4 from PMMA, 1 from FC group) were excluded from the study as a result of implant loss in the first month. PES was made, and marginal bone loss was separately calculated for mesial and distal aspects. Cytokine levels were analyzed from PCF. Statistical analyses (Shapiro-Wilk, repeated measures two-way ANOVA, Mann-Whitney U, α = 0.05) were performed. Results: PES was increased significantly within groups (P < 0.01). However, there was no statistically significant difference between groups in each month. According to the Mann-Whitney U test, no statistically significant difference was found for marginal bone loss either within groups or between groups (P > 0.05). Gap and biotype were assessed with the clinical procedures. Results: PES was increased significantly within groups (P > 0.05). Conclusions: When a single implant is placed immediately, the interim implant-supported fixed crown could be routinely applied to preserve the soft tissues and enhance the esthetic results. Both PMMA and FC have the potential to be applied as an interim implant-supported fixed crown material.

Follow-up After 6 Months of Definitive Single Implant–Supported Crowns Made Using Hind’s Impression Technique
Bahar Sayin, Haydar Albayrak, Gokcan Sahin
Erciyes University, Kayseri, Turkey

Background: Guided soft tissue healing with a fixed interim restoration is one of the key factors to obtaining an esthetic view. Accurate transfer of the peri-implant soft tissue borders to the definitive cast could be challenging with standard impression copings. A clinician could use the interim restorations to verify an impression that reflects the peri-implant soft tissue by using Hind’s technique. Case Reports: Two patients applied to the Prosthetic Department of Erciyes University for definitive restoration. They were systematically compared to early osteoblast adhesion in order to assess whether a correlation could be established. Noteworthy was Sal, representing the horizontal distance in the direction in which the auto-correlation function decays to the value assigned (0.2 by default) the fastest. The possible role of Sal is well known in triloby, but it is unprecedented, to the authors’ knowledge, as for the biologic interfaces, and it may deserve further investigation.

3D Positional and Mating Accuracy of Intraoral and Laboratory Scan Bodies
Zhi Hui Janice Tan, Toh See, Liang Yoong, Kuan Yee Wong, Ming Yi Tan, Beng Choon Keon Tan
National University of Singapore, Singapore

Purpose/Aim: This study aimed to evaluate the effect of torque application on the 3D-positional accuracy of scan body systems to implant fixtures and/ or replicas. Ten test groups allowed for variation of torque application (5 Ncm, 10 Ncm, 15 Ncm, 20 Ncm, and 25 Ncm) on the tooth models. Each test group comprised of 10 scan bodies, and a total of 100 scan bodies were tested on Straumann Bone Level Regular CrossFit implants or replicas. Scan body systems were divided into those for intraoral use only (Medentika [I-MS]; laboratory use only (Amann Girrbach [L-AG], Nobel [L-NP], Sirona [L-SR]); and dual use (Straumann CARES Mono [L-SML-SM], Straumann scan body [I-SML-SS-L], Core3D [L-COL-LAG]). Eight of ten test groups allowed for variation of torque application (5 Ncm, 10 Ncm, 15 Ncm), while two groups (L-NP and L-SR) were hand positioned only. Straumann Meso abutments (ME), torqued to 35 Ncm and 15 Ncm for implants and replicas, respectively, served as controls. A coordinate measuring machine was used to measure vertical linear distortion (δz), global linear distortion (δr), two-dimensional tolerance displacement (dr), change in scan body height (ΔH), and coaxiality of the scan bodies (n = 10). Results: Mean δz ranged from –9 ± 7 μm for L-SM to 23 ± 14 μm for L-AG. Mean dr ranged from 1.1 ± 6 μm for L-SM to 74 ± 41 μm for L-SS. Mean δH ranged from –5 ± 10 μm for I-SM to 23 ± 14 μm for L-AG. Mean coaxiality ranged from 17 ± 6 μm for I-SS to 163 ± 93 μm for L-SS. Two-way ANOVA found that torque had a significant effect on δz and δH. Conclusions: No significant difference was found between test groups and the controls for dr, δr, and δH. Support: The investigations were conducted in the Prosthodontics Department of Erciyes University, Kayseri, Turkey. The authors declare no conflicts of interest.
Two Different Retention Systems for a Bar-Retained Overdenture Mustafa Burak Tangül, Dilay Ünal, Tugçe Kızılçığ, Bülent Göke Gö Ege University, Izmir, Turkey

Case Presentation: Osseointegrated dental implants have been proven successful in the treatment of edentulism. Several techniques have been described for the successful restoration of the edentulous mandible. A 52-year-old man reported to the Ege University Faculty of Dentistry Department of Prosthodontics for prosthetic evaluation. The patient had received fixed maxillary and complete mandibular dentures. He had difficulty in function and esthetics. After clinical and radiographic examination, it was planned to restore the maxilla with a tooth-supported fixed and the mandible with a four-implant–supported, bar-retained overdenture. Four i-system implants (Novodent SA) were placed according to the submerged implant installation protocol. After the healing period, clinical and laboratory procedures were carried out, and the maxillary and mandibular dentures were delivered to the patient. In this implant system, a clamping force between the abutment and implant results in high frictional forces that resist pull-out forces during function. On the other hand, the retention of the bar over the abutments is maintained with restorative screws. This case report describes the clinical and laboratory steps of a screw-retained bar restoration over screwless retained abutments.

One-Stage Technique vs Two-Stage Technique for Placement of Extra-Short Implants: A Multicenter Study

Matteo Tempesta, Francesco Pera, Giulia Ambrogio, Paolo Pesce, Maria Menini, Francesca Delucchi, Stefano Carossa, Paolo Pera

University of Turin, Italy

Purpose/Aim: The aim of this research was to compare the clinical outcomes of extra-short implants inserted with one-stage and two-stage techniques in an environment that was compatible in adjacent structures. Several techniques have been described for the one-stage technique (by means of 0.10 (SD: 0.27) for T0 and 0.55 (SD: 0.58) for T3 were measured to assess gum healing. Follow-up was conducted with Adobe Photoshop), ISQ values (Osstell) were calculated to evaluate the bone density. Bone healing was evaluated using the Hounsfield scale with the BCI Scan program. In every patient, two adjacent distal implants (n = 24 total; extra-short BTI 5.5-mm or 6.5-mm length) were inserted. One of the implants was submerged (two-stage technique), and the second was immediately connected to the multi-unit abutment (one-stage technique). After 3 months, second-stage surgery was performed, and the implants were loaded with screw-retained splinted rehabilitation. Follow-up radiographs were made to evaluate the bone resorption around the implants (comparison of periapical radiographs was conducted with Adobe Photoshop), ISQ values (Osstell) were calculated to analyze implant stability, and periodontal indices (plaque index, BOP, and probing depth) were measured to assess gum healing. Follow-up and medical records were made at the time of surgery and at 3, 6, and 12 months of follow-up. Results: The linear mixed model of the ISQ results showed a nonsignificant difference between the one-stage group and the two-stage group (P = .367) at T1. The linear mixed model showed a nonsignificant difference between the one-stage group and the two-stage group (P = .559) at T3. The mesial MB of the two groups did not differ consistently in the two techniques. For one-stage surgery, a mean of 0.36 (SD 0.55) at T1 and a mean of 0.62 (0.63) at T2 were registered. For the control group (two-stage), means of 0.10 (SD: 0.27) for T1 and 0.55 (SD: 0.58) for T2 were registered. The distal MB of the two groups did not differ consistently in the two techniques. For one-stage surgery, a mean of ~0.07 (SD: 0.40) for T1 and 0.12 (SD: 0.57) for T2 were registered. The use of mixed generalized models, including the interaction of technique and bone type, showed a nonsignificant relationship for the improvement of MB between the two techniques for both distal and mesial MB. Chi-square test showed a nonsignificant difference for plaque between the two-stage and one-stage groups. The test showed a significant difference for the probing depth (mean) between the two-stage and one-stage groups. Conclusions: According to preliminary results, no statistically significant differences resulted between the one-stage and two-stage techniques.

Long-Term Outcomes for a Patient with Fixed Implant-Supported Prostheses Over a 27-Year Period: Case Report

James Tonogai, David Chvartszard

University of Toronto, Toronto, Ontario, Canada

Introduction: This case report illustrates time-dependent changes and complications over a 27-year period for a male oligodontia patient treated in 1991 with fixed restorations in the anterior maxilla and mandible. The patient’s original treatment consisted of single-unit (12, 22) and multi-unit (x-44-43-x-x-x-x-33) implant-supported screw-retained fixed dental prostheses (FPDs). Following treatment, the patient was noncompliant with the maintenance schedule due to a long period of depression. In 2018, the now 47-year-old patient re-presented with a series of complaints, including prosthetic looseness and compromised esthetics. Case Summary: The 2018 assessment revealed chronic periodontal disease with risk factors of the veneering material, wear, gingival inflammation, and malocclusion. Implant-supported crown 22 was mobile due to loosening of the prosthetic and abutment screws. The implant-supported crowns (12, 22) were fabricated on nonengaging intervening abutments, which had resulted in several episodes of clinicians loosening since their original fabrication. The veneering acrylic of the mandibular implant-supported metal-acrylic FPD had fractured completely, leaving only the metal framework. The exposed metal framework combined with parafungus had caused significant attrition on the opposing maxillary incisor (11). The patient’s home care was suboptimal, resulting in generalized gingival inflammation. Comparison to pretreatment records indicated orthodontic changes, which may be the result of lifelong craniofacial changes. The patient’s management focused on addressing the immediate issue of prosthetic looseness, as well as definitive rehabilitation with prosthetic designs less likely to loosen, delaminate, or fracture over time. Single-unit maxillary implant-supported crowns were planned to be replaced with engaging components, and the multi-unit mandibular FPD was planned to be replaced with a full-contour zirconia prosthesis. Discussion/Conclusions: This case report highlights the important concepts of maintenance, optimal prosthesis design, and lifelong craniofacial changes. The identification of complications, time-dependent changes of the abutment, screw, and prosthesis designs aims at prevention of historical technical complications, such as screw loosening and veneering material fracture. Long-term maintenance and management of complications are a critical part of prostodontic treatment. Regular professional maintenance and check-ups for all prostheses is important for the prevention and timely diagnosis of biologic and prosthetic complications, as well as limiting the impact of such complications.

