

Point of Care

The Point of Care section of JCDA answers everyday clinical questions by providing practical information that aims to be useful at the point of patient care. The responses reflect the opinions of the contributors and do not purport to set forth standards of care or clinical practice guidelines. Readers are encouraged to do more reading on the topics covered. This month's responses were provided by speakers at the Special Care Dentistry's 16th Annual International Conference on Special Care Issues in Dentistry and 17th Congress of the International Association for Disability and Oral Health, to be held in Calgary, Alberta, August 21–27, 2004. For more information on the joint congress, visit www.scdonline.org or www.iadh.org.



Question 1 How does the Erbium:YAG laser work, and what are its uses in special needs dentistry?

The Erbium:YAG (yttrium-aluminum-garnet) laser can be used for cavity removal. The primary mechanism of action involves the water that is bound to the crystalline structures of the tooth, which absorbs the laser light readily and easily. Vaporization of the water within the mineral substrate causes a massive expansion of volume, which in turn causes a microexplosion of the surrounding material, a process called ablation. Because there is more water in dentin than in enamel, and even more water in carious dentin, ablation of these various tissues occurs at different rates; ablation of enamel by the Erbium:YAG laser is slower than ablation of dentin.

Erbium:YAG lasers are effective for preparing dental hard tissues, the efficiency and depth of the preparation being correlated with the particular power setting and use of a water spray. The Erbium:YAG laser has certain advantages and some disadvantages relative to other modes of tooth preparation. The laser removes enamel more slowly than a high-speed handpiece or air abrasion. However, the laser is more precise than air abrasion for tooth preparation. In most instances, the Erbium:YAG laser numbs the tooth, so there is usually no need for anesthetic. A high-speed handpiece may cause microfractures in the enamel, whereas there is no risk of microfracture with the laser. However, the laser cannot be used to prepare crowns or veneers, nor is it suitable for removing metal restorations.

The Erbium:YAG laser also has applications for soft-tissue procedures. It can be used to remove excess gingival tissue, which sometimes becomes hyperplastic, growing into areas where there are interproximal caries. Neither a handpiece nor an air abrasion unit can be used on soft tissue without causing bleeding, whereas the laser cauterizes the tissue that remains after removal of any excess tissue. The Erbium:YAG laser can also be used for crown-lengthening procedures as part of crown and bridge restorations.

The Erbium:YAG laser has other advantages over the high-speed handpiece, including etching of the enamel during tooth preparation, which increases bond strength by up to 50%. The effect of the laser on the pulpal floor has the result of cooling the tooth, in contrast to the high-speed handpiece, which heats the tooth. The laser sounds like a popcorn popper, very unlike the whining sound of a high-speed handpiece, which makes it more comfortable for the dentist and the patient. The laser also has other advantages over the air abrasion unit. The latter cannot remove caries as easily as the erbium laser, and the air abrasion process is messy, whereas laser preparation is clean. Also, the powder used in air abrasion may cause abrasion of mouth mirrors and may lead to the presence of aluminum oxide dust in the operatory. The erbium laser is slower than Nd (neodymium):YAG and the carbon dioxide lasers for performing soft-tissue surgery. However, the erbium laser can be used for removal of hyperplastic gingival tissue, periodontal surgery and ablation of benign lesions of the oral mucosa.

The Erbium Chromium:YSGG (yttrium scandium gallium garnet) laser has the same applications as the Erbium:YAG laser.

Clinical Uses of the Erbium:YAG laser

The Erbium:YAG laser has a variety of uses related to both hard-tissue and soft-tissue dental procedures. These uses are suitable for both “specially challenged” patients and those who require routine dental services.

Hard-tissue laser dentistry includes preparations for Class I through Class VI restoration of carious teeth. The main advantages of the erbium laser in this situation are the following:

- no anesthesia required because of the numbing effect of the laser (most patients)
- no need to wait for anesthetic to take effect (most patients), making multi-quadrant dentistry possible



Figure 1: Class V caries on teeth 12 and 22.



Figure 2: Erbium:YAG laser preparation with no anesthesia.



Figure 3: Completed Class V composite restorations.



