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Issue Highlights

These articles have been selected by the Coordinating Editor as Key Reviews.

Dialogue

Zirconia Primary Crowns

Zirconia crowns are very aesthetic and durable crowns, and they can be used in most situations where clinicians would place a stainless steel crown, strip crown or preveneered crown

By William F. Waggoner, DDS, MS

Performing aesthetic dentistry in children can be both one of the most challenging and one of the most rewarding things that we pediatric dentists do. I would like to spend a few minutes sharing with you about one of the newest restorative innovations made available for use in pediatric dentistry — pediatric Zirconia crowns. First introduced less than five years ago by two companies, Tuff Kid Crowns in Florida and EZ-Pedo Crowns located in California, these crowns represent arguably the most aesthetic full-coverage options for badly decayed primary teeth. The Tuff Kid Crowns are no longer available, but besides the Zirconia crowns made by EZ-Pedo, there are two other United States companies that offer Zirconia primary crowns. They are Kinder Krowns and Nu Smile Crowns. Kinder Krowns and Nu Smile have offered resin-based composite preveneered crowns for primary teeth for over two decades, but now they are marketing Zirconia crowns in addition to preveneered. All three companies offer Zirconia primary crowns for both incisors and molars. In this presentation, I will discuss the characteristics of the Zirconia crown, indications for their use, advantages and disadvantages and their cost.

> Zirconia crowns are now available for primary anterior and posterior teeth from at least three United States manufacturers.

At the outset, I must admit that, to my knowledge there are no publications that report on any of the clinical aspects of pediatric Zirconia crowns. However, Zirconia crowns have been used successfully in adults for many years. Some of the characteristics of the Zirconia crowns are that they are thermostable; have low heat conductivity; have low thermal expansion; are biocompatible; have high strength, hardness and abrasion resistance; are color stable; retain a high polish; and are very natural looking.

The indications for using Zirconia primary crowns would be virtually the same as any time we choose to use a full-coverage crown in primary teeth. These include large carious lesions that compromise the strength of the tooth, multiple or large proximal caries, following pulpal therapy and on hypoplastic teeth. I will include a note of caution here. In the posterior, stainless steel crowns have been placed for years on the most badly broken-down teeth without any kind of core build-up. Due to the crimped fit of the stainless steel crown and the good luting cement, these stainless steel crowns generally show great retention and durability even in the worst of clinical conditions. It remains to be seen whether Zirconia crowns and their luting cement can have the same success at being retained well on these nearly hopeless teeth.

There are some disadvantages of the Zirconia crowns. The primary disadvantage in my mind is that these crowns cannot be crimped or contoured to fit a crown preparation. Similar to a preveneered crown, when placing a Zirconia crown, the preparation must be made to fit the crown rather than the crown fitting the prep. This may take a lot of trial and error in preparation. Another disadvantage is that these crowns must fit passively. They cannot be forcefully pushed onto a tooth. This also means that the margins cannot be adjusted for a tighter cervical fit. A significant disadvantage to these crowns

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compared to stainless steel or preveneered stainless steel crowns is that hemorrhage must be well controlled. While stainless steel crowns can be placed with a glass ionomer cement in the presence of blood without significantly influencing clinical durability, Zirconia crowns should be cemented on teeth that are generally dry and with hemorrhage well controlled. Other disadvantages are the cost and the inventory. An anterior Zirconia crown costs $22–$25 per crown compared to a preveneered crown, which is $15–$20 per crown, and plain stainless steel crown or a resin-bonded strip crown formed at around $4–$6 each. The posterior ceramic crowns are about $10 per unit more expensive than the anterior crowns. It should be noted that there are some differences in the recommended handling and cementation techniques between manufacturers. Both EZ-Pedo and Kinder Krowns say their crowns may be tried in and cemented with a glass ionomer, resin-modified glass ionomer or resin cement.

Crowns tried in but not used may be autoclaved for future use. The manufacturers for the Nu Smile Zirconia crowns, however, have more stringent handling requirements. According to published research, it appears that when phosphate groups in saliva come in contact with Zirconia surfaces, the phosphate greatly decreases the adhesion activity to the luting cement. It is extremely difficult to remove this phosphate contamination clinically. Hence, the Nu Smile Zirconia crown kit comes with what Nu Smile refers to as try-in crowns. These try-in crowns are shaded slightly pink in color so they will not accidentally be cemented into the child's mouth. There is a try-in crown for each size crown. Preps are made to fit the try-in crown, and then the appropriate-sized crown is removed from the crown box and cemented without ever having been tried in the mouth. All of the crowns of each size have precisely the same internal dimensions, so all will fit exactly the same as the try-in crown. Nu Smile also recommends, for best retention, that crowns be cemented with a resin-modified glass ionomer or a bioceramic cement such as Ceramir by Doxa Company. The try-in crowns may be autoclaved endlessly. Whether this additional attention to meticulous technique in non-contamination of the Zirconia prior to cementation will have any clinical significance in the long run remains to be seen. However, as these crowns gain popularity, I am certain clinicians will determine the best practices that affect their clinical success.

As a clinician, I have placed thousands of preveneered crowns over the past 15 years, and I have been very happy with the clinical performance of these crowns. So, why might a clinician like myself consider a Zirconia crown? In the anterior region of the mouth, I do not believe there is a more natural lifelike restoration available. Additionally, the shade of the Zirconia crowns more closely matches with primary teeth than some of the preveneered crowns. Additional reasons are the anticipated resistance to fracture and chipping and the color stability of the Zirconia crowns. Certainly fracturing and chipping are seen with both resin-bonded strip crowns and preveneered crowns, probably in about 15% of the cases. Color stability of bonded resin strip crowns after pulpal therapy can also be suspect at times. The Zirconia crowns are opaque enough to mask discolorations under the crown while still exhibiting a natural translucency. Additionally, the hardness of the Zirconia makes it extremely difficult to chip in the mouth. In manufacturers' testing, Zirconia was nine times stronger than enamel. In the posterior region of the mouth, the switch from stainless steel crowns to Zirconia

will likely be more difficult for a lot of clinicians. Most seasoned dentists can prepare a stainless steel crown in a matter of a few minutes and with crimping can get a nicely fitting crown. The Zirconia crowns will definitely require more prep and fit time, as well as attention to hemorrhage control. However, the aesthetic options that the Zirconia crowns give parents is far better than what we previously had to offer.