Maintenance of One-Piece Full-Arch Hybrid Prostheses: Short-Term Clinical Follow-Up

Irem Gokce Uluc, Mustafa Baris Guncu, Guliz Aktas

Hacettepe University, Ankara, Turkey

Background: The term “hybrid prostheses” often refers to a fixed rehabilitation composed of a metal-based substructure covered with acrylic resin using four to six implants. One-piece full-arch hybrid prostheses provide long-term masticatory function for edentulous patients, but this kind of screw-retained prosthesis can only be removed by the dental professional. Therefore, the maintenance of one-piece full-arch hybrid prostheses is an important part of clinical practice. The complications that occur in these prostheses with a high prevalence are the fracture of acrylic teeth, difficulty in cleaning, and wear of the acrylic resin. In this case report was to observe the short-term biologic and mechanical complications of screw-retained acrylic hybrid restorations fabricated on four implants. Technique/Case Report: Four patients (two maxilla, two mandible) with a mean age of 50 years were treated with one-piece full-arch hybrid prostheses. The prostheses were examined at 1, 3, 6, and 12 months. At each appointment, the prostheses were removed, and plaque accumulation, oral hygiene, peri-implant tissue, and soft tissue health were evaluated. Results: At the 2-year follow-up, only one mechanical complication was observed (an acrylic tooth was broken and removed in the mouth). The patients had oral and dental hygiene care and low plaque scores. Discussion: Patients with edentulous arch have various treatment options, and a one-piece full-arch hybrid prosthesis is one of these treatment choices. This type of prosthesis has supported increased quality of life in edentulous patients compared to conventional complete dentures, since it offers functional, esthetic, and psychologic advantages. However, in a survey of the literature, a mechanical and biological failure rate of 42% was reported for 7-year results. Patients should be informed about both oral hygiene and mechanical complications. Conclusion: Within the limitations of this case report, implants and one-piece full-arch hybrid prostheses showed rather high short-term success. Passive adjustment must be made to the metal framework connected to the metal substructure and acrylic prosthesis. The patient-only recommendation is to observe the short-term biologic and mechanical complications of screw-retained acrylic hybrid restorations fabricated on four implants. Maintenance of One-Piece Full-Arch Hybrid Prostheses: Long-Term Outcomes for a Patient with Fixed Implant-Supported Prostheses Over a 27-Year Period: Case Report

Irem Gokce Uluc, Mustafa Baris Guncu, Guliz Aktas

Hacettepe University, Ankara, Turkey

The patient-only management focused on addressing the immediate issue of prosthetic looseness, as well as definitive rehabilitation with prosthetic designs less likely to loosen, delaminate, or fracture over time. Single-unit maxillary implant-supported crowns were planned to be replaced with engaging components, and the multi-unit mandibular FPD was planned to be replaced with a full-contour zirconia prosthesis. Discussion/Conclusions: This case report highlights the important concepts of maintenance, optimal prosthesis design, and lifelong craniofacial changes. The identification of complications, time-dependent changes of the abutment, screw, and prosthesis designs aims at prevention of historical technical complications, such as screw loosening and veneering material fracture. Long-term maintenance and management of complications are a critical part of prostodontic treatment. Regular professional maintenance and check-ups for all prostheses is important for the prevention and timely diagnosis of biologic and prosthetic complications, as well as limiting the impact of such complications.
Immediate Implant Restoration: Short-Term Efficacy Observation

Lili Wang, Yuanyuan Tian

Materials and Methods: Twenty patients with severe dentition loss caused by periodontitis underwent an All-on-Four immediate weight-bearing denture restoration. After 3, 6, and 12 months of permanent repair, the PI, gingival bleeding index, and PD were examined. The vertical bone level was measured indirectly by radiologic examination of the implant. The changes in distance between the neck of the implant and the middle, the far middle, the cheeklip side, the tongue/skull side, and the cervical cortex were recorded. Assessments were performed after 3, 6, and 12 months. Edgebone resorption, evaluation of implant success rate, chewing efficiency, and patient satisfaction were assessed at 12 months. Results: After 1 year of permanent repair, the implant success rate was 98.45%, and the chewing efficiency was 0.673 ± 0.102. There was no significant difference between the early and delayed infection in alveolar bone loss level with no statistically significant difference. There was no significant difference between the early and delayed infection in alveolar bone loss level. There was no significant difference in PD between 3, 6, and 12 months (P > .05). The bleeding index was the highest at 12 months, and the difference was statistically significant (P < .05). There was no significant difference between 6 months and 3 months (P > .05). After 3, 6, and 12 months of permanent repair, 20 patients had marginal bone resorption of less than 0.2 mm at the proximal, distal, buccal/lingual, and lingual/temporal bones at the three time points. There was no significant difference in bone resorption. The patients’ stability and pronunciability satisfaction was 99.35%, esthetic satisfaction was 96.52%, chewing function satisfaction was 93.27%, and comfort satisfaction was 90.00%. Conclusions: All-on-Four immediate weight-bearing dentures have excellent performance in terms of periodontal health, implant success rate, and chewing efficiency. Patient satisfaction was also high, and short-term efficacy was reliable. Long-term efficacy needs further observation.

Fixed and Removable / Occlusion / TMD

Prosthetic Rehabilitation of a Bruxist Patient with Severe Dental Wear
Sebile Altintas, Necati Eres, Deniz Erdil, Cavidan Akören
Ankara University, Ankara, Turkey

Purpose: Dental wear due to bruxism takes place in different positions depending on whether the bruxism is vertical or horizontal. The most common tooth wear is in the horizontal direction. Dental wear caused by horizontal bruxism occurs on the incisal surfaces of anterior teeth and on the occlusal surfaces of posterior teeth. This type of wear is a typical appearance of dental grinding. The loss of vertical dimension is inevitable in cases where attrition is severe. Management of severe dental wear due to bruxism is a challenging situation because of the commonly reduced amount of remaining dental structure and the loss of vertical dimension of occlusion. Severe bruxism and extensive dental wear often necessitate the esthetic and functional rehabilitation of a full dentition. Case Report: A 36-year-old female patient presented to the clinic with the complaint of a nonesthetic appearance as a result of dental wear. During intraoral examination, severe dental wear was observed, while extraoral examination revealed thinner lip appearance in centric occlusion. EMG recordings were obtained from the patient before the treatment. Gingivectomy was performed to increase the clinical crown length. All mandibular and maxillary teeth were prepared, and the patient was treated with a temporary prostheses (DLA) weeks before the insertion of the final prosthesis. Before the treatment, the patient had dental wear due to bruxism. The level of bone loss around the smooth-surface implants was higher than the SLA surface in control and infected groups, compared to teeth. The level of bone loss around the smooth-surface implants was higher than the SLA surface in control and infected groups, with no statistically significant difference. There was no significant difference between the early and delayed infection in alveolar bone loss level. The bleeding index was the highest at 12 months, and the difference was statistically significant (P < .05). The bleeding index was the highest at 12 months, and the effect was statistically significant (P < .05). There was no significant difference between 6 months and 3 months (P > .05). After 3, 6, and 12 months of permanent repair, 20 patients had marginal bone resorption of less than 0.2 mm at the proximal, distal, buccal/lingual, and lingual/temporal bones at the three time points. There was no significant difference in bone resorption. The patients’ stability and pronunciability satisfaction was 99.35%, esthetic satisfaction was 96.52%, chewing function satisfaction was 93.27%, and comfort satisfaction was 90.00%. Conclusions: All-on-Four immediate weight-bearing dentures have excellent performance in terms of periodontal health, implant success rate, and chewing efficiency. Patient satisfaction was also high, and short-term efficacy was reliable. Long-term efficacy needs further observation.
Prosthetic Classification of Missing Teeth Providing Possible Treatment Options
Ildiko Berze, Pal Fejedy, Tibor Fabian, Peter Hermann
Semmelweis University, Budapest, Hungary
Purpose: Prosthetic classifications are supposed to classify missing teeth and provide possible treatment options. In this study, a classification named after Fabian and Fejedy that ensures treatment options based on the number and positions of remaining teeth and the effect of torque induced by the vertical component of masticatory force (VCMF) is presented. In general, this system prefers dental support when giving suggestions for a planned prosthetic device (PPD). Materials and Methods: According to the Fabian and Fejedy classification, an edentulous arch belongs to Class T, while one with all teeth present—even if some teeth are destructed—in Class 0. The classification differentiates three classes (Class 1, 2, and 3) for each jaw, edentulous jaws, with five subclasses: 1A, 1B, 2A, 2B, and 2A/1. Arches in Class 1 have enough teeth for full dental support of a PPD; consequently, the PPD will not move in any direction. In subclass 1A, the VCMF cannot induce torque, and the PPD should be a simple partial denture. In subclass 1B, VCMF can cause torque, which is compensable in a PPD by extending the partial denture to additional abutment teeth. In Class 2, as a consequence of the number and positions of remaining teeth, VCMF can move PPD to one side of the fulcrum line connecting the teeth. Therefore, the PPD support needs to be partially mucosal. In subclass 2A, remaining or missing teeth are in one block: uni- or bilateral missing teeth in the anterior region (the premolar zone) or at least 7 missing front teeth. Subclass 2B is a combination of the above-mentioned and missing tooth/teeth in between. In 2A and 2B, the PPD should be a removable partial denture or complex denture, both with mucosal-dental support. Subclass 2A/1 is for sub-total edentulosity, where torque forces act on one side of the fulcrum line through few remaining teeth. In 2A/1, the VCMF can induce a removable partial denture or telescopic overdenture with mucosal-dental support. In Class 3, due to the positions of the remaining teeth, the torque acts on both sides of the fulcrum line connecting them. As a result, the PPD—a mucosal-dentally supported telescopic overdenture—may tilt. Results: This system has been integrated into the undergraduate program of Semmelweis University, Budapest with great success. Conclusions: This system has served as a useful tool for dental practitioners for years now.