Figure 4: Unerupted maxillary right central incisor.



Figure 5: Excision of gingival tissue with Erbium:YAG laser.



Figure 6: Excision of tissue complete.

- more pleasant experience for patient because anesthetic is not required
- no concern about patients biting lip, cheek or tongue.

An example of preparation of carious teeth is illustrated. The patient exhibited dental caries and enamel hypocalcification because of poor oral hygiene during recent orthodontic treatment (Fig. 1). Preparation of the maxillary right and left lateral incisors for Class V composite restorations was accomplished with the Erbium:YAG laser with no anesthesia (Figs. 2 and 3).

The Erbium:YAG laser can be used for many forms of soft-tissue surgery:

- treatment of gingival hyperplasia resulting from medications
- frenectomy (labial and lingual)
- gingivoplasty
- exposure of teeth to aid tooth eruption
- operculectomy
- gingival removal to expose areas for restorations
- treatment of aphthous ulcers
- pulp therapy
- correction of abnormal gingival architecture associated with orthodontic movement
- excision of soft-tissue tumours (e.g., fibroma, lipoma).

Use of an Erbium:YAG laser in the excision of gingiva overlying an unerupted tooth (Fig. 4) is illustrated here.

The sapphire tip of the Erbium:YAG laser is used to remove the gingival tissue (Fig. 5). There is no bleeding, because of the cauterizing effect of the laser. The laser surgery results in removal of a “window” of tissue, which allows the permanent central incisor to erupt (Fig. 6). ♦



Dr. Fred Margolis maintains a full-time private practice specializing in pediatric dentistry in Buffalo Grove, Illinois. He is a clinical instructor at Loyola University's Oral Health Center. He is a lecturer for Hoya Con Bio. E-mail: kidzdr@comcast.net.

Dr. Margolis' session "The erbium laser and the specially challenged patient" will be held on Wednesday, August 25.

Further Reading

- Coluzzi DJ. An overview of laser wavelengths used in dentistry. In: The Dental Clinics of North America. Philadelphia: W.B. Saunders; 2000. p. 753-66.
- Eversole LR, Rizoju IM. Preliminary investigations on the utility of an erbium, chromium YSGG laser. *J Calif Dent Assoc* 1995; 23(12):41-7.
- Hadley J, Young DA, Eversole LR, Gornbein JA. A laser-powered hydrokinetic system for caries removal and caries preparation. *J Am Dent Assoc* 2000; 131(6):777-85.
- Keller U, Hibst R. Effects of Er:YAG laser in caries treatment: a clinical pilot study. *Lasers Surg Med* 1997; 20(1):32-8.
- Miserendino LJ, Pick RM. Lasers in dentistry. Chicago: Quintessence Pub. Co.; 1995.
- Visuri SR, Gilbert JL, Wright DD, Wigdor HA, Walsh JT Jr. Shear strength of composite bonded to Er:YAG laser-prepared dentin. *J Dent Res* 1996; 75(1):599-605.

Question 2 What are the treatment options for children with oligodontia?

Oligodontia is defined as the congenital absence of 6 or more permanent teeth, third molars excluded. Although rare in the general population, congenital absence of primary teeth is often seen in children with oligodontia. Two major studies of oligodontia in Nordic populations were undertaken in recent years, and prevalence was reported to be 0.17% and 0.08%, respectively.^{1,2}

Oligodontia may be an isolated phenomenon or part of a general medical condition, of which ectodermal dysplasias are the most common. However, oligodontia may be seen in children with such diverse conditions as Down syndrome, Rieger's syndrome or Williams syndrome. Depending on the number and type of teeth missing, oligodontia may represent a major challenge for the affected child. It is important to be aware of the esthetic and social aspects of oligodontia; functional problems may also be present. The absence of teeth is associated with lack of development of the alveolar bone, and the result is poor support of the alveolar ridge. Because freeway space is often as much as 10–15 mm in these cases, dentofacial height may be a problem. In our experience, difficulties with speech and temporomandibular pain are frequent complaints. In some cases, difficulties in mastication are also observed.

