British researchers discover the origin of teeth in fish

BRISTOL, UK: The evolutionary origin of dental structures is highly debated among experts. Now, a team of international scientists has found evidence that tooth-like structures were present in the first jawed vertebrates, although it had long been assumed that teeth developed later.

The researchers discovered the origin of both teeth and jaws through studying fossils of Comipagopus, one of the first prehistoric jawed fishes. While performing 3-D microscopy, they were able to visualize every tissue, cell and growth line within the fish's jaws, allowing them to study the development of the teeth, said Dr Martin Rücklin, lead author and physicist from Switzerland.

“This technique allowed us to obtain a perfect digital model and very detailed internal views of the fossil without destroying it,” said Prof. Marco Stampanoni of the Paul Scherrer Institute, the largest research centre for natural and engineering sciences in Switzerland.

The CT scans demonstrated that some primitive fish possessed jaws with distinct dental ossifications composed of dentine and bone, the researchers said.

In contrast to the hypothesis that teeth were absent in the first jawed vertebrates and that they captured their prey with scissor-like jaws, the present study suggests that the development of tooth and jaw structures was intimately interwoven.

The research was conducted by palaeontologists from the University of Bristol in collaboration with experts from the Natural History Museum in London and Curtin University in Australia and physicists from Switzerland.

India council under scrutiny

A new report issued by the Comptroller and Auditor General of India has painted a poor picture of how the country’s Dental Council is managing dental education. Among other misconstructions, it found that a significant amount of dental institutions have not been inspected by the governmental body for years and that fees worth more than US$1.3 million to be paid by these colleges for the recognition and renewal of certain dental courses are outstanding. In addition, more students were admitted in some of the colleges than actually allowed by the 1948 Dentists Act.

Dental colleges have mushroomed in India over the last few years, now adding 30,000 new dentists annually to an already massive dental workforce of 1.5 million.

Body fat is bad for your gums

A new study conducted at the Boston University School of Medicine in the US has revealed that having huge amounts of body fat could play a significant role in the development of periodontitis in men. Male participants with rapid weight gain had more progression of periodontal disease than those who had smaller weight gains.

Oral health linked to arthritis

Although previous studies have found a link between rheumatoid arthritis and tooth loss in patients, the complex relationship between the two conditions is not yet understood by scientists. However, the findings of a new study, presented recently at the Fresh Science national finals in Melbourne, Australia, suggest that it might be possible to treat gum disease and severe arthritis simultaneously.

In laboratory tests, the researchers replicated both conditions, which are the result of inflammatory responses in the body, by inducing gum disease and arthritis in mice. They found that animals with gum disease developed significantly worse arthritis. In addition, they observed signs of bone loss in the jaws of mice with arthritis alone and signs of bone loss in the joints of mice with gum disease alone. The researchers are now testing whether treating periodontitis could also help to reduce the symptoms associated with arthritis by researching histone deacetylase inhibitors.

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The World’s Dental Newspaper • Asia Pacific Edition
Published in Hong Kong www.dental-tribune.asia
No. 10 Vol. 10

Stone-age dentistry
Researchers find filling in Neolithic tooth

Digital dentistry conference
CAPP event draws over 500 to Singapore

DT Middle East relaunched

The Middle East & Africa edition of DT Middle East & Africa that is published by DT Middle East & Africa relaunched in October. Serving a market of 18,000 dental professionals, the edition is published by the Center for Advanced Professional Practices in Dubai, which signed a licence partner agreement with Dental Tribune International in early September.
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FDI aplogises for cancelled AWDC in Seoul

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PUTRAJAYA, Malaysia: A new bill aimed at restructuring the practice of dentistry in Malaysia has been met with opposition by dental professionals nationwide.

In a recent interview with the tabloid newspaper The Malay Mail, the President of the Malaysian Private Dental Practitioners’ Association (MPDP), Dr Malliga Vadiveloo, said that the draft recently proposed by the country’s dental council does not make sufficient distinction between qualified dental surgeons and therapists.

The bill is also under scrutiny for making it too easy for foreign practitioners to obtain temporary licences to practise and preventing general practitioners from performing specialty treatments like orthodontics and dental implantology. The MPDP and other dentist organisations called upon the council to put the bill up for further discussion, which they claim was drafted without sufficient input from the dental profession.

Proposed by the Malaysian Dental Council in October, the new bill is to replace the 1971 Dental Act.

Dentists in Malaysia disagree with dental bill
Petition for dental scheme in Australia receives support

CANBERRA, Australia: New plans by the Labor government in Australia to shut down its Medicare dental scheme have encountered opposition among patients nationwide. In an online petition, thousands have signed to keep the scheme in place, the advocacy organisation GetUp! has reported.

Labor Minister for Health Tanya Plibersek recently put an end to the Medicare Chronic Disease Dental Scheme by signing a ministerial determination in August that will prevent new patients applying to the programme. She said that instead the government will provide AUS$4 billion for a new programme that will be implemented in 2014 and target children. Additional funding of AUS$1.5 billion will also be provided to state-run public dental clinics.