Surface Gas-Phase Fluorination for Bonding Monolithic Zirconia Restorations
Claudio Contreras, Patricia Lisseth, Jeffrey Piascik, Jason Griggs, Susana Salazar Marocho
University of Mississippi Medical Center, Jackson, Mississippi, USA
Purpose/Aim: The objectives of this study were (1) To optimize the SixOy seed layer of a plasma fluorination treatment on an yttria-stabilized zirconia (YSZ) surface to achieve the strongest bond strength to resin-based cements; and (2) to define the effect of plasma fluorination of YSZ monolithic occlusal veneers and regular crowns on bond strength to resin-based cements. Materials and Methods: For objective 1, the YSZ blocks were divided into four groups (n = 10/group) according to the surface treatment: (1) control (no surface treatment); (2) SixOy seed layer of 5 nm; (3) SixOy seed layer of 5 nm; and (4) SixOy seed layer of 10 nm. YSZ blocks were silanated and bonded to resin composite cylinders using dual-curing resin cement. The specimens were stored in deionized water for a period of 24 hours prior to bonding test. The bond strength was calculated by dividing the fracture load by the cross-sectional area of the specimen. For objective 2, 15 YSZ monolithic occlusal veneers and regular crowns did not receive surface treatment (control group), and another 15 were silica coated. The remaining 15 monolithic restorations received the best fluorination treatment found for the cementation surface in objective 1. All restorations were cemented onto composite resin replicates of a prepared mandibular first molar. The bonding area of the composite resin abutment was determined to calculate the nominal tensile strength after the test. So far, only the restorations of the control and silica-coated groups have been subjected to the bond strength test. These restorations were observed under an optical stereomicroscope to evaluate the fracture surfaces and determine the failure mode. Tukey HSD multiple comparisons test was used to determine statistical differences in bond strength among all groups. Results: Partial results were obtained for objective 1. The silica-coated groups showed higher bond strength values (1.3 MPa) compared to the ISO group (0.2 MPa) for both groups, mixed failure was predominant (100%). Conclusions: For objective 1, the partial results confirm the effectiveness of the silica coating over no surface treatment in YSZ structures and will allow negative and positive controls for the gas fluorination group. For objective 2, occlusal veneers had low bond strength compared to regular crowns even when the conventional silica-coating treatment was used.

Diagnosis and Early Management of a High Smile Line in a Partially Edentulous Patient: A Case Report
Ousama Damlaï, David Chvartszaid
University of Toronto, Toronto, Ontario, Canada
Background: An RDP is one of the primary methods for replacement of missing dentition. Its main advantages are reversibility, minimal invasiveness, and cost-effectiveness. Objectives: This case report focuses on the diagnosis and early management of a patient with a large partially edentulous maxillary segment extending into the anterior region utilizing a removable partial dental prosthesis without a buccal flange. Clinical Scenario: A 54-year-old, ASA II female patient presented to the University of Toronto Graduate Prosthodontics Program wanting to replace her current maxillary and mandibular RDPs to improve esthetics and function. The patient requested that the buccal flange of the maxillary RDP be minimized or absent. The patient's key diagnostic parameters were nonphysiologic occlusion characterized by reduced posterior support and unilateral posterior overbite, a high smile line in the maxilla, and limited interocclusal space. Her partial edentulism was restored with subjectively and objectively suboptimal maxillary and mandibular RDPs.
Discussion: Treatment objectives included addressing the patient's esthetic concerns with the absence of a high smile line, and improving facial esthetics and function. The patient requested for a maxillary RDP without a buccal flange, addressing the limited interocclusal space, increasing the reduced posterior support, and providing the patient with a therapeutic occlusion that was functional, comfortable, and sustainable. Treatments rendered included diagnostic records, diagnosis and treatment planning, several diagnostic tooth set-ups to address the patient's demands, and fabrication of maxillary and mandibular transitional acrylic RDPs based on the patient-approved diagnostic tooth set-up. Conclusion: The patient is currently wearing her maxillary and mandibular transitional acrylic RDPs and is satisfied with function and esthetics. The patient's experience with the provisional transitional prostheses will be used as guidance for definitive care. Tentatively, the definitive treatment plan is fabrication of maxillary and mandibular cast RDPs. Clinical Implications: Buccal flange is an important component in the success of RDPs that is influenced by several factors, including the presence of undercuts and esthetics. These factors must be taken into consideration when determining the presence or absence of design of the buccal flange.

The Effect of Denture Cleaners on the Color Parameters of Artificial Denture Teeth
Özge Faydali, Caner Oztürk, Özge Faydali, Mustafa Zorlututan
Hatay Mustafa Kemal University, Hatay, Turkey
Purpose/Aim: Chemical washing agents as denture cleaners have been commonly used for proper denture care. However, the effect of denture cleaners on color parameters of artificial denture teeth is uncertain. The aim of this study was to evaluate the effect of denture cleaners on the color parameters of different types of artificial denture teeth. Materials and Methods: Four different types of artificial central incisor denture teeth (PMMA, isot (ISO), microfiller-reinforced polyacrylic (MRP), and resin teeth based on PMMA (RPB)) were used in this study. Ten specimens with the same color (A2) and thickness (2 mm) were prepared for each group (n = 10). Artificial aging was carried out in a coffee solution for 3 days. Then the samples were cleaned with soapy water and kept in a denture cleaner solution for 24 hours. A spectrophotometer was used to measure the color parameters of specimens under specific conditions (illuminant D65 and neutral gray background), and translucency parameter (TP) was calculated using the TP formula. Color parameters of the specimens (L*, a*, and b*) were measured at each step (initial, aging, and 1-hour, 6-hour, 12-hour, and 24-hour cleaning). The data were analyzed using repeated-measures ANOVA and post hoc comparison test with Bonferroni correction at the significance level of .05. Results: According to the result of the statistical analysis conducted, the type of artificial teeth and chemical washing, and the interaction between these factors, was found to be significant for the color parameters of the groups. However, the translucency parameters of the groups were not affected by these factors (P > .05). No significant differences were found in terms of color parameters or TP values for the ISO group after 1-hour and 1- and 2-hour time points were not statistically significant for any group. After the 24-hour cleaning period, L* values of the PMMA, MRP, and RPB groups significantly increased (P < .05). Conclusions: Within the limitations of this study, it can be concluded that artificial aging and chemical washing had no significant effect on the color parameters of artificial denture teeth. Clinical washing up was sufficient for artificial denture teeth in terms of color stability. Additionally, artificial denture teeth got brighter after a 24-hour cleaning period.
Finding Occlusal Plane Orientation Based on Skull Morphology, Occlusometry, and VD Meter
Raul Frugone Zambra, Oscar Silva Fontana, Felipe Maturana Núñez, Claudio Morata, Alessandro Bianchi, Antonion Jiménez Silva, Sergio Bortolini
University of La Serena, Linares, Chile

Background: Several points and planes have been settled in order to analyze, through angular and linear measurements, the mutual relation and harmony of cranial structures. Among these, the occlusal plane (OP) and the occlusal vertical dimension (OVD). This concepts is essential for oral rehabilitation. Aim: To describe an indirect technique to correctly align the OP in the context of the OVD, resorting to the following principles and devices: (1) occlusometry; (2) VD Meter; and (3) the otic reference plane, which was formally validated by studies on Pre-Columbian skulls. After an initial neurorhematic thorough examination, a technique in centering the OP should be adopted. The theoretical OP orientation must be determined using occlusometry, given that the OP has an average angulation of 9 degrees with the cranial base plane. By means of a VD Meter—a device that analyzes facial morphology using the left ear-eye distance, gender, and facial type data—the patient could be determined. Finally, the sagittal OP findings should be transferred to a frontal view, resorting to the otic plane as frontal reference. An occlusal recording should assist the clinician in the final OP alignment. Discussion: A patient with severe occlusal discrepancies must be rehabilitated under optimal conditions. A patient with this condition was enrolled to apply the OP. First, the sagittal OP orientation was determined using occlusometry. Once the OP was determined using the VD Meter and the orientation of the OP in the frontal view was settled, the final alignment of the OP was able to be defined in parallel with the otic plane. Adopting the described technique, temporary composite restorations were delivered in OVD occluding in a correct OP orientation prior to making major interventions. This technique seems to be easy and accurate for the management of vertical dimension and OP orientation. Conclusion: The presented technique is easy to reproduce and requires simple devices.

