Current Concepts in Oral Surgery

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( thankyou to Tim Lord and Francis O’Neill)
Topics to be covered

- Management of third molars
- Autotransplantation
- Neurostimulation
- Piezo surgery
- Stem cell research
- Wrong site surgery
- “Sound bites”
Management of M3Ms

The National Institute of Clinical Excellence (NICE) introduced guidelines relating to TMS in 2000 discouraging the prophylactic removal of mandibular wisdom teeth (M3Ms), however, there is growing evidence, that this may not be in the best interest of the patient resulting in delay of inevitable surgery with additional damage to the adjacent second molar. This prompted the stakeholder group to review of the Faculty of Dental Surgery (FDS) guidelines based on best available research evidence.
What is “new”

• AAOMS have recently revisited their M3M guidelines resulting in the introduction of ‘active surveillance’ for patients with M3Ms without indications for surgery.

• A Finnish group have suggested that most wisdom teeth require removal by age 38 years.

• Older patients have significantly more post operative complications

• Therefore if teeth “likely” to need removal should be done as early as possible
Surgical techniques (Cochrane review)

• Triangular flaps were associated with a reduction in alveolar osteitis at one week and reduction in pain at 24 hours compared with envelope flaps. There was no evidence of a difference in overall infection rates, in maximum mouth opening or in permanent sensation.

• The use of a lingual nerve retractor during M3M surgery is associated with temporary altered sensation 10% of which may be permanent (Mason Blackburn). There remains insufficient evidence to distinguish permanent nerve injuries arising due to lingual or buccal access M3M surgery.
Surgical techniques

• There was insufficient evidence that any wound closure technique (primary versus secondary) was superior to another for the outcomes of alveolar osteitis, postoperative infection or maximum mouth opening achieved after seven days, or reactionary bleeding.

• There was some evidence that the use of a surgical drain was associated with less postoperative swelling and greater maximum mouth opening one week after surgery.
High risk M3Ms-??CBCT

• Where conventional imaging has shown a close relationship between the third molar and the Inferior Alveolar Nerve Canal (IANC), Cone Beam CT (CBCT) may be useful in those cases where the radiographic findings will alter management decisions but current evidence suggests CBCT has little effect on outcome.
CBCT evidence

• As the radiation dose and financial costs are higher than conventional imaging, CBCT should **not** be used routinely in the radiographic assessment of third molars.
Coronectomy

• Coronectomy may be considered for patients at high potential risk of nerve injury because of intimate relationship with the inferior alveolar nerve as an alternative to traditional root retention. Coronectomy is an accepted method for management of high risk teeth (Coulthard et al 2014) and effective in minimising inferior alveolar nerve injury in teeth close to the inferior dental canal (Cervera-Espert et al 2016; Martin et al 2015)
22 year old male patient with partially erupted, vertically impacted 28 (A) which on panoramic radiographs demonstrates an intimate relationship of the root apices to the inferior alveolar canal (B). The crown is exposed by means of a mucoperiosteal flap (C) and the crown resected (D). The returned roots (black arrows indicating the tooth margin) are reduced to a sub-cresol level (white arrows indicate the new socket margin). This leaves undisturbed, retained root fragments below the socket margin allowing for bone formation above the roots.
Important points!

- roots will either be “sealed” over with new bone, or migrate
- When roots migrate migration lucency zone NB not infection!
- Reoperation rate owing to postoperative root migration in oral cavity or infection ranged from 0.6% to 6.8%.
- If leave any enamel socket will not heal
- Copious irrigation and 2 mm below bone level
Root migration evidence

• Coronal root migration after coronectomy was a common finding - more than half of the roots migrated at high rate for 3–6 months postoperatively and then gradually stopped at 12 to 24 months. Leung and Cheung and Hatano et al

• All the studies that have evaluated the root migration have detected actual migration of the root and all studies suggested that most migratory component would be present in the first 6 months postoperatively, with an average migration of 2–3 mm.

• Greater in females; younger patients and with conical roots

Goto et al.
preoperative
After coronectomy
Bone coverage
Migration lucency zone
Root may remain dormant
Allows for dentigerous cyst management
Autotransplantation

- 1954  M L Hale
- 1980s  J O Andreasen
Autotransplantation in Adults

- Poor long term prognosis 70% 5yr
- Replacement resorption causing ankylosis
- External resorption
- Difficulty in removing donor tooth
Autotransplantation in Adults

- Difficulty in exact positioning of transplanted tooth
- RCT almost always required
- Contra-indicating medical history
- Superceded by endosseus implants
Autotransplantation in Adolescents