Treatment Options

Only limited prosthodontic treatment is usually offered to children with oligodontia. Although implants are occasionally used to treat edentulous children, such treatment is generally not indicated until jaw growth is complete.

Prosthodontic treatment depends on the number and form of the remaining teeth, which often have an altered morphology. This can cause esthetic worries for the patient and technical problems for the dentist. In some cases, remodelling the teeth (using composite) may be sufficient. Most children with oligodontia can be treated with a fixed prosthetic solution. Again, treatment will depend on the

number, morphology and placement of the remaining teeth, as well as the child's growth and motivation. Because crowns and bridges require removal of tooth substance, semi-permanent solutions are preferred.

In cases with few or no remaining teeth, a removable denture is often the only alternative. The timing of the treatment depends on oral conditions and on the child's age and motivation. Retention is often poor and salivary secretory rates reduced.² Thorough planning is necessary before starting the treatment. Frequent follow-ups will be required to modify the dentures.

The case presented here illustrates some treatment options for a child with oligodontia. The patient, a male, was born in 1991 with normal physical and mental development. He presented with congenital absence of 22 permanent teeth and low facial height (Fig. 1). Teeth 51, 53, 61 and 63 were peg-shaped (Fig. 2). When he was 3 years old, his parents requested prosthodontic treatment, and a partial lower denture was made. The denture was retained on teeth 75 and 85. The child was not interested in wearing the prosthesis, and the treatment failed due to lack of cooperation. At the age of 5, the child showed more interest in treatment. His upper teeth were remodelled with composite and a partial lower denture was made (Fig. 3). Treatment evaluation revealed good esthetic results and increased chewing ability. Speech therapy was recommended. The denture was modified every 4 months and the patient was satisfied.

By age 7, all 4 permanent molars had erupted. The lower partial denture had to be corrected. Although facial height was still too low, the child was not interested in further treatment at this time.

At age 10, the lower partial denture was rarely used because of poor retention. The child did not want to have a new denture made, as he managed very well without it. The upper front teeth were still esthetically acceptable to him.



Figure 1: Low facial height as a result of agenesis of 22 permanent teeth.



Figure 2: Peg-shaped primary teeth.



Figure 3: Patient at 5 years of age. The upper teeth have been remodelled and a lower partial denture made.

At age 11, he wanted better esthetics in the upper front teeth. Since a fixed solution in the lower jaw was discouraged, a new treatment plan was made and the youngster is currently being treated by an orthodontist. Implants in both jaws are planned at the age of 20. Due to a small alveolar ridge, a bone transplant may be necessary to ensure successful treatment. ♦



Dr. Kari Storhaug is the director of the TAKO-center, Lovisenberg Diakonale Hospital, Oslo, Norway. The TAKO-Centre is a resource centre for oral health specializing in rare medical conditions. E-mail: Kari.Storhaug@tako.no



Dr. Hilde Nordgarden is a full-time research coordinator at the TAKO-centre, Lovisenberg Diakonale Hospital, Oslo, Norway.



Dr. Eirik Ambjørnsen is a part-time prosthodontist at the TAKO-centre, Lovisenberg Diakonale Hospital, Oslo, Norway.

Dr. Storbaug's session "Short- and long-term treatment possibilities for children and adults with severe oligodontia" is part of the Lunch & Learn event scheduled for Thursday, August 26.

References

1. Rolling S, Poulsen S. Oligodontia in Danish schoolchildren. *Acta Odontol Scand* 2001; 59(2):111-2.
2. Nordgarden H, Jensen JL, Storhaug K. Oligodontia is associated with extra-oral ectodermal symptoms and low whole salivary flow rates. *Oral Dis* 2001; 7(4):226-32.
3. Nordgarden J, Jensen JL, Storhaug K. Reported prevalence of congenitally missing teeth in two Norwegian counties. *Community Dent Health* 2002; 19(4):258-61.

Suggested Reading

Koch G, Bergendal T, Kvint S, Johansson U-B, editors. Consensus conference on oral implants in young patients. The Institute for Postgraduate Dental Education, Jönköping, Sweden. 1996.

Question 3

What are the oral motor disorders, and can they be treated with botulinum toxin?

