FRENCH DENTAL ASSOCIATION
CONFERENCE & TRADE EXHIBITION
20-24 NOVEMBER 2007

The Quintessence of the 2007 Conference

The abstracts in English of the six sessions scheduled in the International Scientific Programme

ADF
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The Quintessence of the 2007 ADF Conference
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Wednesday 21 November
15:30 – 18:00

TOOTH PRESERVATION: NOW MORE THAN EVER

B40

The Limits of Endodontics

Bernard Ciucchi

Root canal therapy is admitted to be based on a cause-to-effect principle. When the irritant is removed from the canal, the inflammatory process stops and the adjacent tissues start healing. By cleaning, disinfecting and obturating the root canal to an ideal standard, it is thus possible to attain success rates of 87 to 92%. In general practice and with the means currently available, these high rates may be considered as the limits of endodontics.
Some say these limits may be pushed further, when the positive effects of new instruments have really been taken into account. Others, including the author, believe that they will stay unchanged, due to the risks and biases associated with new instruments during the preparation and cleaning procedures.
Unless (ideal) means are available to fully visualise and clean the entire root canal system, endodontics will remain the treatment of one main root canal and, at best, of its nearest ramifications. A natural, biological and quantitative limit therefore exists, which it is difficult to assess and to cross.
In addition to the "traditional" limiting factors of root canal therapy, including preoperative factors (type of tooth, treatment of an anterior root, presence of apical periodontitis, etc.), operative factors (canal enlargement, number of sessions, materials and techniques, possible iatrogenic injuries, etc.) and postoperative factors (crown restoration), a highly determining financial factor now also has to be taken into account, which is the cost of the treatment and of the tooth restoration.
This cost will invariably be compared to that of replacing a tooth with an implant, and it will take much more than a patient's sole motivation to preserve a tooth "at all costs" for him or her to accept a root canal treatment with vague and restricted limits.

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Proroot MTA for Retrofillings and for the Surgical Treatment of Perforations

Arnaldo Castellucci

In the last 10-15 years, several important developments have been introduced in surgical endodontics: the ultrasonic root-end preparation, the surgical operating microscope and a new biocompatible material.
As far as the new materials are concerned, recently the Mineral Trioxide Aggregate became available. This is a revolutionary material, which is extremely biocompatible, is hydrophilic, and is capable of stimulating the healing processes and osteogenesis. Many studies have demonstrated the growth of cementum, periodontal ligament and bone adjacent to MTA when used to seal perforations as well as a retrofilling material in surgical endodontics. For all the above-mentioned characteristics, MTA can be considered the material of choice in surgical endodontics, as a retrofilling material and to surgically seal pathological or iatrogenic perforations.
Thanks to all these revolutionary progresses, the long-term success rate of surgical endodontics is higher and endodontic therapy today is more predictable and even more fun!

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Endodontics and Complementary Surgery for the Treatment of Induced Diseases

Jean-Yves Cochet

Numerous diseases turn out to have an endodontic origin, and making an early diagnosis means that the best-suited treatment can be chosen.
Computed tomography is today one of the fundamental tools in the modern armamentarium of medical imaging. It is becoming increasingly important in endodontics, all the more so because traditional X-ray, although indispensable, is in comparison very insufficient as many

lesions are radiologically invisible. With computed tomography, the extent of the lesions and their location in relation to the various anatomical structures can be assessed and identified with precision. Computed tomography is therefore essential, not only in establishing a diagnosis and monitoring the healing process, but also, when considering a surgical procedure, in locating the exact position of the lesions in relation to vulnerable sites.
Computed tomography is now indispensable for the early diagnosis of radiolucent lesions and of radiopaque lesions such as osteitis, osteoperiostitis, cementoma, fibrous dysplasia, etc., and is taking on a major part in the treatment of extensive lesions.

Extensive apical lesions – new approach and tissue preservation
In the treatment of extensive lesions, after the endodontic treatment or retreatment, cyst decompression will enable the regeneration of significant volumes of destroyed tissues without immediate surgery and with spectacular results. If a surgical procedure remains necessary, it may then be carried out with no or at least very reduced risks.