- Increased long term prognosis 90 - 98%
- Can promote alveolar development
- Can be facilitated by orthodontic appliances
- Ease of removing donor tooth
- RCT rarely required
- Endosseus implants contraindicated
Autotransplantation in Adolescents

**Biological Principles**

- Preservation of periodontal ligament (PDL)
- PDL cells can differentiate
  - fibroblasts
  - cementoblasts
  - osteoblasts
- Preservation of Hertwig’s epithelial root sheath to allow continued root growth
Autotransplantation in Adolescents

**Biological Principles**

- Pulpal regeneration possible (open apex > 1mm)
- Continuing but curtailed root development
- Minimise inflammation in early healing phase
Research

• Stem cells of the apical papilla (SCAP) (Sonoyama 2008)

• Develop from apical portion of the dental papilla

• SCAP exhibits osteogenic, dentinogenic, adipogenic and neurogenic differentiation capabilities when exposed to the respective stimuli.
Research
Autotransplantation in Adolescents

**Indications**

- Caries; early loss of 1\textsuperscript{st} molars
- Tooth agenesis
- Avulsion
- Ankylosis
- Root resorption
- Root fracture
Autotransplantation in Adolescents

**Patient selection**

<table>
<thead>
<tr>
<th>Recipient site</th>
<th>Donor site</th>
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<tr>
<td>• Adequate bone</td>
<td>• Atraumatic extraction</td>
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<td>• Infection free site</td>
<td>• ½ to 2/3 root formation</td>
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<tr>
<td>• Adequate keratinised mucosa</td>
<td>&gt; 2/3; deeper socket, possible RCT</td>
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<td>&lt; ½; Stunted root development, manipulation difficult</td>
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Long term outcome

• Continued development of alveolus

• Continued but shortened root development

• Composite or porcelain veneer to improve gingival health

• Long term survival greater than 90%
In Summary

• Autotransplantation in adolescents is a reliable and predictable technique

• Case selection and timing is critical

• Requires multidisciplinary care best suited to secondary care
Neuromodulation

• Direct stimulation of the nervous system with electrical signals (eg TENs machines)
• Research at Walton centre currently (Dr O’Neill) into sphenopalatine stimulators
• NICE approved for Cluster headaches
• Under investigation for potential use in Trigeminal neuralgia
• It is believed that cluster headaches are caused by a trigeminal-autonomic reflex mediated through the sphenopalatine ganglion. Relieve pain and reduce the frequency of cluster headache attacks by implanting a device in the pterygopalatine fossa to stimulate the sphenopalatine ganglion with small electrical currents.

• Under X-ray control, the lead of the neurostimulator device is advanced subperiosteally along the posterior maxilla in order to place stimulating electrodes in the pterygopalatine fossa. Through the same incision in the mucogingival margin, the main body of the device is fixed medial to the zygoma by means of a small plate.
Activate with handheld device
NB Deep Brain Stimulation now used for

• Parkinson’s disease
• Severe dystonia
• Essential tremor
• Refractory chronic pain conditions
• Tourette’s syndrome
Radiographic appearance of DBS electrodes
Potential for damage to the device from:

- Strong electromagnetic fields - e.g.
  - Defibrillation
  - Electrocautery
  - Therapeutic ultrasound
  - RadioFrequency ablation
  - MRI
- Radiation therapy
Background

- UHA asked to treat DBS patient for extractions under GA
- This led to investigating issues around delivering care to these patients
- No theatre guidelines at present for this scenario – now in development
- The Walton Centre implants approx 75-80yr and rising
  - Encountering these pts will become more common
Guidance – elective surgery GA

• Turn stimulator off during GA
  • To eliminate monitoring artifact
  • Reduce risk of damage to stimulator unit

• Neuromodulation specialist nurse support to check stimulator before and after surgery

• Plan for potential for dystonic reactions when stimulator deactivated
Guidance – elective surgery LA or GA

• Do not use monopolar diathermy and be mindful of bipolar diathermy
• Be aware of potential to encounter leads anatomically
• Do not use magnets or electromagnetic fields near stimulator
  • Do not use magnetic instrument mat or ultrasonic scalers - use hand scalers
Piezo Surgery

• Developed by Tomaso Vercellotti
• Gaining more and more use in OS
• Uses ultrasonic vibrations and results in atraumatic bone cutting
• Avoids the complications of motorized devices
Complications of motorised devices

• Tissue necrosis due to overheating (bone necrosis at 47 degrees)
• Loss of fine touch sensitivity
• Cannot assess cutting depth
• Soft tissue damage
Advantages of ultrasonics

• Cavitation (bubbles) - maintains visibility, creates haemostasis and has antibacterial effect
• Does not cut soft tissues - only mineralised tissue
• Select appropriate tip for procedure
• More touch sensitive (no pressure needed)
• Bone healing is quicker – no damage inflicted on living osteocytes
• Comfortable for patients
TIPS

CUTTING
- Longitudinal vibration: 40 to 200 μm,
- Vertical vibration: 20 and 60 μm

SMOOTHING

NON CUTTING
**SINUS LIFT**

Access window preparation - diamond-coated square or ball-shaped inserts

sinus membrane can be elevated with rounded soft tissue inserts

Atraumatic dissection of a sinus membrane with a lateral approach
* Harvesting Bone Graft

* Dual-angled saw-shaped piezosurgery insert.

