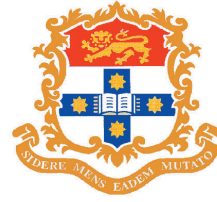


Australian Society
of Orthodontists



University of Sydney



Continuing
your
Orthodontic Education

*Creating **Brighter** Futures*

Continuing your Orthodontic Education

Introduction

It is important to keep up to date with the latest advances in dentistry and this is particularly relevant to orthodontics. Traditionally this involves attendance at continuing education meetings and reading professional literature. In February 2010 the prestigious 'International Orthodontic Congress' is being held in Sydney. This truly international meeting, organised by the World Federation of Orthodontists, is held every five years bringing together the most renowned lecturers and researchers in Orthodontics. The aim of this newsletter is to briefly summarise recent advances in clinical orthodontics, particularly those to be presented at the Congress.

There have been numerous developments in the basic sciences behind the theory and practice of orthodontics. They are paving the way for advances in clinical orthodontics in the two broad areas of diagnostic methods and treatment mechanics.

Diagnostic methods

Improvements in case diagnosis have not been based entirely on new technologies. New concepts include extending case diagnosis beyond the traditional orthodontic parameters and recognising the importance of criteria such as balance in tooth shape and proportionality, thereby applying the principles used by cosmetic dentists to orthodontic cases. These diagnostic criteria can be used to influence the positioning of teeth and jaws, bracket placement, reshaping proximal contacts and teeth, as well as recontouring soft tissues to achieve optimal orthodontic results. Exciting new technologies, including 3D photography and Cone Beam Computer Tomography (CBCT), will also feature strongly at the 7th IOC.

3D photography

There are two main methods used to create 3D photographs of patients. One involves extrapolating 3D imagery from a series of cameras placed around the object, each simultaneously taking a single photograph. Computer matching each photograph with the others then generates the 3D data.

The other method, the technique of structured light, involves projecting a moving grid onto a patient's face and using a series of sequential frames captured in quick succession.

Recent development of 3D facial analyses including superimposition of before and after treatment images allows quantitative assessment of facial changes that occur as a result of growth or produced by different types of treatment. The advantages of acquiring such information photographically, rather than from CBCT scans, include the smaller data file size and avoiding exposure to ionising radiation.

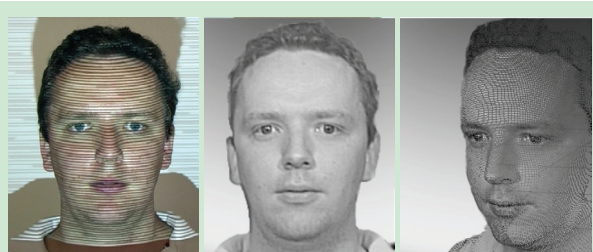


Figure 1. Light patterns projected sequentially onto a 3D object (left) can be analysed and the data from a number of images recombined to form 3D reconstructions of an original 2D image (centre and right).

Cone Beam Computer Tomography (CBCT)

The development of CBCT technology has provided a relatively low cost solution to the limitations of traditional orthodontic radiology where 3D dental and facial structures are represented only in two dimensions. CBCT provides low distortion imaging that allows accurate measurements from the images. The machines use a relatively high voltage (90–120 kV) pulsed beam to minimise soft tissue absorption and reduce exposure to ionising radiation to approximately 3.5 seconds for a 20 second scan. The effective dose of a cone-beam scan with field of view to cover the maxillofacial skeleton can vary from 60–130 microsieverts (μSv) which is equivalent to approximately four to nine conventional OPG radiographs and significantly less than medical CT. CBCT is particularly useful for investigating lesions of the jaws, osseous dysplasias, sinuses, TMJ, 3rd molars, ectopic teeth and fractures as well as treatment planning for orthodontics, orthognathic surgery, orthodontic anchorage implants (TADs) and prosthetic implants.

What is CBCT

Conventional radiographic images are sharply imaged single slices with all layers in the x-ray beam path overlying the desired image. X-ray computer tomography (CT) was developed in the 1960's with the progressive development of detector technology and reconstruction mathematics allowing the generation of increasing numbers of single-slice images without superimpositions. The introduction of multislice detector systems in 1998 led to the ability to acquire volume data and subsequently digital volume tomography (cone-beam volumetric tomography or cone-beam CT).

How does CBCT work

CBCT machines use a cone-shaped X-ray beam rather than the flat fan-shaped beam used in conventional medical CT and a special detector, usually an amorphous silicon flat panel. The X-ray source and detector orbit around the patient taking approximately 10–20 seconds to image a cylindrical or spherical volume referred to as the field of view. The size of the field of view can vary, but typically a volume 15cm diameter by 13–15 cm in height will image most of the maxillofacial skeleton required for orthodontic analysis (Fig. 2). Alternatively the field of view can be collimated to image a confined region specified for purposes such as implant planning (Fig. 3).