As a reviewer, I wish I had more concrete clinical data about the crowns to share with you, but hopefully it will be forthcoming. In the meantime, if you practice at a location where parents have high aesthetic demands, I would urge you to look at the Zirconia crown. All of the manufacturers have starter or trial kits. You will probably also want to consider careful case selection for your first few cases. Choosing a cooperative child whose teeth have a reasonable amount of tooth structure will likely lead to clinical success and subsequent confidence in these crowns.

In summary, Zirconia crowns are now available for primary anterior and posterior teeth from at least three United States manufacturers. They are very aesthetic and durable crowns, and they can be used in most situations where clinicians would place a stainless steel crown, strip crown or preveneered crown. Two apparent drawbacks are the need for very good hemorrhage control and the cost per unit compared to other traditional pediatric full-coverage restorations. Like most dental materials that are introduced in dentistry, there are some hits and many misses. In my opinion, the Zirconia primary crowns are going to be a hit, especially in the suburban aesthetic-conscious practices. Only time will tell if I am correct.

Critical Discussion and Commentary

Replanting Primary Incisors – More Research Needed

While replantation of primary incisor teeth is generally not recommended, there is scant evidence for or against the practice

By Edward J. Barrett, BSc, DDS, MSc, FRCDC
Based on: Holan G. Replantation of Avulsed Primary Incisors: A Critical Review of a Controversial Treatment. *Dent Traumatol* 2013; 29 (June): 178–184.

For those of you involved in teaching at either the university or hospital level, you will be aware that late spring and early summer are times for reflection. Reflection on the performance of our departing residents and students as well as a time to reflect on the state of the art of treatments we will teach to our incoming charges. Of particular interest to me are advances in the management of trauma to the primary and permanent dentitions, as with our program it will make up a large part of our residents' time covering after-hours call. Most years there are few, if any, major changes to established treatment protocols. However, with this thought in mind, I would like to share a paper by well-known pediatric dentist and scholar Gideon Holan. I think it is a paper that we will be talking about for a long time.

To say that this paper will turn a few heads and put a few noses out of joint might turn out to be an understatement. In this paper, the author takes a stab at the long-held orthodoxy surrounding the management of avulsed primary incisor teeth. What? He is going to recommend replanting these teeth? Hold on a minute before you light the torches. This is a well–thought-out paper that takes a critical look at a practice that is generally advised against through arguments that have themselves received little scientific scrutiny.

Holan begins his journey by taking us through a systematic review of the literature that addresses the replantation of avulsed primary teeth. His discovery of only 16 papers since 1925 that reported on an aggregate of 31 avulsed primary incisors in 24 children has been reported by previous authors (in Zamon and Kenny 2001, for example). The inconsistencies in reporting of demographic patient data, treatment rendered, follow-up intervals, success and failure criteria and outcomes are pointed out and discussed. Generally (and I would suggest unsurprisingly), Holan concludes there is little in the literature we could use to develop evidence-based guidelines for the management of avulsed primary incisors.

So here is where the story usually turns, right? There is no obvious evidence to support the treatment, so we should look at the potential risks and if they are deemed significant, we should not adopt the treatment into practice. Instead of saying, "You know what, the IADT and the AAPD guidelines are probably right in not recommending the replantation of avulsed primary teeth" end of story, Holan takes us on a thoughtful consideration of all of the arguments that have been raised against the practice and finds that most (if not all of them) are not supported by sound science.

One of my favorites is the contention that "children do not have any aesthetic expectations for their anterior teeth at the age when they are commonly avulsed" (the average age is about three years old). Of course, there is no scientific evidence to defend this position, but those of us who treat children with severely decayed anterior teeth know how determined the parents of those children are when it comes to preserving them. Given the volume that has been written on the restoration of anterior teeth, there is somewhat of a disconnect here.

Another argument against the replantation of avulsed primary teeth is that young children cannot possibly cooperate for treatment so replantation is just not possible. Holan's counterpoint here is well thought out and, I think, masterfully delivered. Isn't this exactly what we do in pediatric dentistry? Manage children with behavioral problems? Other arguments are similarly handled and by the end of the paper you might think, "Hey! I am changing what I do!"

But wait. That is not the intent of the exercise. I think that Holan wants clinicians to reconsider their motivations for not providing treatments where there is little scientific evidence to support them, but the arguments against performing them are flawed as well. As Holan sees things, the road forward involves both clinical trials that would look at the outcomes of replanting avulsed primary teeth with a degree of

scientific rigor as well laying out well-considered selection criteria and treatment protocols for patients and families who have to endure this difficult injury. A recommended management technique is included as an appendix to the paper.

I thoroughly enjoyed reading this paper, as it challenged many long-held beliefs I had about the replantation of avulsed primary incisors and the reasons I adopted them. I am not sure I am ready to adopt the practice, but I certainly am thinking a lot about it; maybe that is the most important thing about this work.

Are Overweight Children Less Cooperative?

Overweight children, as demonstrated by an increased body mass index (BMI), are less cooperative during orthodontic treatment than are those with a normal BMI

By Jonathon Everett Lee, DDS
Based on: von Bremen J, Wagner J, Ruf S. Correlation Between Body Mass Index and Orthodontic Treatment Outcome. *Angle Orthod* 2013; 83 (May): 371–375.

Fat and *lazy* — two words that when paired together have a negative connotation, such as when someone maliciously says, "That person is fat and lazy." Where does that saying come from? I do not know. Do you find it bothersome when someone associates being fat or overweight as being lazy? Is there any truth to that relationship? Is there a correlation? We do know that there has been an increase in obesity in children. In the United States, overweight children have jumped from about 5% in 1965 to 18% in 2008. And it is not just an issue in the United States. It is an industrialized nation issue. For example, in the United Kingdom 22% of boys and 28% of girls are overweight. So, as the fat and lazy statement implies, does that mean there is an increase in children that are more lazy and less cooperative now? To my knowledge that has not been studied, but authors of a recent study wanted to find out if being overweight affects the cooperation and treatment outcomes in orthodontic patients. They sought to investigate the correlation between body mass index (BMI) and orthodontic treatment outcomes.