Treating combined endodontic-periodontic lesions: endodontics, surgery, or complementary surgery?
Whilst the healing of lesions of endodontic origin is predictable in relation to set objectives, the healing of combined endodontic-periodontic lesions is more uncertain, depending on the associated pathogenic flora. It is important in a first stage to determine the endodontic or periodontic origin of the lesion.
Thermal and electric pulp vitality tests combined with periodontal probing are the key diagnosis tools. Periodontal treatment will be chosen for a vital tooth, endodontic treatment for a necrotic tooth or one that has not been sufficiently endodontically treated:

- In the case of a periodontal lesion of endodontic origin, an endodontic treatment, correctly carried out, will achieve full tissue regeneration without any other treatment.
- If the endodontic treatment cannot be concluded satisfactorily, surgery may be used to complete the treatment and seal the system.
- In the case of a long-established periodontal lesion of endodontic origin, with extensive attachment loss, or if the periodontal lesion is concomitant with the endodontic lesion, the endodontic treatment must be carried out first, after sufficient time has been left for the periodontal healing necessary for spontaneous tissue regeneration.

Periodontal surgery using tissue regeneration membranes will complete the treatment.
In specific cases of cervical root resorption and complex perforations, complementary surgery will often be the only solution available to save teeth that would otherwise have had to be extracted.

Sinus disease of endodontic origin
Many sinus diseases have an endodontic origin and clearly resist medicinal and surgical treatments. Once the endodontic origin has been established, the appropriate treatment may be chosen to remove the cause of the disease and thus avoid falling into an unending cycle of disease recurrence. The anatomical relationship between maxillary molars and premolars is well known, and it is obvious that an infected tooth emerging into the maxillary sinus will inevitably induce a pathogenic process.

An inappropriate endodontic treatment will have the same consequences, and retreatment will become unavoidable.
Although the “non-treatment” of the second mesiobuccal root canal may lead to chronic sinusitis, the localization and endodontic treatment of this root canal are truly challenging tasks and remain highly difficult, even when using the appropriate optical aids and instruments.
The infected tooth acts as a toxin releaser, and if the endodontic treatment cannot be fully carried out, complementary surgery will be necessary to ensure that the endodontic system is properly sealed, and to encourage the healing process.
Before any type of sinus surgery is conducted, an endodontic check-up should be carried out in order to avoid surgical procedures on a sinus infected by badly treated teeth.
Here again, using the appropriate imaging devices will help to assess the extent of the sinus disease. It will also help to reveal and locate any foreign bodies, and to establish the anatomical position of the roots that need to be treated or operated on.
If endodontic retreatment is chosen as the main therapy, it may be completed by surgery if the aims initially set are not achieved, or during the indispensable six-month check-up visit. The surgical treatment will help to completely seal the insufficiently treated root, and to mark the separation between the root and the sinus, by creating a space for regeneration between the sinus floor and the apical portion of the incriminated tooth.
The principles of tissue regeneration will provide the tooth with biological isolation and an environment favourable to healing.

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Thursday 22 November
09:00 – 11:30

ANTERIOR RESTORATIONS: STRATIFICATION OR VENEERS?

C46

Stratifying Composites for an Invisible Restoration of the Anterior Teeth

Walter Devoto

Composite is the material which we make the most use of for our everyday restorations. It is used for interventions as diverse as simple sealing or complex direct restorations, preventative restorations and indirect prosthesis.
Composite has gone from being a material which was only used for temporary interventions to being the most popular first choice material from a clinical point of view.
From an aesthetic point of view, too, the evolution of the material, over the last ten years, has convinced even the most sceptic of clinicians of the high quality of work which can be obtained using composite. Various layering techniques have been published by diverse authors, based on their own personal experiences, and this has given rise to new, high performance materials.
Some dentists are doubtful about the complexity of the stratification techniques proposed. They believe that the chair-time necessary to achieve satisfactory results is too long and therefore not economically viable when compared to a partial or total indirect, ceramic reconstruction.
The operative time needed should be directly linked to the quality of the final result, so it is important to exploit the build up of composite with this in mind and not to consider it a complication. We should train our hands to work with the plasticity of the material, manipulating the layers and masses in search of the ideal form of the tooth to be re-built.
It is fundamental to create a correct treatment plan for each patient. This should take into consideration all the parameters of choice such as age, the conservation of the residual tissue, aesthetic expectations and a critical evaluation of alternative therapies. The treatment plan should look not only at the present but also at the future, as in dentistry, there is no such thing as the definitive therapy. Questions such as “How will I intervene at a later date if a problem arises on this tooth?” should be considered.
With these clear indications in mind, the dilemma of whether to use composites or ceramics is no longer an antagonistic choice. Rather, the two materials represent integrable solutions – a choice – which can be used in harmony, even in the same mouth. Therefore, clinicians now have the possibility of optimising to the maximum the advantages which these materials bring to the profession.