Patients who already have referrals to see a dentist from their GPs have until the end of next month to complete their treatment, according to the ministry.

The Medicare Chronic Disease Dental Scheme allowed patients with chronic illnesses and complex care needs to claim benefits for dental treatment of up to AUS$4,250 (US$4,400). Controversy related to the scheme arose last year, when the government launched investigations into a number of dental practitioners who were alleged to have failed to comply with administrative requirements.

Dental experts have warned that ending the programme without an immediate replacement could add more patients in need of treatment to the already extensive waiting list in public hospitals. They claim that millions have benefited from the scheme since it was implemented by the Howard government in 2007.

According to the Labor government, expenses for the scheme have accumulated to such an extent that it is now costing ten times more than originally projected.

Faster voice recovery

SINGAPORE: Singaporean scientists have designed a new system to help patients who have undergone larynx removal to speak again in a single surgery. In comparison with existing methods, their invention not only reduces the number of surgical steps but also increases accuracy of placement of a voice prosthesis and allows for immediate voicing.

Conventionally, various surgical steps are involved in the insertion of a voice prosthesis. Doctors need to make a small puncture in the wall between the trachea and the oesophagus, while, at the same time, a guidewire is inserted into the fistula to prevent the creation of a false passage. Two dilators are then inserted to widen the fistula.

Previously, a temporary rubber tube was placed into the fistula and the voice prosthesis was inserted about two weeks later, explained the researchers. They think, however, that their newly developed technique can reduce the time needed to restore the patient’s ability to speak to ten minutes after the initial procedure. It offers a one-step solution, reducing the complexity of the surgery and saving patients discomfort and money, said Dr David Lau, the project’s consultant ENT surgeon at Raffles Hospital in Singapore.

“Until now, good sizing of the prosthesis was achieved through trial and error,” said Dr Chui Chee Kiong, project leader and assistant professor at the at the National University of Singapore’s Department of Medical Engineering. “We have merged all the steps into a single procedure. Our system ensures an immediate snug fit of the prosthesis in the passageway created between the trachea and the oesophagus.”

Owing to tissue change and wear, voice prostheses need to be changed, which entails fitting them each time. “Our invention offers patients a more fuss-free system, reducing time and discomfort,” added Chng Chin Boon, a research engineer at the university.

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Dear reader,

Daniel Zimmermann

With new licence partners from Australia & New Zealand, South Korea and Vitznau having joined our publishing network in the last two months, DTIs reach to national dental communities. I would like to welcome our new friends on behalf of our worldwide readership and encourage you to follow their future efforts to provide the latest news from dentistry to their respective national dental communities.

We also announce our support to the Center for Advanced Professional Practices, our new partners from Dubai, who did not only recently agree to publish our Middle-East & Africa edition but successfully held their first ever CAD/CAM and computerized dentistry congress for the Asia Pacific region in Singapore. If you want more information about this novel and interesting event, please read our review on page 10.

Yours sincerely,
Daniel Zimmermann
Group Editor
Dental Tribune International

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Growing a tooth in the future?

Hopes of growing teeth have been supported by the occurrence of supernumerary teeth in the jaws, as well as fully developed teeth in teratomas. The issue of tooth bioengineering has been taken up again more recently, as scientific breakthroughs in the fields of genetics and developmental biology have led to a completely new level of understanding about how teeth develop. Basically, tooth formation is regulated by a chain of interactions between different tissues, epithelium and mesenchyme. And importantly, we actually know that the language that cells and tissues use for communication consists of defined signalling molecules.

Currently, the most realistic scenarios for tooth regeneration involve the generation of teeth from stem cells with the capability to form teeth. The technology would be based on traditional experiments that demonstrated more than 40 years ago that proper tooth form when separated epithelial and mesenchymal tissues from mouse embryonic tooth germs are recombined and cultured as transplants.

The question of the origin of cells for human tooth bioengineering is still unanswered. Adult human teeth do contain stem cells but they may not provide a suitable source. Therefore, it is likely that non-dental cells will have to be reprogrammed for the purpose of clinical tooth regeneration. In addition, there are several other remaining challenges such as the issues of tooth size, tooth identity, crown shape, and composition of the mineralised tissues. The creation of functional roots presents perhaps the biggest challenge that needs to be addressed before bioengineering of teeth will be feasible.

Yours sincerely,
Daniel Zimmermann

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Thoughts on CBCT

Prof. Keith Horner
UK

CBCT is the most significant development in dental imaging during the last 25 years. Concerns have been raised, however, over the radiation doses, which are usually higher than those of conventional dental radiography. Recent reviews indicate that doses from CBCT are typically an order of magnitude greater than those from conventional dental radiography. The health risks from such exposures are also proportionately higher.

The foundations of radiation protection of patients are justification and optimisation. Justification embodies the principle that all exposure to X-rays should give a positive net benefit to the patient. Optimisation is the principle that all exposure should be as low as reasonably achievable. So, where do we go from here?