The volume of data is collated by a computer into cubes or voxels, referred to as the primary reconstruction, with voxel size calibrated from 0.4 mm to 0.25 mm or even as small as 0.12 mm for superior image resolution, which is considerably smaller than in medical CT images. Computer software can be used to select

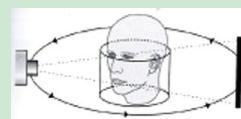


Figure 2. Acquisition of facial volume

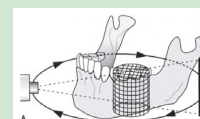


Figure 3. Collimation to isolate implant volume

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Global Child Dental Health Taskforce

The local and overseas Taskforces, established 3 years ago, have brought about many achievements and changes. The Australasian taskforce, chaired by Professor Andy Blinkhorn (Uni of Syd), is made up of representatives from universities, public health, ANZSPD, ADA, NZDA, DHAA, ADOHTA and Colgate.

In 2006, Colgate pledged to donate 30 million tooth-brushing kits worldwide over a 5 year period. The ANZ Taskforce is distributing 100,000 kits each year throughout Australia and NZ. The kits are used in evidence-based oral health promotion activities supporting the National Oral Health Plans. In addition the ANZ taskforce has sent kits to Dr Callum Durward in Cambodia to support his work with disadvantaged children, particularly in orphanages. Kits are also available for small scale oral health promotion activities which individuals or groups may wish to undertake. If interested, please contact Dr Barbara Shearer at barbara_shearer@colpal.com.

Another important role for the Taskforce is to support the leaders of the future. Earlier this year the third Senior Dental Leaders' course took place at King's College in London. Dr Julie Satur (Uni of Melb) represented the South Pacific region. Previous representatives have been Associate Professor Angus Cameron (2007) and Dr Callum Durward (2008). Colgate is proud to have supported the course fees and accommodation for these participants.



Figure 4. 3D imaging of left facial cleft

voxels for construction of a specific view referred to as the secondary (multiplanar) reconstruction. It is possible to reconstruct traditional views such as an OPG and cephalometric views, or to produce 3D images (Fig 4).

However, although it is conceivable that CBCT could displace traditional dental radiography and medical CT imaging in the future, at present there are still limitations to its use in orthodontics. Orthodontics has traditionally relied on cephalometric analysis for the diagnosis of skeletal problems, analysis of treatment changes and growth measurement. At present there are no cephalometric analyses available for 3D CBCT images. Increasingly the focus of lectures on CBCT is the integration of these images into contemporary orthodontic diagnosis and treatment planning.

Treatment mechanics

There has been extensive and continuing development of various orthodontic auxiliaries such as temporary anchorage devices (TADs), aimed at simplifying and extending the versatility of fixed orthodontic appliances. Reduction of friction at the bracket-archwire interface has been a goal for many decades. Different bracket types and appliance systems, which vary considerably in their philosophy and design, have also been developed and are available to clinicians to provide them with a greater variety of clinical choices than ever before.

TADs

Since 'Brighter Futures 2007-3' dealing with TADs there have been considerable advances in this area. As well as being an important part of the 7th IOC programme, TADs will have a full day's pre-congress course devoted to highlight these changes.

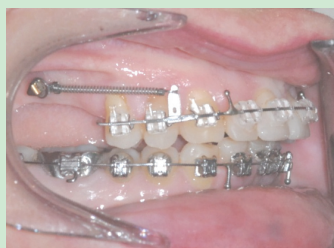


Figure 5a.

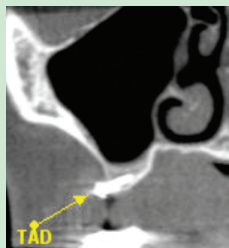


Figure 5b.

Photograph and CBCT image of 8mm TAD placed below right maxillary sinus

Bracket systems

Self-ligating brackets, which use integrated mechanical clips to hold the archwires in place rather than elastomeric o-rings or steel ligature wires, are now common in the orthodontic marketplace. However, the concept is not new as the 'Russell Lock' edgewise attachment was described as early as 1935. Numerous designs have been introduced since then but self-ligation did not become popular until the introduction of the Speed appliance in the early 80's. More recently, other designs have appeared with various claims by the manufacturers including faster ligation, lower friction, faster treatment, less pain, and fewer appointments.

Recent independent studies have questioned the validity of these manufacturers' claims. However some independent studies have shown reduced friction with self-ligating brackets, especially in the early stages of the treatment, and this should aid in more efficient early alignment of teeth. These same studies show similar levels of friction at the bracket-archwire interface in the later stages of treatment reducing the benefit of using the self-ligating brackets from a mechanical point of view.

Self-ligating brackets have been categorized as being 'Active' or 'Passive'. The active design has a spring clip that, depending upon the wire dimension, will apply an active force on the archwire. Examples of active self-ligating brackets include the Speed appliance, GAC In-Ovation and the 3M Smart Clip systems. The passive design, such as the Ormco Damon appliance, has a slide or clip that will not apply any active force of its own. The merits of both are a source of considerable debate, which will be continued at the 7th IOC.



Figure 6. Self-ligating brackets from left to right; Ormco Damon, 3M SmartClip, Gac In-Ovation and Speed System.