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Ceramic Veneers: From Theory to Practice
An Interdisciplinary Approach for Better Aesthetic Results

Galip Gürel

A beautiful smile seems to reflect a certain style of living, and the enhancement of facial beauty is one of the primary goals of patients seeking elective dental care. The lower one-third of the face has a major impact on the perception of facial aesthetics, and a beautiful smile design not only changes the smile but also the overall facial appearance.

Once the ideal relationship between the restoration and the facial soft tissues is achieved, improvements in natural beauty can be expected to follow. With the ever-increasing importance that the media, patients and general society place on appearance, an even greater emphasis has recently been placed on elective aesthetic dentistry. By improving deficient facial proportion and integumental form, surgeons, orthodontists, and restorative dentists have the unique opportunity to weave these aesthetic needs and the creation of a pleasing smile into the fabric of their comprehensive treatment planning.

Achieving precision in terms of preparation, fit and an aesthetic final outcome requires a serious treatment planning which is different for each case… Designing a new smile consists of many steps which are very important and if followed right, produce predictable success.

At this point I would also like to emphasize the importance of minimally-invasive dentistry. This is only possible if we can insure that proper tooth position in the arch is established, eliminating the need for any soft or hard tissue removal. This brings to mind the importance of the interdisciplinary team (in contrast to multidisciplinary). The major difference between an interdisciplinary versus a multidisciplinary approach is that with an interdisciplinary approach, treatment planning is accomplished in a group setting with all treatment team members present. All treatment planning and treatment challenges can be discussed in a collaborative environment with team members complementing and supporting the efforts of each other. In a multidisciplinary approach, on the other hand, each discipline or area of dentistry is involved in one aspect of the treatment without necessarily working together with the others in a unified manner.

In order to achieve a very precise and predictable tooth preparation, wax-up, silicon indexes and related techniques such as APR (Aesthetic Pre Recontouring), APT (Aesthetic Pre-evaluative Temporaries) and preparation through the APTs are extremely crucial. This

eliminates the possible mistakes and risk of destruction by the depth cutters that may occur if the tooth is prepared without taking into account the aging effects on the enamel (volumetric enamel loss) or inappropriate tooth positions on the dental arch…

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ARE COMPOSITES TOXIC? ARE THEY GIVING RISE TO A NEW PUBLIC HEALTH ROBLEM?

C51

Composite Resin Polymerization: Dimensional Stability and Free Monomers

Gaëtane Leloup & Jacques Devaux

Resin-reinforced photo-crosslinked polymer resins are nowadays increasingly used in restorative dentistry as a substitute to metal amalgams. Mixtures of 2,2-bis[4-(2-hydroxy-3-methacryloxypropoxy)-phenyl]propane (BisGMA) and triethylenglycol-dimethacrylate (TEGDMA) are the matrices most frequently found in resin-containing composite materials. With regard to the basic function, i.e. the restoration of the dental anatomy after preparation of the cavity, resins do indeed replace amalgams. But their very different chemical and physical properties require that further studies be conducted, in order to better understand how these materials work and, if possible, to overcome their deficiencies, in particular their tendency to shrink during polymerization and the incomplete conversion of double crosslinks.

BisGMA-based dental resins have a maximum conversion rate of 55-75%. Recent studies have explained the incomplete conversion of dimethacrylate-based systems in terms of gelation and vitrification mechanisms. As the conversion progresses, the propagation and succeeding termination reactions are diffusion-controlled (gelation). Because the formation of a highly cross-linked network drastically restrains molecular mobility, the glass transition temperature exceeds the reaction temperature (vitrification) and the conversion process stops before all double cross-links have been converted, trapping inside the network not only free monomers and non-converted double cross-links, but also a variable quantity of radical substances.

Incomplete conversion gives rise to a number of problems. It has been shown that up to 6% of the unlinked monomers remain inside the material after polymerization. The release of these monomers may increase bacterial proliferation around the restoration and, in some patients, promote allergic reactions. Free monomers may also act as a plasticizer and thus reduce the material's mechanical strength and increase its swelling in the presence of water.

As to the radical-type substances inside the restorations, questions may arise with respect to their identification, stability, release into the surrounding tissues and possible toxicity. Recent studies using nuclear magnetic resonance have led to the identification of two distinct radical species that can survive inside resin composites for three months. The kinetics of their disappearance depend on the conditions the composites are stored in, but the processes that underlie the evolution of radical signals are not yet clearly established. They are however essential to the characterisation of the biocompatibility of composite resins.