The study included 77 adolescents who had fixed orthodontic treatment between 2007 and 2010 at the University of Giessen in Germany. The pretreatment BMI was calculated, and negative file entries such as bad oral hygiene, missed appointments and appliance breakage were recorded. Based on the number of these negative entries, cooperation was then classified as good, bad or poor. In addition, the treatment duration and the number of appointments were recorded and assessed. For the evaluation of treatment outcomes and success, the pretreatment and posttreatment peer assessment rating (PAR) scores were measured.

The data revealed that 21% of the adolescents were overweight as determined by BMI, which unfortunately is not surprising based on the general obesity statistics. In regard to cooperation, about half of the normal-weight children had good cooperation. How about the overweight kids? Only 25% of the overweight patients cooperated sufficiently. Consequently, the number of patients exhibiting bad or poor cooperation was higher at 75% in the overweight group versus the normal-weight group. Interestingly, it falls into the Pareto principle, also known as the 80/20 rule, the law of vital few, and the principle of factor sparsity. The Pareto principle states that for many events, roughly 80% of the effects come from 20% of the causes. For example, you may hear people recite, "Eighty percent of your problems come from 20% of your clients." For treatment outcomes, patients with increased BMI had a slightly longer treatment duration, needing 2.5 more months of treatment as compared to the normal-weight kids. They also required two more appointments than their normal-weight peers. However, the PAR score reduction was comparable.

Based on the findings of this study, although overweight kids will have similar orthodontic treatment outcomes as normal-weight kids, one should be aware that overweight kids may need a little bit more attention and motivation for good oral hygiene, keeping their appointments, and taking care not to break their appliances. Although there have not been any studies that I am aware of, the same may hold true for your regular pediatric nonorthodontic patients. Just be aware. If you would like to learn more about correlation between BMI and orthodontic outcomes, please read the article.

Can Inferior Alveolar Nerve Block Damage Developing Third Molar?

Inferior alveolar nerve blocks administered to young children when the third-molar tooth bud is immature may stop third-molar development

By Paul O. Walker, DDS, MS
Based on: Swee J, Silvestri AR Jr, et al. Inferior Alveolar Nerve Block and Third-Molar Agenesis: A Retrospective Clinical Study. *J Am Dent Assoc* 2013; 144 (April): 389–395.

The authors of a recent study believe there are several plausible reasons why an inferior alveolar nerve block might injure sensitive developing tooth tissues and possibly lead to agenesis. Accidental needle penetration into or near the tooth-forming tissues and subsequent aspiration can be traumatic to a developing tooth, especially if it is in the earliest stages of development as the tooth bud is likely to be no greater in diameter than the needle. The authors conducted a retrospective study to examine whether there was a statistically significant increase in the incidence of radiographically missing mandibular third molar follicles in children seven to 12 years of age who had received an inferior alveolar nerve block at six years or younger.

Using a pool of patients from the School of Dental Medicine at Tufts University, the authors examined 439 potential sites of third molar development for evidence of dental follicles.

The authors then conducted a comparison of the incidence of missing third molar follicles in a group of children that did not have a history of receiving an inferior alveolar nerve block. The authors found a statistically significant greater incidence of missing third molar follicles in mandibular quadrants that had a definitive history of receiving inferior alveolar nerve blocks compared with mandibular quadrants that had no history of receiving this injection. They then concluded that inferior alveolar nerve blocks administered to young children when the third molar tooth bud is immature may stop third molar development.

Due to the significant clinical implications, the authors encourage further research to verify these results. While this study produced an interesting finding, I am not convinced of the cause and effects suggested and will look forward to a future study to replicate these findings.

Bisphenol A Found in Dental Materials That Claim to Be BPA Free

Composite resins have been used safely in dentistry for 15 years; no studies have shown a direct link to the use of these products and human disease

By Elizabeth K. Velan, DMD, MSD
Based on: Gruninger SE, Amer T, Koziol N. Update: Bisphenol A in Dental Materials. *ADA Professional Product Rev* 2013; 8 (1): 2–5.

I recently reviewed an article in the *Journal of the American Dental Association* regarding Bisphenol A (BPA) exposure levels after placement of composite restorations. That study concluded that levels of BPA after placement of composite were higher than baseline exposure. There are several studies that have shown associations between exposure to BPA and human health conditions. BPA is similar in structure to estrogen, making it possible for the product to bind to estrogen receptors. The primary source of BPA exposure is thought to be from the diet, although medical/dental materials and supplies as well as industrial waste are a contributory element. Another recent article evaluates the source of BPA in dental materials and if the levels of exposure are within the acceptable range per the Environmental Protection Agency (EPA) and the National Toxicology Program (NTP).

BPA was an ingredient in sealants in the 1990s. It is still used in the manufacturing of composite materials, but it is not an added ingredient. Products that claim to be BPA free may still need BPA to manufacture the ingredients used to make an epoxy resin. Bisphenol A-glycidyl methacrylate (bis-GMA) is a key ingredient of composite. Bis-GMA requires additional modifiers due to its viscosity. One modifier is Bisphenol A dimethacrylate (bis-DMA). BPA is used to manufacture both bis-DMA and bis-GMA. Even with careful controls, trace amounts of BPA can remain in these ingredients. How does this lead to consumption or exposure to BPA and other ingredients? Bis-DMA when exposed to salivary esterases is hydrolyzed to BPA, thus releasing small quantities of BPA. An alternative modifier for bis-GMA is triethylene glycol dimethacrylate, which does not need BPA to be produced nor can it be broken down to BPA. Bis-GMA is not broken down by salivary enzymes. However, the polymerization process is inhibited when exposed to air. The thin layer of non-polymerized resin is then slowly lost from a newly placed resin product. This can help explain how BPA, bis-GMA/DMA products are found in saliva and urine after placement even when a rubber dam is utilized.

The EPA has set an acceptable exposure limit for BPA <0.05mg/kg in a 24-hour cycle. The NTP has reduced this limit to <0.01mg/kg in a 24-hour cycle. Using two recent studies, the reviewers estimated the exposure EPA limit 100,000 times lower than the NTP.