When we use CBCT, we should never just "press the button" using a standard exposure for everyone, but we should adjust the exposure factors to a level that gives adequate image quality and use the smallest appropriate field of view. These simple steps will reassure our patients that we have their best interests at heart; that is what we really want—isn’t it?”

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World Dental Federation faults WHO plans on noncommunicable diseases

Daniel Zimmermann

GENEVA, Switzerland: The FDI World Dental Federation has issued concerns about a number of action documents recently made public by the World Health Organization with regard to non-communicable diseases (NCDs). In a statement released on its website, the dentists’ organisation criticised the documents for not paying sufficient attention to oral diseases, which it says should be classified as a key NCD by the WHO, along with cancer, diabetes, as well as cardiovascular and respiratory diseases.

In a circular note, the FDI also called upon its members to contact their respective national health officials immediately to ensure that the issue of oral health will be included in the upcoming WHO consultations on the plan, as well as the organisation’s next executive board meeting in January. According to the WHO sources, the draft is to be discussed during an informal consultation in Geneva in early November, which will involve member states and several UN agencies.

Published on 12 October, the paper “Global action plan for the prevention and control of noncommunicable diseases 2013–2020” identifies the threat of NCDs to achieving health-related development goals in low- and middle-income countries and provides recommendations on addressing the situation over the next seven years.

NCDs currently account for 36 million deaths worldwide each year with the majority to be occurring in less developed countries, according to Geneva-based organisation.

While admitting to current constraints of the WHO, the FDI said in its statement that the leadership role of the WHO is essential to keeping oral health a priority in the fight against NCDs. It stated that it had addressed a formal request to the organisation for the inclusion of oral health in its next general programme of work, which will determine the WHO’s expenditure and goals over the next five to six years.

“WHO recognition of oral disease is essential to support and consolidate the significant role the dental profession plays in the prevention and control of NCDs,” FDI President Orlando Monteiro da Silva told Dental Tribune.

The FDI has been lobbying heavily for the inclusion of oral diseases in the WHO’s list of NCDs for years. In February 2011, for example, Executive Director Jean-Luc Escrié spearheaded a submission by the World Health Professions Alliance (WHPA) during a civil society hearing at the UN headquarters in New York, stating that oral diseases share common risk factors with existing NCDs and have a major impact on society.

The federation is also offering an NCD toolkit for both patients and health professionals, which features a health improvement card, among other things, as part of the larger NCD campaign conducted in partnership with the WHPA.

‘WHO’s Global Action Plan on NCD’s pays only lip service to oral health, according to the FDI.

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WHO's Global Action Plan on NCD's pays only lip service to oral health, according to the FDI.
COPENHAGEN, Denmark: Celebrating the achievements of implant dentistry in the last 20 years, thousands of clinical specialists from Europe and around the globe recently gathered at the Bella Center exhibition and congress venue in the Danish capital for the annual scientific congress of the European Association for Osseointegration (EAO). Following a successful event in Athens last year, the congress event more than 2,300 scientists and clinicians involved in implant and restorative dentistry over the course of four days.

Besides an extensive scientific programme covering topics like imaging and factors of implant loss, the event saw a record number of companies exhibiting established clinical solutions and a number of new products, including dental implants and sophisticated surgical equipment. Market leader Nobel Biocare, for example, had its new OsseoCare Pro drill motor, which can be operated entirely through Apple’s iPad tablet computer, on display. Italian manufacturer mectron presented its multipiezo pro device, which can be used for ultrasonic implant cleaning, in Copenhagen.

New implant devices were exhibited by MIS Implants, MegaGen and BioHorizons. Held for the 20th time, the EAO’s latest annual meeting looked back on various issues related to implant dentistry from the last two decades. Acknowledging the progress being achieved in the field, a Saturday morning session titled “Future perspectives of implant dentistry” discussed future prospects of bioactive implant surfaces and the use of computer-guided implant planning, among other topics. For the first time, a session organised by members of the EAO’s Junior Committee also presented new revolutionary ideas that could shape implant dentistry in the years to come.

Having originated from a clinical meeting by implant specialists in the late 1980s, the EAO is today an established authority and one of the most important scientific and clinical forums for implant dentistry in Europe. It is comprised of renowned clinicians and researchers from around the world. With more than one third of visitors coming from regions outside the continent, its annual scientific congress has recently gained more relevance internationally.

Members of the Tivoli Boys Guard entertaining attendees of the opening ceremony.

A record number of companies exhibited at the 20th EAO congress.
Stone-age dental filling identified

Robert Selleck
DT Germany

SAN FRANCISCO, USA: A team of Italian and Australian researchers appears to have found physical proof that restorative dentistry dates to the Stone Age. The researchers identified traces of a dental filling made of beeswax in a Neolithic human tooth discovered in Slovenia, and they are saying it may be the “earliest known direct evidence of a therapeutic-palliative dental filling.”