The objective of this presentation is to explain the precise mechanisms of radical polymerization in light-cure dental resins and to describe their consequences with regard to conversion rates and the release of monomers or radical substances.

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In Vitro Toxicity of the Free Monomers of Composite Resins, Bonding Agents and Resin-Modified Glass-Ionomer Cements

Imad About

Composite resins and resin-modified glass-ionomer cements have rapidly become the choice materials for replacing carious and traumatic dental tissues.

The toxicity of resin-based materials is due mainly to the free monomers they contain. In the first 24 hours, this toxicity is caused by the residual monomers that remain after an incomplete photopolymerization process. Over time, the materials may undergo degradation and the monomers may be released by the erosion of the material and/or by the activity of the salivary esterases.

Free monomers have been reported to have various ill effects *in vitro.* The one most studied is cytotoxicity, which is generally assessed by tests on cultured immortal cell lines or on primary cultures of cells taken from the oral cavity. These screening tests hold the advantage of being quick, reproducible, and inexpensive, and the chemical components can be assessed independently. In this context, numerous studies have shown that monomers are cytotoxic and that their ID ranges between 10^{-5} and 10^{-2} M: Bis-GMA, UDMA and TEGDMA have an ID_{50} of 10 to 110 µM. The degree of cytotoxicity depends on the concentration of the material used and on the association of monomers that may have either synergetic or antagonistic cytotoxic effects. In dental pulp cells, this cytotoxicity is extremely high and may lead to apoptosis.

When used in non cytotoxic concentrations (equivalent to the presence of residual monomers *in vivo*), monomers such as HEMA and UDMA can reduce the mitochondrial activity of the

pulp macrophages, and the toxicity of these molecules increases simultaneously to the incubation time. Moreover, monomers can stop the secretion of interleukin-1 and TNF. UDMA, TEGDMA and Bis-GMA have also been shown to affect the pulp's local immune system, to trigger complement activation, to reduce the expression of dentin sialoprotein (which is involved in the mineralisation process), and to completely inhibit the mineralisation process by the pulp cells.
All these studies show that monomers are cytotoxic when used in high concentrations, but that when used in concentrations equivalent to the presence of residual monomers *in vivo*, they seem to have specific effects on the cells involved in the pulp reaction to biomaterials.
However, a low correlation between these tests conducted according to the specifications of ISO standard 10993 and actual clinical use has often been reported.
During indirect pulp capping, the residual dentin plays a fundamental role in protecting the pulp from the toxic materials. This role is clearly revealed by comparing tests conducted with bonding agents placed onto cell line L929 through slices of dentin to tests carried out on the cell line directly. The MTT test shows that when a slice of dentin is placed between the bonding agent and cell line L929, the cytotoxicity of the bonding agent is far lower because the dentin delays and reduces monomer diffusion.
Although *in vivo* and clinical assessments remain indispensable, *in vitro* tests help to understand the action mechanisms of resin-based materials and to limit the risks that these materials may carry *in vivo*.

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The Genotoxicity and Cytotoxicity of Dental Resin Monomers

Gottfried Schmalz

Composite resins and dental adhesives contain a large number of different compounds including base monomers (e.g. BisGMA), co-monomers (e.g. TEGDMA), catalysts (e.g. camphorquinone) and other additives. It has been shown that some of these substances as well as the composite resin/adhesives as such may elicit toxic and mutagenic reactions in cell cultures or cause an inflammatory reaction when directly applied onto the dental pulp. Several mechanisms that may cause cytotoxicity are discussed in the current literature. In case of high concentrations (e.g. > 3 mM for TEGDMA), the cells in contact undergo immediate cell death (necrosis), which *in vivo* will elicit an inflammatory reaction. At lower concentrations, however, the monomers will not "kill" the cells, but interfere with cell metabolism. It appears as if a key reaction is the intracellular increase of ROS (Reactive Oxygen Species) and thus an imbalance of the intracellular redox system. It was shown that monomers like TEGDMA or HEMA are able to deplete the cells of the ROS scavenger glutathione (GSH), which counteracts ROS effects. GSH depletion leads to an increase of ROS. Camphorquinone directly increases the cellular ROS concentration. Increase of ROS may lead to various cellular processes, including oxidative DNA damage. Increased formation of micronuclei in cell cultures was demonstrated after exposure to TEGDMA, HEMA and dental adhesives. As a consequence, DNA repair mechanisms are activated paralleled by a delay of the cell cycle. If repair is not possible, damaged cells will undergo programmed cell death (apoptosis) through the activation of caspases. Apoptosis can also be triggered by influencing the PI-3K cell survival pathway. TEGDMA has been shown to cause inhibition of the PI-3K-pathway. Beside the induction of apoptosis, ROS may play a role in the activation of MAP-kinases, which influence nuclear transcription factors regulating cell differentiation. Finally, the NFκB-system is influenced by resin monomers, possibly in the course of DNA repair, the PI-3K pathway or by other means. The NFκB system triggers e.g. the expression of inflammation mediators but also protects the cell against apoptosis. Many mosaic stones of the interaction of composite resin/adhesive compounds with cellular metabolism have been elucidated. However, the complete time-dependent cellular stress response is far from being understood.