Resin materials have been used in dentistry for the past 15 years, and there is no direct evidence to link them to human disease. Dentists need to be aware that patient's will be asking questions regarding the safety of resin materials just as they do with amalgam restorations. As always, we need to be well prepared and informed regarding these issues.

Is There a Relationship Between Parenting Styles & Children's Behaviors?

Referred children are younger than non-referred children and have significantly more dental anxiety

By Paul O. Walker, DDS, MS
Based on: Krikken JB, van Wijk AJ, et al. Child Dental Anxiety, Parental Rearing Style and Referral Status of Children. *Community Dent Health* 2012; 29 (December): 289–292.

During a recent clinic session, I observed several non-compliant children who were acting out and candidates for treatment under general anesthesia. I also observed the parenting styles of their caregivers, which ranged from non-involved to authoritarian. I wondered if there was any relationship between the varied parenting styles and the behaviors exhibited by the children. For that reason, an article about child dental anxiety, parental rearing style and referral status of children caught my eye.

Possible child-related factors can be dental anxiety and the child's temperament. A possible parental factor is the parental rearing style. The objective of this study was to assess the possible associations between dental anxiety, parental rearing style and referral status of children. Parents of 120 non-referred and 335 referred pediatric dental patients were asked to fill out the Child Rearing Practices Report (CRPR) and the Child Fear Survey Schedule Dental Subscale (CFSS-DS) on behalf of their children. The goal of the study was to investigate the possible relationship between parental rearing style, child dental anxiety and the referral status of

children. The questionnaires were filled out by 115 (96%) parents of primary school children and by 331 (99%) parents of referred children. Referred children were younger than non-referred children and had significantly more dental anxiety. No differences were found between parents of referred children and parents of non-referred children on parental rearing style. No differences existed between fearful and non-fearful children on parental rearing style and also no correlation existed between children's dental anxiety and their parent's rearing style. However, non-referred children with parents using an authoritarian parenting style were more anxious than the other non-referred children. The authors concluded referral status and dental anxiety of four- to 12-year-old children were not associated with parental rearing style.

The response rate in our study is very high, which may be misleading. The non-referred children were of a larger study (n=1200) and the referred group was children in two practices in one city. In other words, in both groups some selection bias exists, which may have influenced the results. Given the shortcomings of our sample and the questionnaire used, the authors suggest extending the present study using more representative samples and a different measure for parental rearing style.

reviews

Literature Reviews

How Migraine Headaches Can Affect a Child's Behavior

Acute & Chronic Illnesses

Take Home Pearl:
Children with a history of migraines are significantly more anxious than are those without migraines.

Background: Dentists, as would be expected, tend to focus on dental health and oral wellness. We do have to have a wider base of medical knowledge to manage our patients with special needs, and we know there is a "dental epidemic," particularly in our 2- to 5-year-old children. Possibly the only more "underrated" part of the body when it comes to federal funding and insurance reimbursements is mental health. We can't see the scars or wounds that children carry in their minds as easily.

Objective: To look at mental health comorbidity in children with migraines using psychological profiling and a frustration test for assessment of anger management, as well as anxiety.

Participants: 62 children (mean age, 11 years).

Results: Children with migraines were significantly more anxious, and those with severe migraines tended to inhibit their anger emotions, repressing their frustration more often. Conversely, children with low-grade migraines tended to express their anger more often and also suffered more often from separation anxiety. These children were significantly more frustrated in conjunction with migraine attacks.

Conclusions: "Children suffering from severe migraine tend to inhibit their angry feelings. On the contrary, children with low migraine attack frequency express their anger and suffer from separation anxiety."

Reviewer's Comments: As I mentioned in the introduction to this article, it is so hard to see what children are carrying in their mental health "injuries," and their temperament will likely affect how they respond to stress. Children with a chronic history of headaches may present to the dental chair with significantly challenging and volatile behavior responses, and dentists need to be flexible in accommodating these patients.

Reviewer: S. Thikkurissy, DDS, MS
Article Reviewed: Tarantino S, De Ranieri C, et al. Clinical Features, Anger Management and Anxiety: A Possible Correlation in Migraine Children. *J Headache Pain* 2013; 14 (May 20): 39.

Predicting OSA in Children

Acute & Chronic Illnesses

Take Home Pearl:
Nocturnal pulse oximetry is highly correlated with an obstructive sleep apnea diagnosis in children.

Background: The field of sleep medicine and obstructive sleep apnea (OSA) in young children has been very limited. There is a generally poor understanding of sleep behaviors and differentiating apneic episodes from behavioral disturbances during sleep.

Objective: To determine whether oxygen desaturation can predict OSA syndrome in children aged 3 to 12 years.

Design: Retrospective study.

Methods: Data were collected from 148 children, all of whom reported snoring and were suspected of having sleep apnea. Sleep studies were performed, and the Epworth Sleepiness Scale (ESS) was used.

Results: 88% of children were diagnosed with OSA. The desaturation index from nocturnal pulse oximetry had a high level of correlation with the apnea-hypopnea index. There was no correlation between the diagnosis of apnea and the ESS.

Conclusions: "The desaturation index, as determined using a nocturnal pulse oximeter, may be a good tool for predicting both the presence and the severity of OSA syndrome in children."

Reviewer's Comments: I get questioned so many times by parents about the possibility of apnea and the impact of snoring. A great difficulty is that the studies performed in this particular paper such as the polysomnography

and sleepiness scales are difficult to administer and can be subjective to interpretation. However, the outcomes obviously can have a monumental impact on a child's daily function.

Reviewer: S. Thikkurissy, DDS, MS
Article Reviewed: Tsai C-M, Kang C-H, et al. Usefulness of Desaturation Index for the Assessment of Obstructive Sleep Apnea Syndrome in Children. *Int J Pediatr Otorhinolaryngol* 2013; May 31: Epub ahead of print.

The Transforming Power of Hope in Chronic Illness

Acute and Chronic Illness

Take Home Pearl:

Hope is a variable that, for parents, often fluctuates over the course of a child's disease and therapy.