* Clean-cut edges of the harvested bone graft.

* Bloodless and clear surgery during osteotomies and fixation of the bone graft.
**ENUCLEATION OF JAW CYST**

* Only a small number of applications have been reported in the literature

* careful removal of the thin bone laminate that covers the cyst

* meticulous handling of the cyst without tearing the epithelial wall, reduced recurrence
STEM CELLS

• Tooth Fairy is likely to become redundant!
2006

• A joint team of scientists from the institute and Osaka University succeeded in repairing damaged liver and bones in rats using stem cells taken from wisdom tooth germ

• However, the new method that uses tooth germ has been shown to create cells of organs faster than the method that uses stem cells taken from bone marrow.

• A rat with a liver disorder made a full recovery three weeks after it received a human tooth germ cell transplant.
2010 – induced pluripotent stem cells

“We generated iPS cells from mesenchymal stromal cells (MSCs) derived from human third molars (wisdom teeth) by retroviral transduction of \( \text{OCT3/4}, \text{SOX2}, \) and \( \text{KLF4} \) without \( \text{MYC} \), which is considered as oncogene. Interestingly, some of the clonally expanded MSCs could be used for iPS cell generation with 30–100-fold higher efficiency when compared with that of other clonally expanded MSCs and human dermal fibroblasts”

2015

- Because the cells proved to produce specific hepatic proteins and to start functions specific for hepatocytes, such as storing glycogen and urea production, we may state that the mesenchymal cell cultures from wisdom and deciduous tooth pulp acquired morphologic and functional characteristics of hepatocytes.


- Deciduous and permanent dental pulp mesenchymal cells acquire hepatic morphologic and functional features in vitro.

- *Ishkitiev N*¹, *Yaegaki K, Calenic B, Nakahara T, Ishikawa H, Mitiev V, Haapasalo*
• Stem cells from the dental pulp of wisdom teeth can be coaxed to turn into cells of the eye's cornea and could one day be used to repair corneal scarring due to infection or injury, according to researchers at the University of Pittsburgh School of Medicine. The findings, published online today in STEM CELLS Translational Medicine, indicate they also could become a new source of corneal transplant tissue made from the patient's own cells.

Where are the stem cells in wisdom teeth found?

Stem cells are found in immature pulp (dental papilla) inside developing wisdom teeth and in the soft-tissue sac (follicle) covering its crown. The pulps of deciduous (baby) teeth and periodontal ligament (PL) also contain stem cells but they are fewer in number. Dental stem cells are derived directly from the developmental cells, which form teeth.
How do you do it?

• Extracted tooth is immediately stored in sterile transport material and cooled
• Transported to lab
• Tooth is cleaned and “cracked” open to remove the pulp
• The soft tissue is collected, processed, and equilibrated for cryopreservation, and then frozen down at a controlled rate and stored long-term in liquid nitrogen.
• Or a cultured cell service. In that case, after the soft tissue is isolated, it is put in culture, and the stem cells grown out and then frozen down.
• Companies are developing all the time-cost is approx. £500 and then £120 per year for storage!
Never Event -WSS

A freedom of information request revealed that in the period 2004-2014 the Clinical Negligence Scheme for Trusts, (NHSLA) recorded 51 claims for wrong tooth extractions by NHS Trusts in England.

Data from the Dental Defence Union (DDU), which represents a third of all UK practicing dental professionals, disclosed 1-2 cases of wrong site tooth extraction are reported by their members in a primary care setting each week.

313 cases each year in primary care.
Should the tooth be re-implanted?

• No research had been done
• No evidence in the literature to advise
• We sought “expert opinion” by conducting a survey of BAOS members
Incorrect tooth extraction – Never say never?

Would you re-implant the tooth?
Incorrect tooth extraction – Never say never?

Would you splint the tooth?

- Yes: 106
- No: 4
- Not specified: 2
Incorrect tooth extraction – Never say never?

How long would you splint for?