Several different motor disorders that occur in the orofacial region can be treated with botulinum toxin injections, including severe bruxism, masseter and temporalis hypertrophy, sustained and recurrent masticatory spasm, recurrent open locking of the jaw due to dystonia, orofacial dyskinesia, and excessive tongue motion caused by cerebral palsy. Table 1 lists uncommon orofacial motor disorders, the muscles most often involved and the typical dose of botulinum toxin type A used to manage these problems.¹ Botulinum toxin injections provide some degree of help with true jaw spasms, but it must be understood that this is a palliative treatment only. As far as evidence goes, most of the data available for botulinum toxin-induced motor suppression come from open-label clinical trials or case reports. Unfortunately, because of the rare nature of some of these problems, few orofacial disorders will ever be studied through controlled or randomized trials. Overall, experience and the literature suggest that botulinum toxin is a safe therapy when administered in appropriate doses by experienced clinicians.

Botulinum toxin injections work for 2 to 3 months. The prudent clinician will know the muscle anatomy and avoid misplaced or intravascular injections.

Patients with concerns about speech or chewing ability after a botulinum toxin injection in the jaw can be reassured that masseter and temporalis muscle injections will not affect speech. Speech might be affected following tongue or lateral pterygoid muscle injection. The injections also do not substantially reduce the ability of patients to chew, because they do not fully paralyze the muscles, only weaken them. The 2 most common medication-related side effects are weakness in muscles adjacent to injected muscles and changes in salivary consistency (e.g., diminished and thicker or ropy saliva) in patients who have not had direct salivary gland injections.^{2,3} In most cases, the complications are usually less problematic than the untreated original motor disorder and will not generally stop the patient from seeking additional injections. Fortunately, persistent complications are rare. Some patients develop antibodies to the toxin. It is unclear what factors predispose a patient to the development of antibodies, but some studies suggest that risk is increased by higher doses and more frequent injections. For this reason, injections are limited to once every 12 weeks. ♦

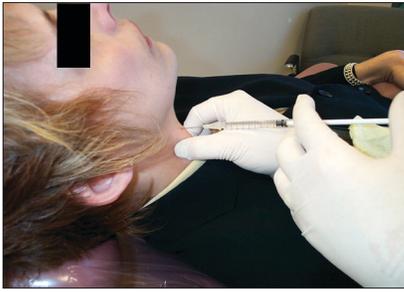


Figure 1: Injection of 5 units of botulinum toxin type A into 1 of the strands of the platysma muscles of a patient with severe dysarthria and spontaneous jaw opening associated with cerebral palsy.



Figure 2: Injection of 15 units of botulinum toxin type A into the left intrinsic tongue muscle.

Table 1 Uncommon orofacial motor disorders treated with botulinum toxin

Orofacial motor disorder	Muscles commonly injected	Dosage ^a and technique
Severe bruxism	Masseter (deep and superficial)	40–60 units per muscle. Inject in 2 or 3 sites in the superficial masseter muscle; try to stay away from the facial motor nerve with these injections and use an extraoral approach with a long 27-gauge needle.
Masseteric or temporalis hypertrophy		
Secondary masticatory muscle spasm (sometimes with actual contracture)	Temporalis (anterior, middle and posterior)	30–50 units per muscle. Inject in 4 distributed sites in the anterior, middle and posterior bands of this muscle using a long 27-gauge needle.
Hemi-masticatory spasm		
Oromandibular dystonia (with recurrent jaw opening)	Lateral pterygoid	20–40 units per muscle. Inject using 1 site for each muscle, depositing the solution slowly; use an extraoral open jaw approach and inject along the axis of the muscle, entering just in front of the condyle with a long 27-gauge needle.
	Anterior digastrics	20 units per muscle. Inject in 2 sites using a submandibular approach to the muscle and a long 27-gauge needle.
	Platysma (Fig. 1)	10–20 units per side. Inject 2 places in each prominent strand of the muscle using a short 30-gauge needle.
Hyperactivity of the tongue	Genioglossus	10–15 units total. Inject in 2 locations at the base of the tongue using an intraoral approach with a long 27-gauge needle.
	Anterior third of the intrinsic tongue muscles (Fig. 2)	15–20 units per side. Inject in 2 locations in the middle lateral side of tongue using a long 27-gauge needle.