Background: When working in a hospital setting, one of the true perils of treating medically fragile children is that, despite our best efforts, some children will not survive significant medical insults such as cancer. There are no words for this devastation.

Objective: To examine "parental hope" during the course of a child's treatment for malignancy, over a 9-month period.

Methods: 40% of children had leukemia or lymphoma, and 23% had brain tumors. Two distinct types of hope were identified across the 35 parents, present-oriented and future-oriented hope. While future-oriented hope focused on an ultimate cure and more quality time, present-oriented hope focused on no complications and no pain.

Results/Conclusions: Hope is a variable that can fluctuate over the course of the disease.

Reviewer's Comments: This article had a relatively small sample size and a "soft" type of finding, but it was something that dentists who treat any kids with chronic illness need to consider. Parents' reactions can fluctuate with disease and therapy progression. Dentists need to be able to read this and accommodate for these families during particularly stressful times. This article also emphasizes the importance of adequate and constant pain assessment and management in children.

Reviewer: S. Thikkurissy, DDS, MS
Article Reviewed: Granek L, Barrera M, et al. Trajectory of Parental Hope When a Child Has Difficult-to-Treat Cancer: A Prospective Qualitative Study. *Psycho-Oncology* 2013; June 5: Epub ahead of print.

Salivary Test Not Recommended in Caries Risk Assessment

Cariology

Take Home Pearl:

More studies are needed to determine the role of saliva in caries development.

Background: Protective functions of saliva have historically been reported as cleansing, diluting, buffering, and enabling ion exchanges as in remineralization.

Objective: To provide a better understanding of the relationship between saliva and dental caries.

Methods/Participants: Subjects were from the Northwest practice-based research collaboration in evidence-based dentistry. Thirty subjects per practice in 3 age groups (9 to 17 years, 18 to 64 years, and ≥65 years) were included. To be eligible, patients had to be aged ≥9 years, have at least 4 permanent teeth, understand English, and provide consent. Dentists and staff were trained by reviewing manuals and participating in telephone training sessions. One staff person was responsible for collection and performing the salivary tests. A comprehensive dental examination was completed, and the dental history was reviewed for the past 24 months. Patients provided additional information by questionnaire, including social, demographic, and medical information, medications, ethnicity, income, and education. Also, beverage consumption (including juices, sports drinks, and soda) was recorded, along with frequency and amount. Cigarette and cigar smoking information was also collected. Saliva was evaluated for consistency, resting and stimulated flow, and buffering capacity. I will present findings only for the children/adolescent group.

Results: 350 of the 1,387 subjects were pediatric; 92% were white; 44% were from low-income families; most subjects were in high school; 36% reported 3 to 6 acidic beverages per week; the mean number of teeth was 24; 55% of subjects brushed 2 times a day with a fluoridated toothpaste; 70% had no visible plaque; and 5% of subjects had thick, sticky saliva. The pediatric group had a mean of 1.1 carious lesions for the previous 24 months. Children with thick, sticky, frothy saliva had a mean of 0.6 cavities; subjects with watery and clear saliva had 1.1 cavities. Children with low buffering capacity had a mean caries rate that was 70% lower than that of children with high buffering capacity. Low stimulated salivary flow was not associated with an increase in caries.

Conclusions: For pediatric subjects: (1) Low buffering capacity is associated with a decrease in cavities; (2) low stimulated salivary flow is associated with a decrease in cavities; and (3) thick, sticky frothy saliva is associated with a decrease in cavities. These findings cannot support the use of a salivary test in caries risk assessment in dental offices.

Reviewer's Comments: I was very surprised about the findings of this study, which are contrary to what we had been taught about salivary characteristics and dental caries in school-aged children. The subjects were from 67 different practices geographically located in the Northwest United States, and the dentists and staffs were carefully trained in the protocol of the study. The authors intend to follow-up on the participants and collect data on the development of new carious lesions on a prospective clinical basis.

Reviewer: Arthur J. Nowak, DMD, MA
Article Reviewed: Cunha-Cruz J, Scott J, et al. Salivary Characteristics and Dental Caries: Evidence From General Dental Practices. *J Am Dent Assoc* 2013; 144 (May): e31–e40.

Sterile Wax Has Same Effectiveness as Calcium Hydroxide, Glass Ionomer When Used as Liner

Dental Materials

Take Home Pearl:

Calcium hydroxide and glass ionomer cement are frequently used as liners for incomplete caries removal. However, no difference has been found between the two liners in effectiveness, and no difference was noted between their use and sterile wax.

Background: A dental liner is a thin layer of material placed on the floor of a cavity to seal dentin. Dental liners are frequently used in the step-wise excavation technique. This technique is used to prevent pulpal exposure in deep carious lesions.

Objective: To examine the effects on dentin of 2 extensively used liners and a negative control on deep carious lesions after partial caries removal and sealing.

Design/Methods: 57 posterior permanent teeth were used in the study. All teeth had caries in close approximation to the pulp tissue, had normal pulp vitality, and had no radiographic evidence of periapical lesions. Each tooth was accessed; caries was completely removed from the walls and margins of the preparations, and a layer of soft dentin was left on the pulpal floor. The color and consistency of the dentin were recorded, and a sample was taken. The color was graded as yellow, light brown, or dark brown. The consistency was graded as soft, leathery, or hard. The teeth were then randomly assigned to 3 different groups: Calcium hydroxide cement, glass ionomer cement, or the negative control group (sterile wax). After a 3- to 4-month waiting period, pulp vitality tests were completed, the teeth were opened, and the liner was removed, the dentin was graded on color and consistency, and a second dentin sample was taken. A scanning electron microscopy was used to exam dentin organization and bacterial infection.

Results/Conclusions: All groups had a statistically significant increase in dentin hardness, an increase in the dentin organization with total or partial obliteration of dentinal tubules, and a decrease in bacterial infection. No statistically significant differences were found among the 3 groups. The correlations between color, consistency, dentinal organization, and bacterial contamination were tested. All had positive correlations to each other with the exception of color and bacterial contamination, suggesting that dentin color and bacterial contamination are not well correlated.