The researchers listed several previously known examples of ancient dentistry but said there was no known published documentation of the use of “therapeutic palliative substance in prehistoric dentistry.” The research team also referenced documentation on the use of beeswax as a binding agent in antiquity—and explained the substance’s ability to remain preserved for long periods of time because of its “extreme chemical stability.” The team’s conclusion: “In this emerging framework of ancient dental therapeutic practices, the finding of a human partial mandible associated with contemporary beeswax, covering the occlusal surface of a canine, could represent a possible case of therapeutic use of beeswax during the Neolithic.”

The 12-person team of researchers from university and governmental facilities in Italy and Australia used synchrotron radiation computed microtomography, accelerator mass spectrometry radiocarbon dating, infrared spectroscopy and scanning electron microscopy to separately analyze the tooth, bone and filling material.

Based on the radiocarbon analysis, the mandible was dated to an age range of 6,055–6,400 years Before Present and the filling, 6,045–6,440 years BP.

The research findings were published Sept. 19 in PLoS ONE, the peer-reviewed, open-access journal, accessible online at www.plosone.org.

The research team also referenced the use of beeswax during the Neolithic.”

The team’s paper is titled, “Beeswax as Dental Filling on a Neolithic Human Tooth.”

In a note regarding the funding of the research project, the team wrote, “This work is part of the ICTP/Elettra EXACT Project (Elemental X-ray Analysis and Computed Tomography) funded by Friuli Venezia Giulia (Italy). The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.”

The research team includes:...
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Maxillent brings sinus lift implant to Hong Kong

HONG KONG: Maxillent has recently signed an exclusive agreement involving its iRaise dental implant with medical device distributor Pioneer Richter Medical Distribution. Under the terms of the contract, the Chinese company will be allowed to market and sell the device in Hong Kong’s growing dental implant market, Dental Tribune Asia Pacific has learned.

Shanghai-based Pioneer already distributes a number of products from different dental manufacturers in China, including those from German dental lab supplier Wieland Dental. Maxillent CEO Gideon Fostick said that the company was selected owing to its expertise and reach in Hong Kong and other Asian markets. Other details were not disclosed.

The deal is Maxillent’s first attempt at gaining a foothold in Far East, where an increasing number of dental practitioners have begun to offer implants as a treatment option. According to a survey conducted by researchers at the University of Hong Kong’s Faculty of Dentistry, more than 60 per cent of dental practitioners in the city were already practising implant dentistry in 2006. Up to now, the market has been shared by Western manufacturers like Nobel Biocare and Straumann, which have been rivalled by low-cost providers from South Korea in recent years.

Maxillent’s iRaise dental implant features an internal channel that allows clinicians to inject fluids directly through the implant into the sinus, a novel procedure that significantly reduces complications, as well as chair and recovery time, compared with traditional sinus lift procedures, the company said.

In addition to iRaise, Maxillent currently distributes a tapered implant under the Sure brand, as well as prosthetics, surgical instruments and bone grafts, in Israel and several European markets.

Cortex announces new implants

COPENHAGEN, Denmark: At the EAO annual scientific congress, the Israeli company Cortex recently showcased its whole range of products and new ideas for the future of implantology. Dr Meir Mamraev, CTO and Senior Vice-President of R & D, said that besides launching new devices soon, his company intends to increasingly target markets in North America.

Founded in 2008 by a group of oral and maxillofacial surgeons, clinicians, opinion leaders and investors in the dental industry, the company based in Shlomi has dedicated itself to designing and producing top-level tooth replacements. Besides dental implants, it also manufactures and distributes prosthetic components like abutments and various instruments for dental implant surgery.

Cortex products are currently available in major markets including Asia, where the company recently received approval by the Chinese State Food and Drug Administration, as well as Latin America and Europe. “Although we already have 50 distributors worldwide, we are still looking for new partners,” Mamraev said.

“We are not present in the US yet but we are considering moving a part of our production there and opening a subsidiary, to ensure that we are ready for this large and demanding market.”

He added that his company is constantly working on new patents and clinicians can soon expect to see a new wide implant for immediate loading and a mini implant for flapless procedures, among other things.
Digital dentistry conference draws over 500 to Singapore

(CAPP) has announced. According to its figures, more than 520 dental professionals took part in the event, which was sponsored by major market players and saw 14 lecturers from around the globe presenting in fields like computer-guided surgery and 3-D dental imaging.

Plans for a follow-up conference in the city-state are already being discussed and will be announced in the coming weeks, CAPP officials recently told Dental Tribune Asia Pacific. The event will be held in autumn next year after the organisation’s eighth Dubai congress scheduled for May 2015.