Correlation Between the Steepness of the Articular Emenience and Occurrence of Anterior Disc Displacement
Deepti Garg, Barbara Geissmann, Eva Piehslinger
Medical University of Vienna, Vienna, Vienna, Austria

Purpose/Aim: TMD represent a cluster of assorted pain and dysfunction conditions in the masticatory system. These conditions have been recognized since the 1930s and have been given various names. The articular eminence inclination in centric relation and the inclination values were correlated with the convexity of the condylar path during mandibular movements and forms the anterior limit of the glenoid fossa. The articular eminence inclination is defined as the angle formed by the articular eminence and the axis orbital plane. The normal value of this angle in adults has been reported to be 30 to 60 degrees. Articular eminence inclination values of 0 degrees are considered abnormal. The inclination of the articular eminence inclination in adults has been characterized as flat, whereas those having values greater than 60 degrees have been characterized as steep. Some studies have provided data suggesting that a steeper articular eminence is a predisposing factor for TMD, while other investigations have failed to confirm this issue. Furthermore, there are some studies demonstrating that a healthy control group has a steeper slope than patients with TMD. There are various diagnostic imaging techniques for the evaluation of TMJ structures. However, CT and CBCT are the primary techniques of choice for optimal imaging of the osseous components. CBCT has a high dimensional accuracy in measuring maxillofacial structures, including the TMJ. But in all previous studies, the measurements were made on static images, and there has been a huge lack of mandibular dynamics. Objective: In this study, whether a relation exists between the occurrence of anterior disc displacement and the steepness or inclination of the articular eminence during mandibular dynamics was analyzed. Materials and Methods: This was a descriptive observational study with a retrospective and prospective model. Condylography (CADIAK 4, GAMMA Dental) of 38 patients with reducible joint luxation visiting the Department of Prosthetic Dentistry university dental clinic were compared to 20 healthy individuals (students of the university dental clinic) as control group. Measurement of the inclination was evaluated. Results: Analysis of variance and Fleiss test confirmed high statistical significance (P <.05) at all 1 to 8 mm of excursive vs incursive movements compared to healthy patients. Conclusions: This study demonstrated that there is a strong significance in the dynamics of mandibular kinematics. The steepness of the articular eminence is one of the contributing factors. However, the relationship between excursion and inclination values remains of much more importance and closely related to the synchronized smooth mandibular movement. The tracings were coinciding in healthy individuals, as compared to patients with reducible joint luxation, in whom there was separation and a clicking phenomenon between the tracings. Therefore, in diagnostic procedures, the significance of the dynamic condylographic data should be emphasized and combined with the static findings in early diagnosis and treatment planning.

Bruxism Assessment Questionnaire: A New Validated Questionnaire for Bruxism Diagnosis
Marcio Grossi, Lourenço Oliveira Castillo, Georgia Meneghini Pinto, Simone Chaves Fagundes, Marcos Pascoal Pattussi
Pontifical Catholic University of Rio Grande Do Sul, Porto Alegre, Rio Grande Do Sul, Brazil

Purpose/Aim: To develop a diagnostic questionnaire for bruxism, particularly for screening purposes. Materials and Methods: The Bruxism Assessment Questionnaire (BAQ) is a self-reported questionnaire developed from the literature and translated into English. It is composed of 13 items within 5 diagnostic areas, with a maximum possible score of 23 points and a minimum possible score of 0. The questionnaire has been compared with a portable electromyographic diagnostic device (BiteStrip), which has already been validated against polysomnography (gold standard). The questionnaire was applied in 50 university students (18 to 30 years of age, 81.6% women) in the Faculty of Dentistry. This study was approved by the Research Ethics Committee of the Pontifical Catholic University of Rio Grande do Sul, Brazil. Results: The results have shown that the BAQ is strongly correlated with the BiteStrip with acceptable diagnostic results: accuracy (68%); sensitivity (69%); specificity (66.7%); receiver operation characteristic (67.8%); positive predictive value (74.1%); negative predictive value (60.9%); diagnostic odds ratio (4.4); positive likelihood ratio (2.1); and negative likelihood ratio (0.5%). Conclusions: The BAQ can be considered a valid diagnostic method with a probable diagnosis for both sleep and awake bruxism.

Does Selection of Post and Core Material Influence Fracture Strength of Endodontically Treated Teeth?
Sahar Habibzadeh, Shima Yousefzadeh
Tehran University of Medical Sciences, Tehran, Iran

Purpose/Aim: In order to determine the influence of post and core material on fracture resistance of endodontically treated teeth, this in vitro study compared cast nickel-chromium alloy (NiCr), cast nonprecious gold alloy (NPG), one-piece custom-made zirconia posts and cores, and fiber-core post systems in premolars under all-ceramic crowns. Materials and Methods: A total of 48 extracted human mandibular premolars subjected to standard endodontic treatment were divided into four groups (n = 12) and treated with posts and cores of the following materials: cast NiCr and NPG post and core; one-piece custom-milled zirconia post and core; and prefabricated fiberglass post with composite resin core. After restoring each specimen with a zirconia all-ceramic crown, they were loaded to failure via a universal testing machine at a crosshead speed of 0.5 mm/minute at an angle of 45 degrees to the long axis of the roots. Fracture resistance and mode of failure were analyzed. The significance of the results was assessed using ANOVA and Tukey HSD tests (P < .05). Results: Fiberglass posts with composite cores showed the highest fracture resistance values (915.70 ± 323 N), and the zirconia post system the lowest (435.34 ± 220 N). The differences among the groups were only statistically significant for the zirconia group (P < .05). Conclusions: The present study failed to demonstrate any statistically significant differences among the experimental post and core material systems used to restore endodontically treated premolars, except for the one-piece zirconia post and core. Moreover, catastrophic and nonrestorable fractures were more prevalent in teeth restored by zirconia posts.

Functional and Esthetic Rehabilitation of a Young Patient with Amelogenesis Imperfecta
Fidan Hasanzade, Tanis Cakirbay, Kürsat Eser
Gazi University, Ankara, Turkey

Background: Amelogenesis imperfecta (AI) is a hereditary disorder of enamel formation that affects the primary and permanent dentition. AI may present a variety of clinical forms and appearances, but its main characteristics are related to the loss of tooth structure, esthetic concerns, and dental sensitivity. This case report represents the treatment planning and performed rehabilitation procedures of a young patient with AI. Case Report: A 20-year-old female patient was referred to the Gazi University Faculty of Dentistry Department of Prostodontics with the chief complaint of dental sensitivity and esthetic concerns associated with brown discoloration on her teeth. Medical, oral, and radiologic examinations showed occlusal and proximal surface wear and, as a result, dentin exposure, tooth loss, and lack of radiographic opacity caused by deficiency in the mineral content of the enamel layer.
In the direction of both the patient's requests and clinical examinations, full zirconia dioxide ceramic restorations were planned (except for the second molar teeth) for protecting the present vertical occlusal dimension. Then gingivectomy procedures were done to increase the clinical crown length of the undercuts. Gothic arch tracings were made with the circumferential chamfer margins. Instantly, acrylic temporary prostheses were prepared from CAD/CAM acrylic resin blocks by using a 3D printer for the purpose of soft tissue healing. A zirconia partial denture framework was designed for the maxillary posterior region because of the loss of the second premolar. Single zirconia copings were designed for the remaining restorations to obtain optimal esthetics. Following the control of zirconia frameworks, conventional layering was performed. All intraoral adjustments were done, and restorations were cemented with self-adhesive resin cement. The patient was followed up at 1 and 3 months, acknowledged the importance of oral hygiene, and was pleased with the treatment result. Discussion: Oral rehabilitation of a patient with AI is a challenge for the clinician. The treatment options vary considerably, depending mainly on the patient's age, AI type, disorder severity, and intraoral situation. Zirconium oxide-based ceramics are biocompatible restorations with acceptable mechanical and esthetic properties. As in this case, oral rehabilitation using zirconia crowns and partial dentures can be acceptable and satisfying for both the patient and clinician. Conclusion: Young patients with esthetically compromised teeth usually have low self-confidence, which often impacts their psychosocial health. In cases where the esthetics and function of teeth have been compromised as a result of AI, dental treatment planning and the choice of restorative material are essential to achieve a satisfactory esthetic and functional result. Zirconia restorations can be a suitable treatment option for obtaining esthetics and function in such cases. Clinical Implications: Use of zirconia restorations for the oral rehabilitation of AI patients provides function with acceptable esthetics.

Reproducibility of Four Scanned Silicone Impressions via a Laboratory Scanner

Tsurumi University, Yokohama, Kanagawa, Japan

Purpose/Aim: The development of digital techniques has made it possible to fabricate various types of dental prostheses through CAD/CAM systems, such as crowns, partial dentures, and posts and cores. There are three techniques for scanning the post space with CAD/CAM: direct scanning (DS); scanning of an impression (IS); and scanning of a plaster model (PS). It was reported that DS and PS were not suitable for a post space over 10 mm deep due to the depth of focus of the scanner. Therefore, the reproducibility of IS was investigated for fabricating posts and cores with CAD/CAM. In this study, the data of four scanned silicone impressions were compared with the gold standard, to assess the influence of impression materials on the scanning accuracy and precision. Materials and Methods: Step Master Series 516-499 (Mitsutoyo) was recruited as a master model. Step Master is a gauge providing four small increments in height (steps) constructed from an assembly of five highly accurate ceramic blocks. The impressions of the steps were made with four silicone materials are Impression Blue, Fusion II (pink), Fit Checker (white), and Imprint Yellow. The impressions were scanned with a laboratory scanner (D900). Scanned data were saved as STL files. The points of inquiry were as follows: (1) adaptability of 3D reconstruction; (2) reproducibility of surface level; and (3) detectability of micro-step. Tukey HSD test was performed to compare the surface levels among the four impressions and to evaluate the differentials of step levels in the same impression. Statistical analysis was performed with IBM SPSS Statistics v. 22 with a significant level set at P < 0.05. Results: The scanned data of Imprint could not be reconstructed into a 3D model. The reproducibility of surface level and the detectability of micro-step in Fusion II were significantly better than in the other impression materials. The D900 uses blue light to improve the accuracy. It was suggested that the decrease in scan accuracy in the Imprint was due to the material color. Conclusions: Within the limitations of this study, it was suggested that impression material influences scanning accuracy and precision.