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J Dent Res 2005; 85: 870 – 877

Are the So-called Biocompatible Resins Used in Endodontics Reliable?

Stéphane Simon

Obturation is a crucial stage of the endodontic treatment. The objective is to achieve a perfect seal in order to avoid any risk of reinfection of the root canal system and to prevent the diffusion of toxins into the deep periodontal tissues around the root.
Although gutta percha and Zinc oxide-Eugenol cements are currently the choice materials, others have been used, including resin-based materials. Bakelite resins have had their hour of glory, but were abandoned by clinicians because it was impossible to remove them when retreatment was required. The major danger associated with these materials was their lack of safety for the biological tissues.
Modern shaping techniques all insist on the need for an adequate preparation of the lumen and a narrow foramen. The contact area between the filling material and the periapical tissues is thus relatively small, and may be considered as negligible. Obturation procedures that achieve the three-dimensional obturation of the root canal system are all based on the compaction of a pre-heated material. Quite often, the material, mainly cement, is extruded into the periapex. The question of the biocompatibility and possible ill effects of these materials should therefore be considered.
For the past few years, a new resin-based material has been available on the market. It is used with a protocol where the whole obturation system is bonded inside the canal. The main advantages of the system, as claimed by the manufacturer, are the ability to achieve a hermetic seal, and the biocompatibility of the materials, particularly of the bonding agent that has a composition very similar to that of the material placed inside the canal.
Some studies tend to show that Resilon® has interesting biochemical properties[1,2], whilst others question its ability to achieve perfectly hermetic seals[3]. This conception of biocompatibility is interesting, since many materials used in dentistry and more particularly in endodontics have been tested, and very few in the literature are regarded as toxic. This is surprising considering that their various constituents (Zinc oxide for example) are themselves toxic.
At a time when a new resin-matrix is made available to practitioners, it seems interesting and important to recall the definitions of biocompatibility and toxicity, and to explore the possible relationship between these properties and the long-term prognosis of our treatments.

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Thursday 22 November
12:30 – 15:00

ENDODONTICS IN EUROPE: CURRENT CONCEPTS

C58

Endodontic Emergencies – The Hot Tooth: Diagnosis and Treatment

Julian Webber

Endodontic diagnosis can be a difficult and complex aspect of treatment planning for patients who require root canal treatment. Nowhere is this more relevant than in the diagnosis and treatment of the endodontic emergency, the “Hot Tooth”, when a patient presents in pain to your office in the middle of a busy day.

Isolating the correct tooth and carrying out the correct treatment represents a “minefield” of dilemmas which if not carried out methodically with a logical and well defined sequence of diagnostic tests can result in the wrong tooth being treated with the attendant risks of litigation.

The golden rule of endodontic diagnosis for treating patients who are in pain is to “mimic” in the surgery exactly the same symptoms that the patient has complained of. Symptoms can range from sensitivity to hot and cold which may linger, tenderness to percussion, palpation, biting and obvious swelling and sinus fistula formation. It is not always easy to conduct the tests which will confirm all the signs and symptoms of the “Hot Tooth”. Radiographic evidence may well be inconclusive.

This lecture will look at the endodontic diagnostic procedures which will identify which tooth is the cause of pain and the treatment procedures which will eliminate the pain. Diagnosis should be conclusive, treatment swift and effective with complete comfort for the patient both during and after the emergency procedure.

How to Optimise the Preparation of the Access Cavity

Beat Suter

To avoid cusp fractures, the cusps should be shortened prior to the preparation of the access cavity. The access cavity should be shaped according to the anatomy of the tooth. As a general rule, it should be located in the mesial part of the occlusal surface and shaped like an inlay, with walls flaring out towards the occlusal portion of the tooth. Ideally, there should be a root canal orifice at each corner.