The TP Tip Edge Plus appliance varies from other bracket systems in that it has been designed with a cut-out on the bracket wing to permit controlled tipping of teeth as an integral part of the treatment process (Fig 7). The manufacturer claims rapid correction of deep overbites and large overjets in the initial stages of treatment, while at the same time reducing friction to provide more efficient treatment and lighter forces. The bracket has a rear bracket slot (Fig 7) that can be used in isolation for passive self-ligation or it can also be used in combination with the main archwire slot to intentionally increase friction between a bracket and the archwire to restrict the movement of selected teeth for the purpose of differential tooth movement.



Figure 7. Tip Edge Plus bracket from front and rear.

Customised bracket systems based on 3D virtual imagery are a recent innovation. After formulating a treatment plan the patient's impressions or dental casts are sent to a specialised laboratory where brackets are individually manufactured according to a computer generated virtual setup and the specified treatment prescription with individual torque and tip values for precision alignment and occlusal co-ordination. Transfer jigs are then used to bond the brackets accurately on the patient's teeth. The laboratory also provides, according to the orthodontist's prescription, customised archwires in various alloys, dimensions and sequences as requested. Such systems potentially have the advantages of greater control in bracket placement and reduced need for wire bending. They also potentially can reduce bracket and wire inventories within the practice.

The 7th IOC programme will cover all these innovations and controversies with a pre-congress day set aside to debate the advantages and disadvantages of the various bracket systems.

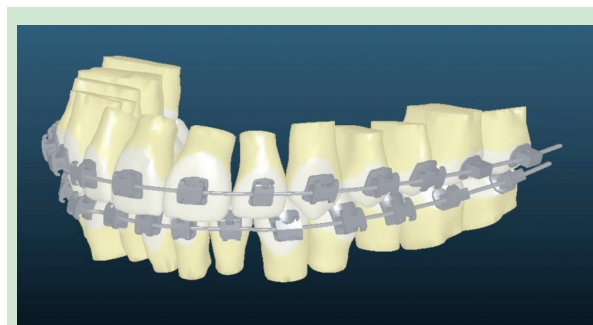


Figure 8. Computer setup showing the virtual position of brackets and archwires, in readiness for appliance manufacture

Brighter Futures is published by the Australian Society of Orthodontists (NSW Branch) Inc. in conjunction with the Orthodontic Discipline at the University of Sydney.

The newsletter is intended to help keep the dental profession updated about contemporary orthodontics, and also to help foster co-operation within the dental team.

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An invitation

The Australian Society of Orthodontists warmly welcomes all dental practitioners to the 7th International Orthodontic Congress to be held in Sydney from the 6th to 9th February 2010. This will be the first time that such an auspicious orthodontic event has been held at a location outside either the USA or Europe. The Congress is hosted by the World Federation of Orthodontists, which is the parent body of all national orthodontic societies around the world. The Congress is held every five years and there is a very competitive bidding process to earn the right to stage the meeting. It has been described as the 'Olympics' of Orthodontics. As such, it provides a truly once in a lifetime opportunity to see world renowned orthodontic presenters at a truly International orthodontic meeting.

Attending the 7th IOC is not restricted to orthodontists and is open to all dentists and their staff. It will be of particular interest to all practitioners who seek balanced, broad based and up to date information in the science and application of clinical orthodontics.

Nearly 40 Keynote and over 70 Invited speakers will be presenting with the Principal lecturer being Professor Bill Proffit. He will be presenting on "New Approaches and New Technologies in Modern Orthodontics". All speakers are world authorities in their disciplines and come from all parts of the globe.

The Scientific programme encompasses a wide and varied series of topics, such as the factors affecting tooth movement and root resorption, sleep apnoea, oral medicine, and the management of dental and craniofacial anomalies. Lectures topics comprise the latest diagnostic techniques, including 3D imaging as well as treatment techniques such as sequential plastic aligners, lingual orthodontics, temporary anchorage devices, dento-facial orthopaedics and maxillofacial surgery.

A comprehensive Allied Dental Health Professionals and Staff programme, featuring many respected Australian and International speakers, has also been structured specifically to improve the depth of clinical and professional knowledge of all members of the Orthodontic Team.

In addition there are two Pre-congress courses. The first covers the latest information regarding the use of Temporary Anchorage Devices in orthodontics. The second provides a comparison of a variety of different orthodontic techniques and philosophies. Delegates will also have the opportunity to attend a one day Damon course, or you may prefer to attend a one day course on the latest generation of the 3M Smart Clip bracket.

There are also a number of industry sponsored satellite symposia, and an extensive trade exhibition, providing all practitioners the opportunity to gain further and more specific information on clinical material of specific interest to them. For example GAC will be highlighting their In-Ovation system, TP their InVu ceramic and TipEdge Plus brackets as well as Speed with their pioneering self-ligating bracket system.

Not only does the 7th IOC represent the pinnacle of orthodontic education. There are comprehensive Accompanying Persons and Social programmes that have been organised to enhance the Congress and provide interest for all who attend.

The 7th IOC webpage, www.wfosydney.com, provides further important information about the Congress and you should also visit this webpage to register online. The ASO looks forward to seeing you in Sydney in February next year.

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