^aThe unit doses refer to units of Botox Type A, a product manufactured by Allergan (Irvine, Calif.). Botox Type A is the primary product available and used in North America.



Dr. Glenn T. Clark is professor of diagnostic sciences and director of the Orofacial Pain and Oral Medicine Center, School of Dentistry, University of Southern California, Los Angeles, California. He has no declared financial interests in any of the products mentioned in this article. E-mail: gtc@usc.edu.

Dr. Clark is symposium chair and one of the co-presenters at the session titled “Botulinum toxin, pain, spasms and the special needs patient” scheduled for Wednesday, August 25.

References

1. Clark GT. The management of oromandibular motor disorders and facial spasms with intramuscular injections of botulinum toxin. *Phys Med Rehabil Clin N Am* 2003; 14(4):727–48.
2. Eleopra R, Tugnoli V, Caniatti L, De Grandis D. Botulinum toxin treatment in the facial muscles of humans: evidence of an action in untreated near muscles by peripheral local diffusion. *Neurology* 1996; 46(4):1158–60.
3. Wohlfarth K, Schubert M, Rothe B, Elek J, Dengler R. Remote F-wave changes after local botulinum toxin application. *Clin Neurophysiol* 2001; 112(4):636–40.

Question 4 Do I need to prescribe prophylactic antibiotics for dental patients with body prostheses?

More and more patients with various body prostheses are presenting in dental offices today. Dentists are rightly concerned about the possibility of a bacteremia as a consequence of dental treatment causing infection at the site of a body prosthesis. Although the guidelines for prescribing prophylactic antibiotics for patients with prosthetic heart valves are well known, dentists may be somewhat less familiar with guidelines for prescribing antibiotics before dental treatment for patients with certain other types of prostheses, such as vascular expansion stents, joint prostheses, penile implants and breast implants.

There are no hard and fast rules about antibiotic prophylaxis in such cases; however, consultation with the patient's medical specialist and the dentist's experience are very important starting points for making this type of clinical decision. This article reviews some of the key points dentists should consider when deciding whether to prescribe prophylactic antibiotics for patients with certain types of body prostheses.

Guidelines for Particular Types of Prostheses

Vascular Expansion Stents

This type of device is used to expand obstructed blood vessels (often the coronary arteries). Because thrombosis is a complication with this type of device, patients are prescribed platelet aggregation inhibitors or anticoagulants. During the initial period of 3 to 6 months after placement of the stent, the prescribing recommendations of the American Heart Association may be considered as advisable

(Table 1). Antibiotic prophylaxis is not recommended after the period of 3 to 6 months has elapsed.

Joint Prostheses

This is the family of prosthesis that dental patients will most commonly present with. According to the joint Advisory Statement of the American Academy of Orthopedic Surgeons and the American Dental Association, antibiotic prophylaxis is not routinely required for most patients with total joint replacements.

Some patients may have an elevated risk of hematogenous infection subsequent to undergoing some higher risk dental interventions (e.g. extractions, periodontal procedures, dental implant placement, endodontic procedures beyond the apex). The higher risk patients include patients taking an immunosuppressive medication; patients with autoimmune pathologies, hemophilia or decompensated type 1 diabetes; and patients who have had a prosthesis replaced or previous infections affecting the prosthesis, or who have a desinserted implanted prosthesis. In these cases, the dentist will need to use professional judgement about the need to prescribe prophylactic antibiotics. If antibiotic prophylaxis is indicated, the specifications in Table 2 are recommended.