Tungsten carbide burs are used for removing and/or penetrating metal reconstruction materials as they are ideal for cutting through metal. Diamond cone burs are used for the initial preparation of the access cavity. Round steel burs are used exclusively to excavate the caries. The preparation is finished using air-driven oscillating diamond instruments, which guarantee that the procedure will run smoothly, with good visibility under the microscope. The same instruments will be used to prepare the straight-line access to the root canals.

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How to Achieve a Good Standard 3D Filling of the Root Canal System

Elio Berutti

A successful endodontic treatment depends upon the three-dimensional obturation of the root canal system up to the tip of the canal. Since it is virtually impossible to completely eliminate bacteria from the canal system, the obturation must provide a hermetic seal at the apex in order to prevent re-infection of the periapical tissues. In 1978, Johnson introduced a new obturation system employing heat-softened gutta-percha: the Thermafil system, a simple technique whereby a central carrier transports the softened gutta-percha into the root canal and provides reasonably good apical control. The Thermafil system has since evolved and is currently one of the best available ways to fill root canals.
However the instructions for use given by the manufacturer are questionable. Indeed, the taper of Thermofil obturators is .04, whereas today's NiTi Rotary instrumentation creates canals with tapers between .04 and .012. The classic obturation method employing a Thermafil obturator the same size as the apical master file (working length) may thus result in a discrepancy between the obturator selected (.04 taper) and the canal taper. The method we propose uses a Thermafil obturator one or two sizes larger than the apical master file, with the carrier fitting at 0.5 mm from the apex. Above all at the apical level, the larger obturator makes it possible to compensate for the discrepancy in taper and to achieve a more hermetic seal. Moreover, after removing the gutta-percha, the plastic carrier is used as verifier to select the size of the Thermafil obturator: this corresponds to the size of the verifier (plastic carrier without gutta-percha) fitting 0.5 mm short of the working length. The quantity of gutta-percha in front of the plastic carrier in Thermafil obturators may vary considerably (0.5-2 mm); any excess should be removed with a scalpel, leaving only 0.5 mm. The obturator used is thus

one or two sizes larger than the apical master file (30#), depending on the taper of the apical third of the root canal.

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Thursday 22 November
15:30 – 18:00

DENTAL EXTRACTIONS: DECISION-MAKING IN PERIODONTICS

C68

Periodontium and Peri-Implant Tissues: What Are the Differences?

Ubele van der Velden

The most obvious difference between natural teeth and implants is the presence of the periodontal ligament in the case of natural teeth and osseointegration in the case of implants. Furthermore, the connective tissue surrounding the teeth is attached to the cementum whereas in the case of implants there is no real attachment present between the mucosal connective tissues and the implant. In addition, the preceding history is quite different as well. Periodontal tissues are formed during tooth development early in life and as soon as teeth have erupted, they are subjected to the oral environment, including colonization by micro-organisms. It has been shown that the composition of the oral microbial flora changes with age. Colonization by many putative periodontopathic micro-organisms can occur quite early in childhood without clinical signs of periodontal disease. This is true also for *Aggregobacter actinomycetemcomitans* and *Prevotalla intermedia*. However, colonization by *Porphyromonas gingivalis* is not detected in periodontally healthy children and colonization occurs later in life.

As a result of the longstanding interaction between the host and environmental factors, destructive periodontal disease may or may not develop. It has been shown that subgingival calculus and subgingival presence of *A. actinomycetemcomitans* are risk factors for the onset of periodontal breakdown. In addition, interproximal pocket depths $\geq$ 5 mm and the presence of gingival recession can be considered as risk predictors for disease progression. For the majority of subjects it can be assumed that it takes at least 25 years before a tooth starts to show significant attachment loss. In contrast, when an implant is placed, it will in most cases be placed in individuals of an older age. This means in tissues that have aged and suffered from all kinds of environmental attacks, e.g. micro-organisms, diet and smoking. In addition, implants can be placed in edentulous patients and partially edentulous patients. In general, most studies show that the subgingival flora of implants in partially edentulous patients resembles that of the natural dentition. However, the inflammatory lesion in the connective tissue lateral to the junctional epithelium tends to be larger and contains more inflammatory cells in the gingival tissues of natural teeth in comparison to the soft tissues around implants. Furthermore, it has been shown that in lesions of both peri-implantitis starting months after osseointegration and in juvenile periodontitis, the most abundant cells in these infiltrates are T and B lymphocytes, in which T cells are predominantly involved. This may suggest that indeed in a small minority of subjects, a kind of juvenile peri-implantitis can develop, whereas

in the majority of cases, like for natural teeth with chronic adult periodontitis, it may take decades before peri-implantitis develops. If this concept is true, it seems advisable to avoid implant placement in partially edentulous subjects too early in life. In adults up to 50 years old, it may be safer to restore the dentition by proper conventional restorative therapy.