Knowledge of Removable Partial Denture Design Among Dentists, Dental Technicians, and Students in Turkey

Berk Kaffaf, Sebnem Inan, Cagatay Dayan, Olcay Sakar
Istanbul University, Istanbul, Turkey

Purpose/Aim: The current study was conducted to investigate the knowledge of dental technicians, general dental practitioners, and dental students regarding RPD design. Materials and Methods: A total of 100 participants, including general dental practitioners, prosthodontics postgraduate students, dental technicians, undergraduate dentistry students, and postgraduate dentistry students, and dental technicians, were included in the study. The participants were asked to examine eight different partially edentulous clinical scenarios on the prepared forms. The participants then designed the RPD framework design on the prepared forms of the partially edentulous arches. The accuracy of the major connectors, indirect retainer, and rest and clasp design were evaluated by two experienced academicians. Planning of clasps and indirect retainers was not considered as part of the assessment. Among the four impressions, there was a statistically significant difference among the participants (P < 0.05) in both the maxillary and mandibular partial edentulous clinical scenarios, except for planning of type of cast on the maxilla (P = 0.153). Concerning the major connector design, there was a statistically significant difference between both the maxilla and mandible (P < 0.05). Concerning the planning of rest number, localization, and design, there was a statistically significant difference among the participants (P < 0.05) in both the maxilla and mandible, except for localization of the occlusal rest on the maxilla (P = 0.211) and design of the occlusal rest on the mandible (P = 0.987). Concerning the indirect retainer design, there was a statistically significant difference among the participants in both the maxilla and mandible (P < 0.05). Concerning the planning of rest number, the indirect retainer and rest, but were inadequate when planning indirect retainers and rests. It is recommended that RPD design should be performed by the dentist and dental technician together, and more importance should be given to RPD design in dental education.

Are Systematic Reviews the Panacea for Evidence-Based Dentistry?

Sadika Khan, Quaantaia Isaac,
University of the Western Cape, Gatesville, Western Cape, South Africa

Purpose/Aim: To conduct an overview of systematic reviews (SRs) related to different aspects in prosthodontics, reviewed and appraised by prosthodontics clinical assistants. Materials and Methods: All SRs relating to prosthodontics concepts, procedures, and interventions for adults reviewed by the prosthodontics clinical assistants as part of their academic coursework were identifed and evaluated. Clinical assistants were requested to send all their SRs to the researcher. Two review authors (S.K. and Q.I.) independently screened the results of the requests for SRs emailed to the primary researcher. They then independently evaluated these SRs using the AMSTAR checklist and/or AMSTAR 2 tool, when applicable. When eligibility for inclusion was unclear, clarification was sought from the prosthodontics clinical assistants. Differences regarding study inclusion eligibility were resolved by consultation between the review authors. The two review authors independently extracted information on prosthodontics topics, methods, participants, interventions, outcomes, and conclusions from each included SR using a specially designed preprinted data extraction form. Results: Clinical assistants forwarded 37 articles, including 3 reviews published in accredited prosthodontics journals, to the primary researcher. Of these, only 17 were actually SRs, as stated in their titles. The other 18 reviews received from the clinical assistants were either nonstructured and biased literature reviews or purely methodological articles. The remaining 18 SRs were from a varied range, including: TMD; implant-retained dentures; tooth wear; and all-ceramic resin-bonded fixed appliances, among others. AMSTAR (used to evaluate SRs when RCTs were included) and AMSTAR 2 (used to evaluate SRs when nonrandomized controlled trials were included) scores were low for most SRs, as a structural and methodological approach was limited. Concerning validity, most SRs were mostly of mixed design and quality, which reduced the value of the evidence. Students’ misconceptions regarding what constitutes good SRs and appraisal skills are highlighted.

Complete Denture Rehabilitation of Edentulous Patients Using Suction Denture: A Clinical Report

Ye-Ji Kim, Young-Gyun Song, Jong-Hyuk Lee, Ji-Hyun Yim, Cheonan, Choongnam, South Korea

Case Presentation: Support, stability, and retention are the three main factors for a successful complete denture. There are several factors that affect retention, and the “suction denture,” a concept introduced by Jiro Abe, emphasizes negative pressure by sealing the entire border around the denture. The closed-mouth impression technique is used to take the impression with the patient’s functional pressure. For successful sealing, the sealing of the retromolar pad and sublingual area is indispensable. Optimum retention was attained when the buccal mucosa and the tongue side wall make a contact (BCT point) at the retromolar pad area when the lower jaw is closed. To perfectly seal the sublingual area, the denture should fully enclose the area, and sponge-like tissue in the sublingual fold should seal the denture border. In this case, two dentures were tried. One denture used suction denture design, and the other denture did not use the suction dentures using the BPS system. Patients were diagnosed at their first visit. Preliminary impressions were taken without applying pressure on the retromolar pad area, and diagnostic casts were fabricated. Afterwards, individual trays were made and final impressions were taken, followed by wax and metal working. Individual trays were arranged in dental models with SR locoap injection system. When final dentures were delivered, the posterior border of the denture was examined with a bronchoscope to check...
the BTC point. Patient A had none of the difficulty factors for the suction denture, and successful retention was attained. Patient B had poor ridges but enough space under the retromylohyoid area. During try-in of the wax denture, retention seemed to be weak, so the bite setting impression was taken without the patient. Retention was better than before, but the sealing was broken in the sublingual area. On the final denture, a modeling compound was added in the sublingual border for full coverage of the sublingual area. Laboratory refining was done, and the patient was successful with the retention. Patient C had fair ridges, but lack of space under the retromylohyoid area. The final impression was carefully taken to make the best use of the space under the retromylohyoid area. The final denture showed satisfying retention. Patient D had poor ridges, stiff tissue in the sublingual fold area, and a retruded tongue position. Even though the BTC point was attained and the sublingual area was fully covered, retention was still weak. This made a good bond to the stiff tissue in the sublingual fold area. Retruded tongue position lets air break into the sublingual area, and the stiff tissue could not compensate for the sealing in the sublingual area. In conclusion, for a successful suction denture, case selection is important. Difficulty factors should be diagnosed carefully. A patient with a prognosis of unsatisfying retention with the suction denture should consider other impression methods, like Piezography or the neutral zone technique.

Impact of Pain-Related Disability on Treatment Outcome in TMD Patients

Ritva Kuoppala, Pinja Ahetonen, Ulla Kotiranta, Kirsi Sipilä
University of Oulu, Oulu, Finland

Purpose/Aim: The most common symptoms of TMD are pain in the TMJ and masticatory muscles, TMI sounds, and restricted mouth opening. Treatment of TMD aims to reduce pain and restore function. Psychosocial factors exist in the background of TMD and may affect treatment response. The aim of this study was to evaluate the effect of pain-related disability on treatment response in TMD patients. Materials and Methods: Patients referred to the Oulu University Hospital Oral and Maxillofacial Department due to TMD pain were included in the study. The study group was composed of 80 patients (mean age 52.8 years, range 22 to 77 years). The clinically diagnosed TMD based on the RDC/TMD, were at least 20 years of age, and had no long-term illnesses that may affect the TMI or muscular functions. The data was divided into two groups: splint group and control group. Information was gathered via a clinical examination and questionnaire. Patients were referred to the splint therapy group, who had a cushion splint, and those not referred to a splint therapy group were treated with a stabilization splint, and patients in the control group were given the same counseling and guidance but not splint therapy. The follow-ups after treatment were performed at 1 month, 3 months, 6 months, and 1 year after the first examination. The Graded Chronic Pain Scale 1.0 (GCP S 1.0) of the RDC/TMD was used to determine the pain-related disability at baseline. Pain intensity was assessed at baseline and at follow-ups using a VAS. Patients’ subjective estimates of the severity of symptoms and effects of the treatment were evaluated with a questionnaire. Results: Patients with a severe degree of disability reported poor treatment response significantly more often compared to others, and they also reported less pain relief, although not significantly. Conclusions: Based on this pilot study, it can be suggested that high pain-related disability impacts treatment response of conservative treatment of TMD. Consequently, it can be suggested that GCP S can be utilized in treatment planning and assessing the prognosis of treatment in TMD patients.

Effects of Type of Implant Prostheses on Oral Health–Related Quality of Life in Edentulous Patients

Yuriko Kusumoto, Daisuke Sanda Higuchi, Minoru Matsumoto, Takashi Yokoyama, Kazuyoshi Sawako Baba
Showa University School of Dentistry, Tokyo, Japan

Purpose/Aim: It has been well documented that implant-supported fixed prosthetic treatments are highly predictable, allowing excellent treatment outcomes. When they are applied to edentulous patients, however, they require invasive surgical procedures, which are associated with high expenditures. The implant-supported removable denture — the implant overdenture (IOD) — is another treatment option for edentulism that allows reasonable treatment outcome with less surgical invasion and expenditure. The aim of this study was to compare treatment outcomes as evaluated with OHIP-QOL between an implant-supported fixed complete denture (IFCD) and an IOD. Materials and Methods: This study was conducted at the Department of Prosthodontics and Implant Center at Showa University Dental Hospital and two private practices. Edentulous patients who received implant prostheses were recruited consecutively between May 2018 and May 2019. In total, 63 patients participated in this study. A total of 31 patients (67.5 ± 7.3 years old, 48.4% women) received IFCDs for the maxilla and mandible, while 32 patients (76.1 ± 6.2 years old, 68.9% women) received an IOD for the mandible and a complete denture for the maxilla or IODs for both arches. OHIP-QOL was evaluated with the Japanese version of the OHIP during the maintenance phase. After adjusting for confounding factors, the intergroup difference in the OHIP-QOL summary score, as well as four dimension scores (oral function, orofacial pain, orofacial appearance, and psychosocial impact), were calculated. These OHIP-QOL scores were compared between the two groups using paired t test (P < .05). The study protocol was approved by the ethics committee of Showa University (#2007-29). Results: After adjusting confounding factors, there were no statistically significant differences in the propensity score between patients (ICFCD: 13.8 ± 7.7 years old, 46.2% women; IOD: 13.7 ± 5.7 years old, 53.8% women) remained, and the data from these patients were compared. The mean OHIP summary scores showed no significant difference between the two groups (IFCD: 9.1 ± 3.1, IOD: 10.2 ± 2.8, P = .28). Conclusions: At the 1-year follow-up, patients with both types of implant prostheses showed improvements in their OHIP scores and no significant difference was detected between the two groups.
score for IFCDs (21.0 ± 22.7) tended to be lower, which indicates better OHRQoL, than that for IODs (29.3 ± 25.3), but this trend was not statistically significant (P = .39). The same trend was also found in the four dimension scores. When each questionnaire item was investigated, “avoid eating,” “diet unsatisfactory,” and “interrupted meals” item scores in the oral function dimension were significantly higher for IOCs than for IFCDs (P < .05).