Penile Prostheses

Some authors claim that there is a relationship between dental procedures and infection at the site of penile implants, especially when there is a short time lag between both procedures (1–4 weeks). In most of these cases the

Table 1 Antibiotic prophylaxis protocol for dental, oral, respiratory tract or esophageal procedures advocated by the American Heart Association

	Route	Dose – adults	Dose – children ^a	Timing
General				
Amoxicillin	Oral	2 g	50 mg/kg	1 hour before
Ampicillin	i.m. - i.v.	2 g	50 mg/kg	30 minutes before
Allergy to penicillins				
Clindamycin	Oral	600 mg	20 mg/kg	1 hour before
Cephalexin	Oral	2 g	50 mg/kg	1 hour before
Cefadroxil	Oral	2 g	50 mg/kg	1 hour before
Azithromycin	Oral	500 mg	15 mg/kg	1 hour before
Clarithromycin	Oral	500 mg	15 mg/kg	1 hour before
Allergy to penicillins and incapacity to receive prophylactic treatment via the oral route				
Clindamycin	i.v.	600 mg	20 mg/kg	30 minutes before
Cefazolin	i.v. - i.m.	1 g	25 mg/kg	30 minutes before

^aThe pediatric dose should never exceed the adult dose. Cephalosporins should not be administered to children.

Table 2 Suggested antibiotic prophylaxis regimens

Patient type	Suggested drug	Regimen
Patients not allergic to penicillin	Cephalexin, cephadrine or amoxicillin	2 grams orally 1 hour before dental procedure
Patients not allergic to penicillin and unable to take oral medications	Cefazolin or ampicillin	Cefazolin 1 g or ampicillin 2 g intramuscularly or intravenously 1 hour before dental procedure
Patients allergic to penicillin	Clindamycin	600 mg orally 1 hour before dental procedure
Patients allergic to penicillin and unable to take oral medications	Clindamycin	600 mg intravenously 1 hour before dental procedure ^a

^aNo second doses are recommended for any of these dosing regimens.

patients were diabetic. According to a 1992 survey, 58% of the urologists in the United States considered that there is a slight risk of penile implant infection following dental treatment. A current tendency is to consider glycosylated hemoglobin assays before deciding to provide prophylaxis.

Breast Implants

Lack of scientific evidence has prevented the systematic prescription of prophylactic antibiotics before dental treatment in patients with breast implants. One group of authors has claimed a relationship between infectious processes and a breast implant following endodontic treatment. The isolated germ in this case was *Clostridium perfringens* type A. Late breast implant infections have also been described in association with bacterial stomatitis. For this reason, some authors advocate the use of cephalosporins as prophylaxis for dental procedures.

Patients with breast cancer who receive breast implants following mastectomy may be immunosuppressed because of anticancer therapy. This may place them in a higher risk category for developing late peri-implant infection following dental treatment.

Conclusion

Antibiotic prophylaxis is not indicated on a routine basis for patients with body prostheses, except for patients carrying heart valve prostheses. The final decision to prescribe prophylactic antibiotics should be made after evaluating each patient on an individual basis.

Before providing dental treatment, dentists must carefully evaluate the risk factors associated with the patient's condition, and those associated with the dental interventions planned. Practitioners should pay particular attention to pathological conditions or drug therapies that could suppress the patient's immune system. A final therapeutic consideration hinges on whether oral interventions are required immediately or whether they can be postponed for approximately 6 months after body prosthesis implantation. ♦



Dr. Antonio Cutando is full professor at the Special Patients Integrated Clinic of the University of Granada Dental School, Spain. E-mail: acutando@ugr.es.

Dr. Cutando's session "Prophylactic use of antibiotics in patients with prostheses" is part of the Lunch & Learn event scheduled for Thursday, August 26.

Further Reading

American Dental Association; American Academy of Orthopedic Surgeons. Antibiotic prophylaxis for dental patients with total joint replacements. *J Am Dent Assoc* 2003; 134(7):895-9. Available from: URL: <http://www.aaos.org/wordhtml/papers/advistmt/1014.htm>.
 ADA Division of Legal Affairs. A legal perspective on antibiotic prophylaxis. *J Am Dent Assoc* 2003; 134(9):1260.
 Baker KA. Antibiotic prophylaxis for selected implants and devices. *J Calif Dent Assoc* 2000; 28(8):620-6.
 Cutando A, Galindo P. Antibiotic prophylaxis in dental patients with body prostheses. *Medicina Oral* 2002; 7(5):353-60. Available from: URL: <http://www.medicinaoral.com/medoralfree/v7i5/medoralv7i5p348.pdf>.