CAPP has been organising congresses for dental CAD/CAM and computerised dentistry in the Middle East and Africa. As a spin-off of its successful annual series there, a conference was organised for Asian dentists for the first time this year. Besides a three-day scientific programme, it offered a theatre presentation on chairside CAD/CAM-fabricated restorations, as well as a parallel session that aimed to provide dental technicians in the region with an overview of the latest digital technology and guidelines for its use in dental labs. In addition, renowned orthodontist Dr Khaled Abouseada held a workshop on using ClearPath, a US-developed invisible orthodontic therapy manufactured and distributed by ClearPath Orthodontics in Saudi Arabia, with dental CAD/CAM.

Prof. Seung-Pyo Lee and Shin-En Nam from South Korea won the poster presentation competition with their new method of measuring interdental space using 3-D virtual models. They competed against fellow researchers from South Korea and Malaysia, who presented latest findings on digital restoration using implant prostheses, among other things.

“We should all be open to learning about the newest technologies,” Dr Kuan Chee Keong, President of the Singapore Dental Association (SDA), remarked. “CAD/CAM technology is inevitable and it is a very good idea to hold such a conference here.”

Keong added that his association will continue to support CAPP’s efforts in Singapore in the years to come. The SDA has worked with the company over the last 12 months to raise awareness of the event among local dentists, who represented more than 40 per cent of the conference attendees.

The event also received support by Dental Tribune’s flagship publication DT Asia Pacific, as well as its CAD/CAM international magazine of digital dentistry. CAPP recently partnered with the international dental publisher, agreeing to manage it’s operations in the Middle East and Africa.
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Aesthetic restorations using veneers made from a leucite glass-ceramic ingot for press technology

Orthodontic pre-restorative treatments can sometimes put a patient's patience to the test. Lingual brackets in conjunction with a labial impression technique can shorten treatment time.

Dr. Seung-Kyu Lee & Ha-Sung Yoo
South Korea

An 29-year-old patient came to my clinic to have her discoloured teeth in the maxillary and mandibular anterior dentition treated. She requested laminate veneers, as the discoloration had not improved even after several tooth-whitening procedures had been performed. There were other problems, like severe crowding and malocclusion of the teeth, which had to be treated orthodontically prior to prosthetic restoration (Figs. 1–3). The patient was therefore referred to an orthodontist for preliminary treatment. Although the orthodontic treatment had not been concluded yet, the patient came to the clinic again after six months and strongly urged us to provide her with laminate veneers to improve her aesthetic appearance.

After intensive discussion with all parties involved and after having contemplated all the technical and medical options, we found a way to meet the patient’s request by providing her with laminate veneers during the orthodontic treatment (Figs. 4 & 5).

Since the patient had already received orthodontic treatment in the form of lingually attached brackets (Fig. 6), the impression was taken from the labial side with an individual tray. Using an individual tray, we were mostly able to avoid interference by the brackets (Fig. 7). In order to evaluate the functional and aesthetic possibilities, we fabricated a wax-up. A silicone key, created on top of the wax-up on the model, served as a guide to ensure sufficient reduction during veneer preparation (Fig. 8). Figures 9 and 10 show the preparation in more detail.

At the same time, a provisional restoration was fabricated in acrylic material based on the wax-up (Fig. 11). The accuracy of fit was optimised through intra-oral relining. We added acrylic resin material to the lingual and interdental areas to keep the provisional veneers in place.

Owing to the tooth shade of A1.5, we decided to use the leucite press ceramic IPS Empress Esthetic (Ivoclar Vivadent) in shade ETG1, which is suitable for very bright shades or after tooth-whitening procedures. IPS Empress Esthetic ingots generally show a lifelike light-scattering pattern and offer a balanced chameleon effect. They are available in 12 ingots, which feature seven levels of translucency, and are used to fabricate single-tooth restorations (veneers, inlays, onlays, partial crowns, and anterior and posterior crowns).

The veneers were pressed according to the fully anatomical wax-up. In order to design natural-looking mamilon structures, the incisal third was reduced. We applied IPS Empress Esthetic Veneer wash pastes (Modifiler Sky Blue, MM yellow-orange, MM reddish-orange, high value and others) and fixed them at 650 °C in order to imitate the internal characteristics in the area of the incisal third. Subsequently, the veneers were covered with IPS Empress Esthetic Veneer layering materials (Incisal Opal LT, MM, and HT, and Incisal White and Orange) and other layering materials and then fired. Considering the patient’s age, we did not include any abrasion marks in the incisal area or on the surface. After glaze firing, the surface characteristics were designed with the help of silicone polishes. The veneers were then polished using diamond paste (Fig. 12). Finally, we applied Varionil II Base (Transparent) to seat the veneers and light cure them.

Figures 13 and 14 show the treatment outcome, with which the patient was extremely satisfied. The orthodontic treatment of the patient went on for another 12 months.

The long-term outcome is of particular interest to any treatment team for obvious reasons. After completing the orthodontic treatment, therefore, fixed lingual wire retainers were applied in order to stabilise the new position of the maxillary and mandibular anterior teeth. Figures 15 shows a photograph taken at a follow-up appointment after three years.

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The advent of CAD/CAM technology and the more widespread utilisation of implants in modern dentistry have led to an explosion of treatment solutions designed to address any situation encountered by the general dentist.