Conclusions: While general OHRQoL status, as evaluated by the summary and four dimension scores, the IOD group was not significantly different from that of the IFCD group, there was a general trend that IFCD allowed better OHRQoL than IOD, especially in specific items related to eating.

Digital-Conventional Methods for Oral Rehabilitation of Defective and Severely Worn Dentition: A Case Report
Shanshan Liang, Tingting Kang, Kong Junjun, Yuquan Liu, Peng Zhou, Yining Wang, Huanhu Cao
Wuhan University, Wuhan, Hubei, China

Case Presentation: Oral rehabilitation of the worn dentition presents an increasing challenge that is encountered more frequently in daily dental practice. For some elderly patients with severely worn dentition and insufficient posterior occlusal support, it is a quite complicated procedure to rehabilitate oral function and esthetics by using fixed or removable prosthesis. The present clinical case report describes the full-arch rehabilitation of an elderly patient with severe tooth wear, defective dentition, and occlusal trauma by using digital-conventional methods, including different kinds of techniques for increasing the vertical dimension of occlusion (VDO), and restoring the defensive dentition. CAD/CAM lingual and occlusal veneers, 3D-printed framework for try-in and cementation of lingual veneers; and a fixed prosthesis for restoring severely deficient mandibular teeth. With the combination of digital technologies and conventional methods, the results were satisfactory during 24 months of follow-up. In this case report, the analysis and design were applied, T-scan and articulators were used for digital occlusal analysis and assessment, and a personalized anterior guide was used for finding out CR. After increasing VDO based on CR position, some available space for restoration was achieved, and minimally invasive approaches were applied to rebuild the stable occlusion and oral function. According to digital esthetic analysis and available space between the maxillary and mandibular dentitions, nonprepared lingual veneers were considered to be a reasonable option for the maxilla. The application of CAD/CAM technology may be useful for improving the adaptation of veneers without tooth preparation. Moreover, an innovative 3D-printed framework with personalized design should be very helpful for try-in and cementation of lingual veneers and also for improving the accuracy of clinical practice and simplifying the cementation procedures. Finally, a satisfactory result of functional and esthetic rehabilitation for severely worn and defective dentition was achieved under conventional restorative management and combined with digital technologies, such as CAD/CAM, 3D printing, digital occlusal examination and analysis, and digital smile design.

Swing-Lock Removable Partial Denture in Mandible with Few Remaining Teeth: A Case Report
Hui-Yi Tsai, Chieh-Chueh Yang, Tong-Mei Wang, Li-Deh Lin
National Taiwan University, Taipei, Taiwan, China

Background: It is difficult to have ideal retention and stability with denture design when patients have few remaining teeth or unfavorable distribution of abutment teeth. In this situation, a special denture design, the “swing-lock,” might provide better retention and stability. In this case report, a swing-lock RPD was performed in a patient with few remaining mandibular teeth, improving chewing function and obtaining retention and stability of the prosthesis. Case Report: A 65-year-old woman with a remaining left mandibular canine to right mandibular lateral incisor—which were severely lingual tilting and distributed straightly—and severe ridge resorption requested a removable prosthesis to improve chewing function. Based on clinical examination, a swing-lock RPD was indicated for prosthetic rehabilitation. Prosthetic treatment began with border molding and selective pressure impression technique. After survey of the cast, the hinge of the swing-lock was placed at the right side (behind the right mandibular lateral incisor), and the lock was designed at the left side (behind the left mandibular canine). Then, framework of the swing-lock was performed and fit confirmed in the mandibular edentulous ridge. After a trial with a wax denture, the definitive denture was fabricated with packing, laboratory remounting, and polishing. Finally, the swing-lock RPD was placed in the mandible after adjustment. The stability and retention were good. The occlusal scheme was designed as bilateral group function. In the follow-up period, the patient came to the clinic every 6 months, and oral hygiene instruction and prosthesis care were reinforced. Discussion: In a patient with few remaining natural teeth and unfavorable abutment teeth distribution, the design of the swing-lock RPD might provide better stability and retention with the labial bar and lingual plate. When the patient has the esthetic need, pink resin can be added to cover the metal parts. Conclusion: According to the appropriate impression technique and denture design of the RPD, good retention and stability were achieved with the swing-lock design.

Is There a Place for Removable Partial Dentures in the Postimplant Era?
Matshedioi Mothopi-Peri
University of the Witwatersrand, Johannesburg, Gauteng, South Africa

Purpose/Aim: An increase in life expectancy in populations around the world is expected to result in an increase in partially dentate individuals as people retain their teeth for a longer period of time. These individuals will continue to require management/rehabilitation from the dental profession. Materials and Methods: RPDs are one of the earliest treatment options for partially dentate rehabilitation and are still used to this day. The first published description of an RPD was by Wood in 1870. Unfortunately, over the years, RPDs have also been known for perhaps creating more problems or challenges than solutions. These include lack of retention, comfort, function, and esthetics, among others. The introduction of implant dentistry has changed the way both completely edentulous and partially dentate patients have been rehabilitated. Prostheses that offer improved retention, function, comfort, and esthetics became possible with implant-supported prostheses. Conclusions: However, implant dentistry has reached only around 1% of the population worldwide, and the vast majority of partially dentate individuals have no option but to resort to an RPD. The role of RPDs in modern dentistry and what methods can be used to improve their function, even with the limited options, such as acrylic resin–based dentures.

Oral Health–Related Quality of Life of Nonmetal Clasp Dentures and Shorter Dental Arch with Unilateral Mandibular Distal-Extension Edentulism
Nobuyuki Nakai, Takafumi Kurogi, Hiroshi Murata
Nagasaki University, Kyoto, Japan

Purpose/Aim: The aim of this clinical trial was to investigate OHRQoL in patients with nonmetal clasp dentures (NMCDs), conventional distal-extension RPDs (CRPDs), and shortened dental arch (SDA), applied in a private practice. The null hypothesis was that these treatment options for unilateral mandibular distal-extension edentulism would not lead to different OHRQoL outcomes. Materials and Methods: The trial included 24 participants with a mean age of 59.0 years (men 62.6, women 57.5; 24 to 85 years old). This study employed a crossover design, within-subject controlled clinical trial for the three treatment options. All experimental procedures were approved by the Ethics Committee of Nagasaki University Hospital (ref: 15022331), and the trial was registered in the ISRCTN registry (Trial ID: ISRCTN49105064). All patients were fully dentate in the maxilla, with 2-3 teeth-unilateral mandibular distal-extension edentulism in the mandible. The differences in OHRQoL scores among the three treatment options were estimated using a mixed-effects model. A Japanese version of the OHIP (OHI-JAP) was used. Results: There was a mean total OHRQoL score of 48.83 (± 35.76) for SDA, 60.63 (± 28.91) for CRPDs, and 32.62 (± 21.23) for NMCDs. CRPD scores were higher than for SDA and NMCDs, and these differences were statistically significant. The null hypothesis was rejected. Similarly, CRPD scores were higher than for SDA and NMCDs in the oral function dimension, and these differences were also statistically significant. In the oral occlusion appearance dimension, CRPD and SDA scores were higher than for NMCDs, but no statistical significance was observed between the CRPD and SDA treatment options. In the orofacial pain dimension, CRPDs and NMCDs showed higher scores than SDA; however, these differences were not statistically significant. There was no statistically significant difference in the psychologic impact dimension. The mixed-effects model investigated the effect of other factors. The gender and gender treatment option interaction was statistically significant, and gender was considered to have some effects on the total OHRQoL score. Regarding the SDA treatment option, there was a significant difference between men and women. The total OHRQoL score of SDA in men was significantly lower than in women. Conclusions: In conclusion, NMCDs and SDA with unilateral mandibular distal-extension edentulism were superior to CRPDs concerning OHRQoL, particularly in the oral function dimension. However, gender had a significant effect on the score.

Change in the Concentration of Volatile Sulfur Compounds in Patients Using Removable Dentures
Magdalena Nowak, Zbyszewskyj Gaduj, Wieslaw Hedzelek, Mariusz Przylnski
Poznan University of Medical Sciences, Poznan, Poland

Purpose/Aim: The aim of this study was to examine whether the dependence between the concentration of volatile sulfur compounds (VSCs) in exhaled air. Materials and Methods: This study included a group

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of 100 patients aged 33 to 84 years using complete (maxillary and mandibular) dentures for 3 years, 5 years, or over 5 years. The patients came to the Clinic of Prosthodontics of the Medical University of Poznan in order to perform new prosthetic restorations. A portable monitor for testing VSCs, the Halimeter, was used to determine their levels in parts per billion (ppb). The measurement of the breath composition in the oral cavity was performed twice: once with old dentures and after insertion of the new dentures. The study was supplemented by an assessment of the health of the prosthetic field according to Newton classification and an assessment of the amount of plaque based on the modified PI for total dentures according to Ambjörnsen and Imageal program. A questionnaire was also used that included questions about general health, co-occurring systemic diseases, eating habits, and the hygiene of the used dentures. Results: In the studied group of patients, it was found that prosthetic restorations used for more than 5 years caused a noticeable change in the level of exhaled VSCs compared to the results obtained after the insertion of the new dentures and for patients properly caring for both oral hygiene and prosthetic restorations. Conclusions: Long-term use of removable prosthetic restorations is associated with an increase in the concentration of VSCs. Patient’s education regarding the proper hygiene of dentures and oral mucosa, and especially the tongue, is of great importance in the prevention of halitosis.