Reviewer's Comments: This study highlights the importance of negative controls in randomized clinical trials. This study concluded that there was no difference in effect between calcium hydroxide or glass ionomer cement being used as a liner. It further concluded that the liners were not more effective than a sterile wax liner when used in the step-wise excavation technique.

Reviewer: Elizabeth K. Velan, DMD, MSD
Article Reviewed: Corralo DJ, Maltz M. Clinical and Ultrastructural Effects of Different Liners/Restorative Materials on Deep Carious Dentin: A Randomized Clinical Trial. *Caries Res* 2013; 47 (3): 243–250.

The Long Goodbye — Anticipatory Grieving in Parents of Children With Special Needs

Developmental Disabilities

Take Home Pearl:

Parents often underestimate the emotional energy required in caring for a child with special needs.

Background: A large portion of my faculty practice is caring for children and adults with special healthcare needs. These are some of the most fulfilling patient encounters I have had. I have grown to know many of these families, and, in this context, seen changes in the families as my patients get older or become more medically fragile.

Objective: (1) To examine the quality of life for parents living with a child with cerebral palsy; and (2) to examine "anticipatory grief," a concept in which there is mourning, coping with loss, and planning for the impending or eventual loss of a loved one.

Methods: The literature on special needs children has established that parents do feel a sense of worry and loss with the potential questions surrounding the children's future once they are no longer able to provide their care. This study used structured interviews on 204 parent-child dyads. Inventory of Grief and Quality of Life Indices were used.

Results/Conclusions: The emotional energy and tenacity required to care for a child with cerebral palsy were greater than the parents anticipated. Parents who had a higher level of anticipatory grief also had a significantly lower quality of life. No gender differences were noted.

Reviewer's Comments: In recent years, the term *family-centered care* has gained more momentum in the quality-of-life literature and also in the focus of the medical (and dental) home. This article emphasizes the mental strain on parents in having a child with special health needs.

Reviewer: S. Thikkurissy, DDS, MS
Article Reviewed: Al-Gamal E. Quality of Life and Anticipatory Grieving Among Parents Living With a Child With Cerebral Palsy. *Int J Nurs Pract* 2013; 19 (June): 288–294.

I Will Brush My Teeth More Often, but Do Not Tell Me What I Should Eat

Diet Management

Take Home Pearl:

It is still not possible to determine the cariogenicity of foods and beverages.

Background: There is a need for patients and clinicians to be able to identify foods and beverages that will promote oral health.

Objective: To develop food and beverage cariogenicity indices for use in nonmedical settings such as Head Start and the Women, Infants, and Children program in educating parents.

Methods: Children with or without severe early childhood caries (S-ECC) were recruited. At the time of initial enrollment, the subjects had to be between 2 and 6 years of age and have full primary dentition, non-contributory medical history, parental consent, and no restorative treatments. Children with ≥3 surfaces of decay and one pulpally involved tooth were designated S-ECC; caries-free children were used as the control group. Comprehensive oral evaluations were conducted by a licensed dentist at 3 participating institutions using standard methods with radiographs; demographic information was collected from primary care providers. Dietary assessments were made at baseline using a 24-hour diet recall conducted by trained interviewers. The 81-item Kids Food Frequency Questionnaire (FFQ) was used to capture usual intake over the previous 6 months. A cariogenicity classification scheme for foods and liquids was developed using the carbohydrate content and pH of the foods. With data from the 2 dietary assessments and using the food and beverage cariogenicity indices, each subject had 4 separate cariogenicity scores.

Results: 883 children participated in the study; 454 were designated as having S-ECC, and 429 were caries free; 87% completed 24-hour dietary recalls, and 85% completed the FFQ. The mean food cariogenicity score was 5.4 (range, 1.5 to 10) using the 24-hour recall tool and 4.0 for the FFQ. The mean beverage cariogenicity score was 5.0 for the 24-hour recall assessment and 4.7 for the FFQ.

Conclusions: Mean food cariogenicity scores were similar between both groups using either dietary analysis; the liquid cariogenicity score was higher in the S-ECC group. In the multivariate logistic regression model, the food cariogenicity score did not discriminate between groups. The authors conclude that the liquid cariogenicity index has the potential to discriminate between groups using either dietary assessment models. They further suggest that consumption of sugar-sweetened beverages, with an acidic pH, increases the odds for S-ECC.

Reviewer's Comments: This was an ambitious study, and I have several concerns. Researchers were dependent on the caregivers' recall of the child's diet when using the FFQ assessment. Dental examinations were performed by uncalibrated, licensed dentists from 3 major teaching hospitals, but there was no information on the years in practice or whether they were residents or staff. The authors did not take into account the time the teeth were exposed to a food or liquid, plaque scores, or fluoride status, and no information on the protective factors of foods or what feeding methods were used in infancy and early childhood was given.

Reviewer: Arthur J. Nowak, DMD, MA
Article Reviewed: Evans EW, Hayes C, et al. Development of a Pediatric Cariogenicity Index. *J Public Health Dent* 2013; March 14: Epub ahead of print.

Understanding Traumatic Sports-Related Injuries in Young Children

Other

Take Home Pearl:

Younger children who participate in sports are more often diagnosed with fractures (specifically physeal fractures) than are older children.

Background: When we talk about sports-related injuries, we tend to focus on adults and adolescents who usually participate in competitive organized sports. However, younger children are participating in contact group sports. There has been relatively little information in the literature focused on the epidemiology of traumatic dental injuries in these young children.

Objective: To examine epidemiological features such as type of injury, location, and severity in children aged 5 to 12 years compared to those aged 13 to 17 years.

Design: This was a retrospective chart review of >2,000 children over a 9-year period.

Results: Younger children tended to have more traumatic injuries in the upper extremities and were more often diagnosed with fractures (specifically physeal fractures) compared to higher soft tissue injuries in the older population. More than one-third of younger children were diagnosed with spondylolysis. The older group tended to have injuries that were more often classified as "overuse" injuries. In fact, >50% of the 13 to 17 year olds had such injuries.

Conclusions: "Sports injuries to children differ by age in injury diagnosis, type, and body area. Older children sustain a greater proportion of overuse injuries classified as soft tissue in nature."