- 2 weeks: 48
- 1 week: 17
- 3 weeks: 14
- 4 weeks: 15
- 5 weeks: 2
- 6 weeks: 9
- Other: 2
Incorrect tooth extraction – Never say never?

If reimplanted, would you provide a course of antibiotics?

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<tr>
<td>No</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td>Not specified</td>
<td>2</td>
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Incorrect tooth extraction – Never say never?

[Diagram of the process involving incorrect tooth extraction and decision-making steps, including assessment of tooth condition, need for orthodontic opinion, and immediate action or referral to specialist.]
Soundbites
Soundbites-Buccal infiltration not IDB

• **Purpose**
  
  Profound anesthesia for mandibular molars by buccal infiltration has been tried in recent years, with promising results. This prospective, randomized, single-blinded, crossover study investigated the clinical anesthetic efficacy obtained with 1:100,000 epinephrine plus 4% articaine (A100) 1.8 versus 3.6 mL as mandibular first molar buccal infiltration during removal of impacted lower third molars.

• **Materials and Methods**
  
  Thirty adult patients underwent removal of symmetrically positioned impacted lower third molars in 2 separate appointments. The patients randomly received mandibular buccal first molar infiltration of A100 1.8 or 3.6 mL during surgery. For assessment of anesthetic efficacy, any pain during surgery was rated using the visual analog scale. Also, the onset, duration, and total amount of anesthetic used were recorded.

• **Results**
  
  Compared with the 1.8-mL volume of A100, the 3.6-mL volume showed a statistically higher success rate (93% vs 56%).

• **Conclusions**
  
  Infiltration in the buccal vestibule opposite the mandibular first molar by A100 3.6 mL may be a good option for extraction of mandibular third molars, with supplemental lingual anesthesia.
Soundbites-M3M surgery (FDS)

• When surgery is indicated consideration should be given to administration of steroid medication that may reduce trismus but not surgical pain or swelling.

• Optimal post-surgical analgesia has been described with the combined effect of ibuprofen with paracetamol.

• There is weak evidence that preoperative rinsing with chlorhexidine mouthwash may reduce dry socket. Chlorhexidine containing compounds should not be used for irrigating fresh wounds including extraction sockets.
Soundbites-socket healing

• The use of resorbable collagen membranes (RMs) in the healing of a bone defect on the distal side of a lower second molar (L2M) after surgical extraction of an impacted lower wisdom tooth. “Effects of Collagen Resorbable Membrane Placement After the Surgical Extraction of Impacted Lower Third Molars,” appears in the 2015 Journal of Oral and Maxillofacial Surgery (vol. 73, pp. 1457-1464) written by Isidoro Cortell-Ballester and et. al.

• The effect of platelet-rich fibrin (PRF) on postoperative pain, swelling, trismus, periodontal healing near the second molar, and progress of bone regeneration in wisdom teeth extraction sockets. “Evaluation of Treatment Outcome After Impacted Mandibular Third Molar Surgery With the Use of Autologous Platelet-Rich Fibrin: A Randomized Controlled Clinical Study,” appears in the Journal of Oral and Maxillofacial Surgery written by Nilima Kumar and et al. (vol 73, pp. 1042-1049).
Platelet Rich Fibrin Membrane

• Collect 2 x 5mls venous blood in tubes – no anticoagulant-and centrifuge 3000rpm 10 mins
• 3 fractions-lower cells; top plasma, middle contains fibrin clot and acellular plasma
• Remove middle and compress in gauze to give membrane
Soundbites – nerve repair

• ID nerve-microsurgical repair-retrospective cohort study that evaluated all patients who had undergone microsurgical repair of the IAN by 1 of the senior surgeons from March 1986 through December 2005.

81.7% gained an acceptable level of neurosensory function

Inversely related to time from injury and age

Significant drop at 12 months and 51 years of age

Soundbites 2017 SDCEP
MRONJ
Classification of Patient Risk

• Assess whether a patient taking anti-resorptive or anti-angiogenic drugs is at low risk or higher risk of developing MRONJ based on their medical condition, type and duration of drug therapy and any other complicating factors and record this in the patient’s clinical notes
Soundbites-IV sedation 2017

• Scotland – retaining the original IV sedation guidelines
• England – accepting new guidelines NB Use of Capnograph!!
Soundbites -???really??

• 1989 a US airforce veteran believed he had had an electronic listening device implanted into his extraction socket following removal of his wisdom teeth
• He now has many followers believing the same thing has been done to them.
• The case is still ongoing!
Finally

• Remember that all Oral Surgeons suffer from:-

CENOSILLICAPHOBIA
Meaning

• Fear of an empty glass!!

![Meaning Icon]
Thank you

- Any Questions?