As patients have become more aware of the benefits of implant therapy, they have begun to demand more immediate restoration of their teeth. The provision of a fixed prosthesis has always been the goal in dentistry; however, the cost of such treatment is pricing the vast majority of patients out of the implant market. Immediate loading, avoiding conventional grafting techniques by placing implants in various angulations (MI-8, Nobel Biocare; Columbus Bridge, BIONIT 3), has resulted in a significant uptake of treatment by edentulous patients. Treatment by edentulous patients resulted in a significant uptake of this type of occlusal loading. Tissue flaps are not designed to function under this type of occlusal loading. This continuous movement of the prosthesis results in loss of the supporting bone (or mucosa) and, eventually, denturing the denture. Poor ridge form increases denture instability and this produces more remodeling. Edentulism fulfills the WHO definition of physical impairment.

Treatment protocols

A similar treatment protocol was devised to treat this problem. According to this protocol, two dental implants are placed in the interforaminal area of the mandible, to which either a bar or stud attachments are connected to retain the lower denture. This treatment greatly reduces the number of surgical steps and surgical efficiency and function in patients.

Over the last two decades, attempts have been made to redesign and improve the implant-retained overdenture, in particular, the SFI-Bar.3

The SFI-Bar is a modular system that connects multiple dental implants with no soldered or laser-welded joints. An implant-level master cast will be required for cutting in the laboratory. The cutting of the tube bar must always be carried out extra-orally. Once the tube bar has been cut, the ball joints are inserted into each end of the tube bar prior to seating on the implant adapters (Figs. 7a–c) and torqued into place. The SFI-Bar is now complete and the patient is ready for the retentive element to be housed in the denture. The ball joints can accommodate non-parallell implant placement up to a maximum of 15° angulation correction. The absence of any soldered or welded joints means that a greater length of the bar can be engaged by the retentive clip. In conventional techniques, the presence of a weld increases the bar thickness, at that point preventing any retentive clip engaging that area. In the SFI-Bar, the clips engages the full length of the bar between the ball joints (Fig. 6). The bar assembly must be parallel with the occlusal plane; therefore, a selection of implant adapters of varying lengths should be available.

The path to place more implants in an attempt to improve the situation led to the bar- and clip-retained overdenture scenario. This technique was more successful but still encountered similar issues to the stud-attachment overdenture.

Poor stress transmission from the prosthesis to the supporting implants results in bone loss around the implants (especially the most distal implants in the multiple bar scenario), in addition to prosthetic and surgical complications. This resulted in implant companies and clinicians moving away from two implant-retained overdenture treatment option in favour of fixed solutions, such as crown-bridge restorations fixed on four or more implants. As a result, the vast majority of patients are keen to access implant therapy owing to financial constraints. The McGill consensus brought the implant-retained overdenture back into the spotlight as a way of increasing access to implant dentistry and improving patients’ quality of life. Improved component manufacturing techniques, and greater care and attention to both surgical and restorative treatment planning have significantly improved treatment outcomes using overdentures.

Recently Cendres+Métaux introduced the Stress Free Implant Bar, or SFI-Bar, to the dental community. This unique, implant-platform independent retentive bar overdenture solution allows the fabrication of a true passive-fit bar and clip system on two or more implants (Fig. 1). Finite element studies and clinical evaluation of the system have found minimal stress transmission from the prosthesis to the implants under loading (Figs. 2a–c), with most stresses being evenly distributed between the supporting implants. Vertical loads are transmitted effectively to the supporting implants, while undesirable lateral stresses are largely eliminated. More recent clinical studies have also shown it to be a viable immediate-loading treatment solution. The technique is in its infancy, so long-term (five years or more data) is not available. The SFI-Bar is a modular system that connects multiple dental implants with no soldered or laser-welded joints. The minimum inter-implant distance is 8 mm and the maximum is 20 mm. This is an expandable bar system, in which add-on kits (Fig. 1) can be used to incorporate multiple implants to create a roundhouse bar. Implant adapter abutments are first torqued onto the implant (Figs. 4a & b). They form one half of a universal ball joint—the other half being incorporated into the bar element. The bar itself is formed by a hollow tube bar that fits onto the end of each ball joint (Fig. 2e). This tube bar is cut to the correct length using a specialized jig and cutting disc (Figs. 6a–c). The jig is designed to mimic a ball joint connection, ensuring a perfect section each time. The jig slides along the tube bar until it reaches the implant adapter, accurately sizing the bar. The tube bar is then locked in place and cut to size with a cutting disc (Fig. 6e). This process can be carried out either chair side (two-implant bar) or in the laboratory (four-implant bar or larger). An implant-level master cast will be required for cutting in the laboratory. The cutting of the tube bar must always be carried out extra-orally.