Reviewer's Comments: While this was a retrospective study, I believe it adds significantly to our knowledge of sports injuries in younger children. I was interested in the concept of "overuse" injuries, which I interpret as being the responsibility of adults who are overseeing these activities. Children may not know their own limits.

Reviewer: S. Thikkurissy, DDS, MS
Article Reviewed: Stracciolini A, Casciano R, et al. Pediatric Sports Injuries: An Age Comparison of Children Versus Adolescents. *Am J Sports Med* 2013; June 5: Epub ahead of print.

Well-Child Visits Enforce Continuous Oral Healthcare

Promotion & Motivation

Take Home Pearl:

A six-month recall dental examination for children continues to be preferred by caregivers.

Background: How often and how soon after an initial dental visit should a child return for further evaluation and parental education? Periodicity of care should be based on initial findings and assessing the risk of the child to further disease.

Objective: To determine how effective Federally Qualified Health Centers (FQHC) are in scheduling Medicaid-enrolled children to return for regular dental care after an initial examination at the center, and to also determine what factors are involved when the child returns within 12 months.

Design: Retrospective cohort study.

Methods: 6-year-old Medicaid-enrolled children were randomly selected if they had been enrolled within 2 months after birth and continuously during the 36-month period of this study. Information regarding types of dental services and dates of services were collected from the dental charts. In addition, the number of well-child visits and dental visits of siblings were determined. Information about the parents in the household and the child's birth certificates were reviewed for possible explanatory variables.

Results: Of the 200 children (mean age, 25.6 months), 21 (11%) had cavities at the initial visit, and 168 (84%) returned for a second visit within the 36 months of the study; 115 children were seen in an FQHC, and the remaining patients were seen by a dentist in the community. The most frequent interval to return for the second visit was 6 months after the initial dental evaluation. Of the 200 subjects, 57% returned for the second visit within 12 months of the first visit. Family size and maintaining well-child visits were statistically significant as to whether a child would return for the second visit within 12 months.

Conclusions: The more frequent the well-child visits by subjects or siblings and the number of siblings in the family, the greater the likelihood for a second visit in the first 12 months, even though most children (>90%) were placed on recall. Because recall success varied among the 5 FQHCs, the authors suggest the following reasons: (1) Poor recall system; (2) new patients were a priority; (3) transient population; (4) staff turnover; and (5) parents responsible for recall. They also point out the importance of medical providers to remind families of regular care over episodic dental care.

Reviewer's Comments: With only 11% of the subjects having cavities at the initial dental visit, I suggest that parents might have become complacent on the need for follow-up routine care even though it is a free service in the clinics. Along with our medical colleagues, we need to reinforce the need for a dental examination or referral at each of the 11 well-child visits recommended by the American Academy of Pediatrics in the first 3 years of life.

Reviewer: Arthur J. Nowak, DMD, MA
Article Reviewed: Kuthy RA, Kavand G, et al. Periodicity of Dental Recall Visits for Young Children First Seen in Community Health Centers. *J Public Health Dent* 2013; April 9: Epub ahead of print.

Formocresol Still Most Common Medicament in Training Programs

Pulp Therapy

Take Home Pearl:

There is a significant decrease in the number of training programs using formocresol.

Background: The pediatric dentistry literature is filled with studies and case reports looking at various techniques for performing primary tooth coronal pulpotomies. The conventional wisdom seems to be that the profession should move away from formocresol due to concerns of carcinogenicity, but there is not a consensus as to that next step.

Objective: To survey pediatric dentistry graduate program directors to determine what materials are being taught and if a change in medicament has occurred over the past 5 years.

Design/Participants: Web-based survey involving 71 program directors.

Methods: The survey was sent to all pediatric dentistry program directors through SurveyMonkey; of these directors, 47 responded, and 39 were included in the analysis (55% response rate).

Results: There has been a statistically significant decrease in the number of programs that are using formocresol. Seven directors reported they had eliminated the material completely, citing concerns of carcinogenicity, systemic health, and evidence-based literature. The survey also found a significant increase in the amount of programs using ferric sulfate and mineral trioxide aggregate (MTA).

Conclusions: 82% of pediatric residency programs still use and teach formocresol pulpotomies. Based on this, it is clear that there has not been a seismic shift away from the medicament. There are indications, however, that programs are trying to move away from formocresol, as a significant decrease in usage was found. The increases in the use of MTA have been significant as well, with the most reported barrier to even more widespread use being the high cost of the material.

Reviewer's Comments: I certainly can understand directors being burned out by surveys, but I wish we had a more thorough response to this one. In addition to this information, I would like to determine if programs are teaching indirect pulp capping as an alternative to coronal pulpotomy. A fair amount of research and prominent opinion pieces have come out in recent years that push for the elimination of formocresol and tout indirect pulp therapy as the answer to our problem. Walker's survey and the conclusions drawn from it are very interesting. I am not surprised to see that programs are looking into alternatives to formocresol, in light of emerging concerns about nasopharyngeal cancer. Even with these health concerns, 82% of programs still use formocresol, which is not really shocking news because we know it works. Until we have clear

scientific evidence that formocresol is a threat to systemic health and until we have proven alternatives that are also affordable, formocresol will continue to be the predominantly used pulpal medicament.

Reviewer: Matthew K. Geneser, DDS
Article Reviewed: Walker LA, Sanders BJ, et al. Current Trends in Pulp Therapy: A Survey Analyzing Pulpotomy Techniques Taught in Pediatric Dental Residency Programs. *J Dent Child* 2013; 80 (January–April): 31–35.

SLS Affects Duration, Pain of RAS

Soft Tissues

Take Home Pearl:

Sodium laurel sulfate-free toothpaste has been found to decrease the duration and mean pain score of patients with frequent (>1 episode per month) oral aphthous ulcers.

Background: Recurrent aphthous stomatitis (RAS) presents as one or more painful well-defined ulcers surrounded by an erythematous halo located on the unattached (nonkeratinized) mucosa that usually heal without scarring in 7 to 14 days. The reported prevalence is 10%, and it is usually first noted during childhood or adolescence. The etiology is unknown, but it is thought that an antigen-stimulated cytotoxic destruction of oral mucosa occurs. Many predisposing factors have been postulated, such as the use of toothpaste containing sodium laurel sulfate (SLS), which might damage the mucin layer covering oral mucosa, thereby allowing penetration of exogenous antigens.