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What Are the Chances of Preserving the Teeth Over Time?

David Nisand

In the 1980s, the practice of periodontics was marked by the advent of new procedures (surface treatment, guided tissue regeneration) and techniques (tunneling, root amputation, hemisection) designed to postpone the loss of the dental organ for as long as possible. The development of these techniques probably stemmed from the complexity and risks associated with the placement of fixed or removable prostheses on reduced supporting periodontal tissues – natural teeth had to be preserved at all costs.

A turning point came with implant techniques that made it possible to replace an individual tooth without jeopardising the neighbouring ones. Why then insist on preserving the tooth when there was a reliable technique to replace it?

However, time and the literature clearly showed that implant-supported restorations were not free of complications, particularly in patients with periodontal diseases.

In parallel, knowledge about periodontal diseases and their treatment increased, opening up new perspectives for the preservation of periodontally compromised teeth.

The question of whether to save or extract the tooth was back at the centre of the debate.

In the era of implantology, are mobile teeth, or those with endodontic-periodontal lesions, attachment loss or bone loss condemned from the start? Or should we on the contrary do all in our power to save them?

The question is essential and the answer bears heavy consequences. It implies a complex decision-making process that cannot rest simply upon dogmatic positions but, on the contrary, requires that a number of criteria be taken into account, including the prognosis for the individual tooth, the nature of the periodontal disease, the patient's motivation, and the global treatment plan set for this particular patient.
It is necessary in order to integrate the decision-making process into the treatment plan to determine at what moment the decision should be taken, and which precise parameters, in relation to the tooth and to the patient, should be considered to make the decision.
Except in specific situations (low subgingival fracture, endodontic prognosis), the fundamental decisive parameters in relation to the tooth should be the degree of attachment loss and the degree of bone loss. These parameters however are not sufficient, as the decision to save the tooth must be weighed against the patient's global treatment plan, particularly if a prosthetic treatment is required.

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Periodontal and Peri-implant Diseases: Do They Share the Same Risk?

Stefan Renvert

Over the last decades, dental implants have become a commonly used treatment alternative to removable dentures. Previous published long-tem follow-up studies on implant therapy merely presented survival or so-called success rates and only few long-term studies reported on the incidence of peri-implantitis. However, biological complications do occur around implants and recently a few papers have presented data indicating that as many as 28% of the patients with implants demonstrate progressive bone loss, at one ore more implants after at least 5 years in function (Fransson et al. 2005).

If a patient develops biological complications around implants, several implants are often affected in the same patient. Accordingly patient-related risk factors such as an altered immune response, smoking and genetic factors have been proposed to be related to the development of peri-implantitis. Several studies have highlighted the fact that periodontitis patients are at higher risk for developing peri-implantitis, implicating (van der Weijden et al. 2005, Roos-Jansåker et al. 2006) that similar factors could be involved in both diseases. As for periodontitis, smoking has also been associated with the presence of peri-implant disease (Roos Jansåker et al. 2006). On a local level, the presence of plaque has, as for periodontitis, been implicated to be of importance for the development of peri-implantitis.

In conclusion, data indicate that periodontitis and peri-implantitis may share the same risk factors. Therefore, in everyday practice, patients with a history of periodontal disease, smokers, and subjects with bad oral hygiene should be considered as risk patients for peri-implantitis. Early detection of signs of disease, reinforcement of oral hygiene measures and smoking cessation programs are recommended.

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New Periodontal Approaches to Dental Extractions

Charles Micheau

Preventing the loss of periodontal structures when performing tooth extractions is of major importance when the alveolar bone exists only through the presence of the teeth. The loss of bone and mucosal structures jeopardises either the feasibility of a subsequent implant treatment or the aesthetic outcome of a prosthetic treatment involving a conventional or implant-supported prosthesis.

It is therefore essential to prevent periodontal breakdown by using all the means available, including surgical techniques such as the systematic sectioning of the roots of molars, and the use of instruments that exert lower mechanical stress on the tooth-supporting structures during tooth loosening and luxation (periotome).

Preventing periodontal breakdown is all the more difficult when the cortical bone loss is due to a trauma or a disease (periodontitis). This raises the delicate question of whether the tooth socket should be filled or not, and whether it should be closed using a sliding flap or a gingival graft. Many choices are available, including bone substitutes, collagen sponges, or the combination of both.