Most of the major implant companies offer CAD/CAM-fabricated bar and clip solutions. However, these bars are relatively expensive and are fabricated through a conventional impression and master cast technique. Studies have shown that 50 per cent of all errors during impression making and cast fabrication result in non-passive fit of bars and frameworks. Thus, any bar fabricated through an impression or cast technique cannot be truly passive.3,4 A clinical case will be presented below in order to demonstrate the different chair-side methods. The patient was not keen to have any nerve repositioning or complex bone grafting. Another important factor negating the fixed solution was the size of the volume defect. This would have been difficult both to correct and to maintain and would have produced a poor aesthetic result. The additional bulk of denture flanges allowed proper facial support.

After discussing all the relevant issues, the patient initially presented, complaining of an ill-fitting lower denture. The patient had worn a conventional complete mandibular denture for over 20 years, opposing a metal-based maxillary removable partial denture. The patient had visited a dentist on several occasions to try to improve the situation. After multiple refining procedures, the patient decided to seek expert help. An OPG radiograph revealed a severely resorbed mandible that clinically presented as a classic horseshoe deficiency (Figs. 9a–c). Radiographic examination revealed there was adequate bone volume in the anterior region for the placement of denture implants. However, a fixed solution would only have provided the patient with a better fitting denture, leaving the lower edentulous area open to any nerve repositioning or complex bone grafting. Another important factor negating the fixed solution was the size of the volume defect. This would have been difficult both to correct and to maintain and would have produced a poor aesthetic result. The additional bulk of denture flanges allowed proper facial support.

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denture. This denture functioned without surgical or prosthetic issues for a five-year period. Unfortunately, the patient revisited her dentist and complications arose after an attempted intra-oral refining procedure. On examination, it was determined that the ball abutments had become loose and needed to be replaced. The female housings needed to be replaced, as they were no longer seated properly on the ball abutments.

The patient was then given the option of having either another ball-abutment-retained overdenture or a bar- and clip-retained overdenture instead. The patient opted for the bar and clip overdenture. The first step was to remove the damaged ball abutments and seat the appropriate implant adapters on each implant (Fig. 9a b). Then, the adapter was torqued into place. The disc implant adapters on each implant was to remove the damaged ball abutments. The bar assembly then was connected to the implant adapters and torqued into place. The universal nature of the bar joint allows the bar to be located in the horizontal plane in a truly stress-free alignment (Fig. 2a–c).

The implant adapters were chosen so that when the bar is seated it is parallel to the occlusal plane, with at least 1.0 mm clearance between the underside of the bar and the mucosal surface (Fig. 7b). This allows for the effective and viable biomechanical procedures around the dental implants and reduces the risk of tissue damage around the bar when the denture is seated. From a surgical perspective, ridge reduction procedures may be required firstly to aid implant placement and secondly to ensure that there is enough space to fabricate the final denture to be seated on the bar assembly. If multiple implants are used, adapters with a range of lengths should be used. Multiple implants are more difficult to place parallel to other teeth, but the bar joints can accommodate up to 15° of implant divergence. Surgical complications are seen more commonly in bar and clip overdentures than in stud-attached overdentures. Clinically, the whole procedure took six minutes, from removing the bar assembly to fabricating the bar assembly into place.

The ball-abutment-retained denture was then hollowed out so that it could be seated over the bar assembly and used as a provisional while the new definitive denture was being fabricated. A custom tray was used to make a border-moulded final impression with Impregum (3M ESPE). After blocking out the bar assembly, new abutments were fitted (Fig. 8). A wax occlusal rim was then used to determine and fabricate the vertical dimension of the occlusion and obtain a CR record. This was followed by a full denture try-in to ensure that all the aesthetic, phonetic and occlusal parameters were correct. At this point, the denture was ready to be processed. The denture is processed as follows:

In the laboratory technique, the denture is processed and a window is cut into the denture, through which the dentist can pick up the female part (made from Edilor — 0.6% per gold alloy), using self-curing acrylic resin in the patient’s mouth after seating the spacer and blocking out all overdentures (Fig. 10).

The total width of the bar with the E clip seated is 4.5 mm (Fig. 12) and 5.6 mm with the T clip seated (Fig. 11a). This is relevant for treatment planning, as ridge reduction may be indicated in order to provide space for the denture. In the laboratory method, the denture is completed with the female part T integrated into the denture. The dentist then chooses the level of retention required by selecting the appropriate plastic inserts and seating them in part T (Fig. 11b). The plastic inserts are designed to compensate for transient inaccuracies during the impression, master cast fabrication and post-processing stages. The presence of a laboratory technician is recommended for the chairside technique. A spacer is placed on the tube bar prior to seating the E clip to ensure vertical resilience. The spacer ensures a slight gap between the E clip and the tube bar so that when the patient bites down, the E clip does not overload or distort the bar as the denture beds into the supporting mucosa. All undercuts around the bar assembly, especially between the bar clip and tissue, were blocked out with a silcone material (Fig. 10). A window was then cut into the lingual aspect of the denture to expose the E clip (Fig. 11a). A small bead of cold-cure acrylic resin was then placed on the E clip, covering the retentive element of the clip. The E clip was then attached to the denture with small increments of resin (Fig. 11b). The resin was allowed to cure fully before the denture with the E clip was removed from the mouth. The remainder of the void was then filled with cold-cure resin and allowed to cure outside the mouth (Figs. 13a b). Ideally, this process should take place in a pressure pot.