A Preliminary Study on the Accuracy and Cost of a Digital Workflow for Metal-Based Frameworks

Yasmin Osman Latib, Christopher Peter Owen, Gladys Thokoame Meriting

University of the Witwatersrand, Johannesburg, Gauteng, South Africa

Purpose/Aim: The most cost-effective treatment for the replacement of missing teeth is by RPDs, which can either be based entirely in acrylic resin or a combination of acrylic resin and metal frameworks. Metal frameworks are conventionally made with the lost-wax casting method. This is a lengthy and labor-intensive process that comprises many steps. A digitally constructed prosthesis can allow for the elimination of waxing on a comparatively rough refractory cast, which may render the potential for errors and result in better quality control in the dental laboratory and lead to improved framework fit. The purpose of this study was to compare the accuracy and comparative costs of a digital workflow that produced a milled hard resin framework pattern to be cast conventionally with an identical framework manufactured conventionally from a wax pattern.

Materials and Methods: A maxillary master cast was prepared with appropriate tooth preparations for an agreed design. From the master cast, six casts were made and their accuracy determined using a Reflex Microscope (Consultantnet). Three casts were scanned using an inEos extraoral scanner (Dentsply Sirona). The other three casts were used for the conventional casting technique, by sending normal instructions for the design to a commercial laboratory. The three scanned models were imported into materialise software (Materialise, Leuven, Belgium), and a pattern designed on each in accordance with the design. The digital pattern was milled in a resin block (VIP BLOCK). Each framework was measured using the reflex microscope at predetermined points on the framework. Thereafter, the milled framework was sent to the same laboratory, together with the pattern, with instructions to cast and finish the framework. Results: The outcomes of the study will be presented in a graphic and diagrammatic format, comparing the accuracy of the digital vs conventional casting methods. Conclusions: A milled PMMA framework has the potential to reduce the cost compared to rapid prototyping and/or milling directly or after laboratory transportation.

Cross-Contamination During Denture Fabrication

Peter C. Owen, Kristy Moodley, Mrudula Patel

University of the Witwatersrand, Johannesburg, Gauteng, South Africa

Purpose/Aim: Contamination during denture fabrication can occur at any point between the laboratory and the clinic. Contaminated denture surfaces are reservoirs and vehicles for both opportunistic and pathogenic microorganisms between patients and dental personnel. This study assessed the cross-contamination between the clinic and the laboratory, as well as the efficacy of a currently used disinfectant. Materials and Methods: Samples of denture debris, impressions, trial bases, primary and master casts, and articulators were collected with sterile cotton tipped swabs after completion of each procedure prior to disinfection (if carried out) and then after disinfection. At least 10 samples were collected for each stage of denture manufacture. Common aerobic bacteria were isolated on several agar media. A disc diffusion test was used to determine the antimicrobial activity of Germicide 3 and chlorhexidine disinfectants. Microbiologic results were descriptively analyzed using both quantitative and qualitative analyses. The presence and absence of contamination was determined with a chi-square test. Results: Mixed flora were present in 87% of the samples from the clinic. Streptococci had the highest prevalence (71.5%), with a cell count of > 100 cfu/mL (32.6%). The least prevalent microorganism was lactobacilli (11.7%). Disinfection in the clinic resulted in a reduction in numbers, but microorganisms present after disinfection varied from 25% to 75% of the clinic and 25% to 50% of the laboratory. Group A samples were disinfected in 70% of tested samples, whereas try-in dentures were only disinfected in 30% of samples. The mean zone of inhibition of Germicde was greater with S aureus and S mutans. The zone of inhibition with candida was comparable for both disinfectants. However, the zone of inhibition with lactobacilli was greater with the 0.2% chlorhexidine gluconate than the Germicde. Conclusions: Streptococci, lactobacilli, candida, aerobic gram-negative bacteria, and S aureus were present at every stage of denture fabrication. The disinfectant used reduced the level of microorganisms but did not eliminate them. Thus, clinicians must be cognizant of disinfection protocols and ensure complete item disinfection before and after laboratory transportation.

Comparative Analysis of Internal and Marginal Fit of Lithium Disilicate CAD/CAM Crowns with Different Finish Lines

Maria Rizonaki, Matthieu Boone, Wolfgang Jacquet, Peter De Coster

University of Ghent, Ghent, Flanders, Belgium

Purpose/Aim: To evaluate, in vitro, the internal and marginal fit of lithium disilicate CAD/CAM crowns with different finish lines using x-ray microCT. Materials and Methods: Frasaco maxillary central incisors were prepared for complete crowns with three different finish lines (three test groups: chamfer, feather-edge, and rounded shoulder). Digital impressions were made with the 3Shape TRIOS intraoral scanner. Each incisor was duplicated to fabricate CAD/CAM lithium disilicate crowns (IPS e.max CAD, Ivoclar Vivadent) (n = 3 x 10). The crowns were cemented with Nexus III (Kerr) luting cement and inserted into the maxillary incisors in every sagittal and coronal section. A total of nine measurement points were determined and digitally standardized: seven points for defining the internal fit (IG) and two points both for defining the marginal fit (MG) and the absolute marginal discrepancy (AMD). Mean values of the measurements from the three groups were compared with ANOVA at the 5% significance level, and between-group differences were assessed with the Tukey post hoc test. Results: Statistically significant differences were observed among the three test groups. With respect to IG, feather-edge finish line showed the smallest mean values, followed by chamfer and rounded shoulder. As for MG, shoulder finish line showed the smallest mean values, followed by chamfer and feather-edge. Conclusions: Within the limitations of this study, it can be concluded that: (1) internal/marginal fit and absolute marginal discrepancy of milled e.max crowns differ significantly according to the finish line configuration; and (2) post treatment with CAD/CAM e.max CAD crowns can provide a well best internal fit, while lithium disilicate CAD/CAM crowns with rounded shoulder finish line have the best marginal fit.

Effects of Two Post Systems on Failure Patterns on Endodontically Treated Mandibular Premolars

Roberto Santana, Gabriel Urbina, Bárbara Mansilla, Evelyn Martinez

Universidad Mayor, Santiago, Region Metropolitana, Chile

Purpose/Aim: This study aimed to compare fracture patterns according to site and direction in endodontically treated mandibular premolars restored with fiber-reinforced resin (FRC) and prefabricated metal (PM) posts. Materials and Methods: A total of 60 extracted human mandibular premolars were endodontically treated and divided into 2 groups of 30. The following in vitro treatments were evaluated: group A = 2-mm continuous ferrule/fiber-reinforced composite post and resin core/metal crown (TENAX fiber post, Coltene Whaledent); and group B = 2-mm continuous ferrule/pre-fabricated metal post and resin core/metal crown (Mooser post, Dentsply Maillefer). Specimens were loaded (N) at 45 degrees to the longitudinal axis until ultimate failure occurred. All samples were assessed for failure mode by eye inspection and were defined according to fracture site (apical, middle, or cervical third) and fracture direction (horizontal, oblique, or vertical). Failure patterns between groups were analyzed with Fisher exact test. Results: The majority of the failures were at the cervical third and oblique direction (group A = 69.2%, group B = 74.1% fracture at cervical third; group A = 88.46% and group B = 96.3%, oblique fracture direction). There was no significant difference among the fracture sites between the groups (P > 0.05), and there was no significant difference according to fracture direction between the groups (P > 0.05). Conclusions: Within the limitations of this in vitro study, the variable post system had no influence on the failure patterns in terms of site or direction of endodontically treated mandibular premolars.
New Concept of Rotation Axis for Analyzing Mandibular Movements
Shuji Shigemoto, T. Ito, M. Ito, T. Kihara, T. Ikawa, J. Park, E. Ando, Y. Shigeta, T. Ogawa
Tsurumi University, Yokohama, Japan

Purpose: To analyze mandibular movements, several rotation axes have been used; for instance, the instantaneous center of rotation (ICR), hinge axis (HA), and kinematic axis (KA). KA separates the translational and rotational components of sagittal jaw movement and enables the simple expression of jaw movement. The translation of the mandible is said to minimize in the area of the mandibular foramen due to a biologic necessity. Therefore, a new-concept rotation axis of the mandible named the least motion axis (LMA) is proposed. LMA has the minimum range of motion of the mandible within the sagittal movement. The purpose of this study was to investigate the spatial and kinematic characteristics of KA and LMA in healthy adult volunteers. Materials and Methods: Forty-five volunteers (24 women, 21 men, 26.7 ± 6.6 years) with asymptomatic TMJs participated in this study after giving informed consent. A custom-made electro-magnetic jaw-tracking device was employed to record the sagittal border jaw movements. The KA points (KAPs) and LMA points (LMAPs) were individually computed in 13 sagittal planar images using an estimation algorithm by the authors. KA and LMA were then determined as straight lines so that the sum of the square distance for each set of 13 points would be minimum when using 3D linear regression. To investigate the spatial characteristics of KA and LMA, the square mean perpendicular distance of entities on the axis points and the line, the radial thickness of KA, and the range of motion of LMA, as well as the distances and angle between KA and LMA, were calculated. A statistical analysis was performed with Wilcoxon signed-ranks test with a significance level set at < .05. Results: KAPs and LMAPs were located mostly on KA and LMA, respectively. There were very little kinematic differences between the right and left KAPs, and LMAPs. LMA was approximately parallel and was located significantly antero-inferior to KA. Conclusions: Although LMA was found apart from KA, LMA has almost the same spatial and kinematic characteristics as KA except for location. In conclusion, the present study has demonstrated that LMA can be applied to analysis of mandibular movements.