There are two conflicting points of view. Whilst for some, a blood clot is the best space filler, for others, biomaterials alone are capable of limiting ridge resorption.

We will compare the literature to our own clinical experience and try to define a biologically consistent approach to tooth extraction in order to establish a reproducible management strategy.

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Friday 23 November
09:00 – 11:30

WHERE THE DEVIL IS THE ENAMEL?

D77

Dental Erosion: From Diagnosis to Treatment

Adrian Lussi

Dental erosions have a multifactorial genesis. Acids of intrinsic and extrinsic origin are thought to be the main aetiological factors, but abrasive components can also be involved in tooth destruction. This overview gives information about the clinical appearance and the risk factors for the development of erosive lesions. In addition, preventive and therapeutic measures are discussed. Knowledge of the patient's history, an accurate clinical examination and a correct diagnosis are prerequisites for an adequate preventive and therapeutic concept. It is important to get data about diet habits and host factors, such as salivary flow rate, buffering capacity and pH, as well as intrinsic factors such as the occurrence of gastroesophageal reflux or vomiting. A novel scheme showing the dependence on the different risk factors is given. To determine a patient's individual risk for erosion, the dentist must be able to assess the erosive potential of these parameters. Data about the distribution and clinical appearance of erosive defects, photographs and study casts are important to plan the prevention and therapy and to judge the success of such measures.

Molar-Incisor Hypomineralisation (MIH): Aetiology & Diagnosis

Frédérique d'Arbonneau-Loreau

Molar-Incisor Hypomineralisation, more often referred to in the literature by the acronym MIH, is a defect that affects the enamel structure (Weerheijm, 2001) in at least one of the permanent first molars, and sometimes in the permanent incisors. MIH was first described in 1970 and is found in an estimated 15% of all children. Prevalence in Europe ranges from 3.5 to 25% depending on the studies, the countries investigated, and the study cohorts. Following the annual Congress of the European Academy of Paediatric Dentistry in 2003, the clinical characteristics of MIH were clearly established (Weerheijm *et al.*, 2003). Before then, MIH lesions were often confused with other enamel defects or identified under other names such as hypoplasia, first molar hypomineralisation not caused by fluoride, etc. (Weerheijm, 2003). As they can now be more easily identified, it is possible to compare and interpret the results of different studies. The clinical diagnosis of MIH does however remain difficult, because the disease is not yet well known and because there are variations in the clinical alterations to the teeth. MIH lesions can vary in severity from one patient to the next, and even in the same individual from one tooth to the next. The enamel defects are not necessarily symmetrical or of the same severity, depending on the teeth. However, the lesions occur more frequently in the upper first molars, and less so in the lower incisors. The more the molars are affected, the

higher the number of lesions in the incisors. And clinical studies show that the greater the number of affected teeth, the more serious the MIH lesions.
The clinically observed enamel defects result from a systemic disorder that affects the mineralisation process of the enamel. The time, intensity and duration of the disorder are responsible for the location and severity of the lesion(s). it is therefore mainly during the very first years of childhood (between the ages of 0 and 4), when mineralisation of the crowns of the permanent molars and incisors takes place, that a systemic disorder may induce hypomineralisation.
MIH has unpleasant aesthetic and functional consequences for the child. The affected teeth have a weakened structure, and are thus more susceptible to caries. This is enhanced by the fact that, being hypersensitive, they are more difficult to brush. They are also difficult to anaesthetise and to restore. Taken together, all these parameters often make the management of MIH a real clinical problem for practitioners.
The causes of MIH are still not clearly established. The aetiology of the disease remains a matter of controversy, and many possible causes are described in the literature, including perinatal complications, respiratory infections, lack of oxygen in early childhood, calcium and phosphate metabolism disorders, environmental pollution, etc. Environmental changes and factors are increasingly incriminated, and have indeed been shown to cause disruptions in the mineralisation phase during odontogenesis. These environmental factors include exposure to dioxines, which according to recent studies could be a possible cause of MIH (Maurin *et al.*, 2005). It is thought today that MIH has a multifactorial aetiology, but its cause or causes still remain unclear (William *et al.*, 2006).
In the course of this lecture, we will examine the (differential and positive) diagnosis of MIH and, using an epidemiological study conducted in the health care centre of the University Hospital of Brest, France, we will investigate the causes of MIH, in order to better recognise, better understand, and better treat the disease.

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