A transfer jig that fits into the E clip and is effective a tube bar replican be utilised if a large volume of acrylic has been used to house the E clip. The transfer jig seated in the E clip is bedded into a patty of fast-set plaster, similar to a denture-repair technique. Once the stone has set, the denture is placed in a pressure pot with warm water and the self-curing resin is allowed to polymerise. Once the acrylic has fully cured, it is separated from the stone base and the transfer jig and all excess acrylic is trimmed. At least 50 per cent of the lamellae of the E clip must be clear of resin. Only the superior part of the E clip with the attachment portion and shoulder section is locked into acrylic (Fig. 1c). The lamellae must be free to flex over the tube bar during insertion and removal of the denture. If the resin is in direct contact with the lamellae, the denture may not seat, as the E clip cannot flex. Finally, the definitive prosthetic was seated (Figs. 14a b).

The level of retention of the E clip was adjusted using the activating and deactivation tools provided in the restorative kit. The occlusion was checked and adjusted after verifying that the denture had been properly seated, using pressure-indicating paste. The bar assembly is required to retain the denture in the two-implant scenario. Support is provided from the conventional hard- and soft-tissue load bearing areas like the residual ridge and the buccal shelf. The patient was then instructed on appropriate care of the implants and the prosthesis, and a routine recall and maintenance programme was instituted.

Discussion

It is imperative that the block-out procedure around the bar assembly is correct. Otherwise acrylic will enter an underformed area and cause loss of the denture to the bar assembly. As a consequence, there would be no option but to cut the denture from the bar to free it. This will not only ruin the denture, but may also damage the bar—a very costly and time-consuming mistake. The E clip is designed for use with the two-implant bar and should be picked up with a self-curing resin as explained. The T clip is for a laboratory-processed denture on four or more implants, as the plastic inserts correct any processing errors. It must not be used in a two-implant situation.

Several studies have shown that conventional bar- and clip-retained overdentures transfer significant stress to the supporting peri-implant tissues (mainly bone).1 5–8 The key to the SFI Bar system is that the bar is assembled in the patient’s mouth without the use of soldering, laser welding or conventional bonding techniques, thus reducing stress transmission to bone and hence around the implants. Studies have demonstrated that any laboratory-based technique that requires a master cast made from a dental impression will result in a bar that is not truly passive.9 10 A result, several authors have suggested that the only way to achieve a passive fit would be to assemble the frame work intra-orally and then bond the bridge pontic in place. Th is is the method employed with this system.

There is no casting, soldering, laser welding or bonding of compo- nents when fabricating a definitive bar. This, combined with the universal ball-joint nature of the components allows a true passive fit when the bar is assembled. The finite element analysis clearly shows the stress-free nature of the bar when being assembled and when the prosthesis experiences loading (Figs. 2a–c).

No laboratory time is required to fabricate the bar and there are no costly implant components or gold-alloy charges. Clinically, there is no need for the bar sections to be sol- dered in an attempt to achieve pas- sive fit—a step that may need re- peating—as with the conventional method.

There are no soldered or laser- welded joint points. The bar assembly has no inherent weak points that may fracture or corrode. The bar is assembled by the practitioner who also attaches the E clip intra-orally. The reduced number of clinical ap- pointments, laboratory time and component costs result in reduced treatment costs for the patient. In the case presented, for example, the bar assembly was completed in only six minutes. This is approximately 50% faster than it takes for a polyether impression material (like Impregum) to set!

Conclusion

The SFI Bar is relatively inex- pensive compared with conven- tional gold castings and CAD/CAM options. The overall cost of the prosth- esis and treatment time are sig- nificantly reduced compared with conventional and CAD/CAM tech- niques. Precision-milled compo- nents provide an improved quality of fit. The physical and mechanical properties of the component mate- rials can be controlled accurately, which is not always possible with conven- tional casting methods. The SFI Bar can be used with any number of implants to create a full-arch bar if needed, while the SFI-Bar system provides a simple, cost-effective, but may also damage the bar— a very costly and time-consuming mistake. The E clip is designed for use with the two-implant bar and should be picked up with a self-cur- ring resin as explained. The T clip is for a laboratory-processed denture on four or more implants, as the plastic inserts correct any process- ing errors. It must not be used in a two-implant situation.

The finite element data and images were kindly provided by Dr Ludger Keilig, Endowed Chair of Oral Technologies, University of Bonn, Germany.

Disclaimer: The SFI-Bar, implant adapters and E clips were provided by Cravers-Mixau. The author did not receive any payment, nor was asked or encouraged to write this article or payment towards laboratory charges. No kind of payment, gift or reward was received.

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