Evaluation of Treatment Effects of Oral Appliance at Different Mandibular Positions for Patients with Obstructive Sleep Apnea
Takafumi Watanabe, Eri Makihara, Shin-Ichi Masumi
National Dental Centre Singapore, Singapore

Sectional Maxillary Complete Denture in a Patient with Microstomia
Purpose:Aim: To fabricate a sectional maxillary complete denture. The patient was a 55-year-old Chinese man with limited mouth opening from previous burns. He sought treatment for a new set of complete dentures. For his new maxillary dentures, a sectional maxillary complete denture was fabricated using the sectioned special trays to fabricate individualized impressions of the edentulous arches. The maxillary impression tray consisted of two attachable pieces that could be inserted and reattached intraorally in the correct position. Border molding was done with green stick compound. Master impression was made using addition polyvinyl silicone and poured using type IV dental stone. Two sectional cobalt-chromium frameworks with interlocking segments were cast separately and connected together by three studs with parallel walls on the left overaping on the three protruded structures on the right metal base. Wax rims were added on the metal framework to record the maxillary-mandibular relationship. Before the issue stage, a metal tube was also embedded in cold-cured acrylic resin at the anterior buccal flange region to allow the patient to lock in the two segments using an L-shaped stainless steel wire for additional retention. Discussion: Patients with microstomia tend to have difficulty inserting and removing their removable prostheses due to constricted mouth opening. Advantages of this technique as compared to other designs include (1) cost-effectiveness since no additional material such as hinges or attachments are required; and (2) greater intraoral positioning precision and stability. The disadvantages of this technique include increased laboratory work and time for the technician. Conclusion: Overall, the patient was satisfied with the treatment course, and function and comfort of the sectional maxillary complete dentures. The patient was able to insert and remove the dentures without difficulty. The need for regular follow-up and good denture hygiene was emphasized to the patient. Clinical Implications: Sectional complete dentures can be cost-effective but provide good support, stability, and retention in patients with microstomia.

Comparison of Crown Fitness and User-Friendliness Between Tooth Preparation with Electric and Air-Turbine Handpieces
Lu Yi, Dandan Pei, Yuchen Meng, Yufei You
Xi’an Jiaotong University, Xi’an, Shaanxi, China

Purpose:Aim: Tooth preparation of precise accuracy is demanded in contemporary all-ceramic crown restorations. As one of the indispensable instruments, a dental handpiece can influence the accuracy of tooth preparation. Compared with the traditional air-turbine handpiece, the electric handpiece, which has been introduced as an alternative, needs to be evaluated on its performance in tooth preparation. This study aimed to evaluate the user-friendliness and tooth preparation performance of electric vs air-turbine handpieces by comparison of self-reports of user comfort, noise intensity, surface roughness, and crown fitness. Materials and Methods: Twenty dentists were asked to use the air-turbine and electric handpieces, respectively. Feedbacks were collected regarding comfort, noise, weight, vibration, flexibility, and tooth preparation feeling in general were scored according to a VAS. Moreover, the dentists were asked to complete a questionnaire on handpiece preference during tooth preparation. Noise emitted by the two handpieces was detected with a precision sound level meter. After tooth preparation with air-turbine and electric handpieces, the surface roughness of 10 teeth was measured with a profilometer. The other 18 teeth were prepared as abutments to measure the marginal and internal fitness of all-ceramic crowns via replica technique using silicone rubber impression material. Results of noise intensity and the VAS scores of user-friendliness were analyzed with Mann-Whitney U test. Chi-square test was used to compare the ratio of preferred handpieces. The surface roughness and marginal and internal fitness were analyzed with t test to determine significant differences (α = .05). Results: The electric handpiece had heavier weight (P = .009). Noise produced by the electric handpiece tested lower during both idling and teeth preparation at 15 cm, 30 cm, and 45 cm (< .05). The electric handpiece produced similar surface roughness values to the air-turbine handpiece (P = .377). There were no significant differences in the marginal and internal crown fitness between the air-turbine handpiece and electric handpiece (P > .05). Conclusions: Despite the heavier weight, the electric handpiece emitted lower noise and was preferred in the finishing stage with greater smoothness (P = .006). Noise produced by the electric handpiece tested lower during both idling and teeth preparation at 15 cm, 30 cm, and 45 cm (< .05). The electric handpiece produced similar surface roughness values to the air-turbine handpiece (P = .377). There were no significant differences in the marginal and internal crown fitness between the air-turbine handpiece and electric handpiece (P > .05). Conclusions: Despite the heavier weight, the electric handpiece emitted lower noise and was preferred in the finishing stage of tooth preparation with greater smoothness than the air-turbine handpiece. The surface roughnesses of prepared teeth and crown fitness between teeth and cast crowns fabricated by the use of air-turbine handpieces and electric handpieces. The electric handpiece is significantly quieter and smoother than the air-turbine handpiece, making it more recommended for precise tooth preparation.
Comparison of Three Conservative Treatments for Myofascial Pain with Limited Mouth Opening: A Retrospective Study
Chun-Hua Yu, Hai-Xin Qian, Jian Sun
Shanghai Jiao Tong University, Shanghai, China

Purpose/Aim: Conservative treatment modalities are recommended to manage myofascial pain with limited mouth opening (MPWLMO) in subjects with TMD. The aim of this study was to compare the effectiveness of three conservative modalities, including splint therapy, physiotherapy, and manipulation therapy. Materials and Methods: A total of 168 patients with MPWLMO were retrospectively observed in this study. Between January 2014 and December 2016, 63 patients received splint therapy (group 1), 35 patients received manipulation following electrophysiotherapy (group 2), 33 patients received a combination of splint therapy and manipulation following electrophysiotherapy (group 3), and 37 patients received counseling only (group 4). All subjects received 12-week recall visits. Clinical assessments included intensity of spontaneous pain of the masticatory musculature, pain on palpation, chewing pain, and pain-free maximal mouth opening. Intragroup and intergroup differences were examined using ANOVA and Kruskal-Wallis test. Results: Spontaneous pain of masticatory musculature was relieved significantly in all groups since the 6-week visit (P < .05), and no significant differences were found among all groups (P > .05). Pain on palpation was relieved significantly no later than the 9-week visit in groups 1, 2, and 3 (P < .05); in group 4, 12 weeks were needed. Chewing pain was relieved significantly since the 6-week visit in groups 1, 2, and 3 (P < .05), but no significant change compared to baseline was observed in group 4 at any interval (P > .05). Significant increase of maximal pain-free mouth opening was observed since the 9-week visit in group 1 and since the 3-week visit in groups 2 and 3 (P < .05). Nevertheless, no significant change in mouth opening was found during the whole follow-up interval in group 4 (P > .05). Conclusions: Each included treatment modality could reduce the spontaneous pain and pain on palpation during the recall intervals. A combined approach of stabilization splint and manipulation integrated with electrophysiotherapy could promote the process of relieving chewing pain and improving pain-free mouth opening.

Therapeutic Approaches, Treatment, and Follow-up of Heavy Bruxers with Full-Mouth Rehabilitations
Eran Zenziper
Tel Aviv, Israel

Background: Bruxism is a repetitive jaw activity that can occur during sleep or during wakefulness. Sleep and awake bruxism are potential risk factors for oral hard tissue damage, failure of dental restorations, and TMD. A 13-year follow-up of two heavy bruxers treated with full FDPs on teeth and on implants is presented. There were several clinical dilemmas concerning the treatment plan that will be discussed, including: adaptation to increased vertical dimension; establishing posterior occlusal support with the desired excursive guidance; preserving teeth with poor prognosis vs extracting them and placing implants; splinting of teeth vs single-crown restorations; placing implants in heavy bruxers; and choice of material of the final restoration. While all teeth with poor prognosis that were preserved survived, implants with excellent conditions developed peri-implantitis. Splinting of FDPs in heavy bruxers is considered to be a risk factor for cement washout. The presentation demonstrates both splinting and single-crown restorations, depending on the endodontic status of the abutments. Both options showed success. There is no ideal material for the final restoration. Both PFM and zirconia (monolithic and bilayer) restorations were represented, and each material showed advantages and complications. Complications included porcelain chipping and abrasion of natural teeth opposing the restorations. An alternative for restoring abraded teeth is with a direct glass-ionomer restoration, with the advantages of minimum cost and minimum chair time. Discussion: The survival of the rehabilitations in the two heavy bruxers after 13 years was good. Minor maintenance was needed. Teeth with poor prognosis survived, while implants with ideal properties developed peri-implantitis and required surgery and further prosthetic treatments. Conclusion: It is possible to treat heavy bruxers with fixed dental prostheses with a good prognosis when the posterior occlusal support is established and forces of excursive guidance are balanced. It is possible to use monolithic zirconia restorations to avoid bilayer porcelain chipping. It is crucial to maintain meticulous oral hygiene measures. Probing around implants on regular check-ups is important in order to detect peri-mucositis in time and to try to prevent peri-implantitis. Teeth with a poor prognosis showed good clinical performance in time, and it is advised to preserve teeth when possible. Clinical Implications: Despite the risk factors that heavy bruxers present, it is possible to treat these cases with high predictability.