Objective: To compare the effect of SLS on the frequency, duration, and pain score of RAS.

Design: Double-blind, crossover, clinical trial.

Participants: 90 patients with frequent (>1 episode a month) RAS who were not taking medications for ulcers and who did not have any other oral mucosal disease.

Methods: Subjects were stratified into 3 study groups and given 2 different toothpastes to use during two 8-week periods. Group 1 used SLS-free toothpaste and SLS-A toothpaste (SLS-free + 1.5% SLS); group 2 used SLS-A toothpaste and SLS-B toothpaste (1.5% SLS-containing dentifrice); and group 3 used SLS-free and SLS-B toothpaste. Outcomes measured were the number of ulcers, the number of episodes, the duration of ulcers, and the mean pain score (scale of 0 to 10).

Results: A statistically significant decrease in duration and pain scores of ulcers was recorded in groups 1 and 3 when using SLS-free toothpaste compared to group 2. However, there was no statistically significant difference in the number of ulcers or in the frequency of episodes. In group 2, no difference in any of the outcome measures was noted.

Conclusions: SLS appears to affect the duration and pain associated with RAS but not the frequency and number of ulcers.

Reviewer's Comments: RAS is a very common and painful oral mucosal condition for which our pediatric dental patients present for emergency visits. Since the etiology of this condition is still not known, identifying predisposing factors might help reduce the occurrence of this condition. This study tries to answer the question of whether SLS-free toothpaste has an impact on clinical parameters (onset, number, duration, and pain) of aphthous ulcers. It is a well-designed, randomized, double-blind, crossover study, but the execution had some problems. There was a very high dropout rate in the experimental groups (60 of 90 subjects) due to pain from RAS that required medication. In addition, all clinical outcome measures were self-recorded by patients, limiting the objectivity of these results. The authors were not able to find a difference in the frequency of RAS episodes in patients using SLS-free toothpaste — only a difference in duration and pain. We can still recommend that patients with RAS not use SLS-containing toothpaste; even though it can help with symptoms and healing, there is no clear evidence that using SLS-free toothpaste will prevent episodes from occurring.

Reviewer: Christel M. Haberland, DDS
Article Reviewed: Shim YJ, Choi J-H, et al. Effect of Sodium Lauryl Sulfate on Recurrent Aphthous Stomatitis: A Randomized Controlled Clinical Trial. *Oral Dis* 2012; 18 (October): 655–660.

Practical Reviews presents Critiques in

Pediatric Dentistry quiz Vol. 27 No. 4

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To receive credit for this activity, answer the practice quiz questions below, read the content, and complete the online post-activity quiz at www.practicalreviews.com. Log in using your email address and password, click on "Take a Quiz," and enter the e-quiz code located below.

E-quiz code: 32390N

1. The current recommendation to not replant avulsed primary incisors is evidence based.

   Practice: T F ***Answer Submitted*: T F**

2. Children who are overweight and those of normal weight do not have the same orthodontic treatment outcomes, as demonstrated by peer assessment rating scores.

   Practice: T F ***Answer Submitted*: T F**

3. There has been a significant increase in the use of mineral trioxide aggregate over the last 5 years

   Practice: T F ***Answer Submitted*: T F**

4. Children with low-grade migraines tend to suffer from increased separation anxiety.

   Practice: T F ***Answer Submitted*: T F**

5. In patients with recurrent aphthous stomatitis, the use of sodium laurel sulfate-free toothpaste has been proven to decrease the frequency and number of aphthous ulcers experienced.

   Practice: T F ***Answer Submitted*: T F**

6. Calcium hydroxide is a statistically more effective dental liner than is glass ionomer cement when used in the step-wise excavation technique.

   Practice: T F ***Answer Submitted*: T F**

7. The desaturation index may be good for predicting the presence of obstructive sleep apnea syndrome in children.

   Practice: T F ***Answer Submitted*: T F**

8. There is a statistically significant greater incidence of missing third-molar follicles in mandibular quadrants with a history of receiving inferior alveolar nerve blocks compared to mandibular quadrants with no history of this injection.

   Practice: T F ***Answer Submitted*: T F**

9. In Federally Qualified Health Centers clinics, the 12-month dental recall period is favored by caregivers.

   Practice: T F ***Answer Submitted*: T F**

10. For parents of children with cancer, future-oriented hope focuses on an ultimate cure and more quality time.

    Practice: T F ***Answer Submitted*: T F**

11. Trace levels of bisphenol A can be found in dental materials containing bisphenol A-glycidyl methacrylate.

    Practice: T F ***Answer Submitted*: T F**

12. Mothers have a significantly lower quality of life than do fathers with respect to anticipatory grieving in caring for a child with special needs.

    Practice: T F ***Answer Submitted*: T F**

13. Referral status and dental anxiety of 4- to 12-year-old children are not associated with parental rearing style.

    Practice: T F ***Answer Submitted*: T F**

14. According to a recent report, low buffering capacity is associated with a decrease in cavities.

    Practice: T F ***Answer Submitted*: T F**

15. More than 50% of children aged 13 to 17 years who play sports may have overuse-type injuries.

    Practice: T F ***Answer Submitted*: T F**

16. Food cariogenicity scores discriminate between children with severe early childhood caries and caries-free children.

    Practice: T F ***Answer Submitted*: T F**

1. **T** When patients are exposed with a round collimated beam instead of a properly sized rectangular collimated beam, they receive at least 2 times more exposure than is needed for an intraoral image.
2. **T** During intraoral radiography, the radiation dose to the thyroid is less using rectangular collimation alone versus using both a round cone and a thyroid collar shield.
3. **T** Most cone cuts associated with use of rectangular collimators do not lead to a loss of essential diagnostic information.
4. **T** To reduce detrimental characteristics associated with x-ray beam divergence, an open-ended cylinder (so-called cone) can be used to increase the distance between the x-ray source and the object being imaged.
5. **F** When switching from a short cone to a long cone, the required adjustment in exposure time is associated with a significant increase in radiation exposure to the patient.
6. **T** In dental radiography, use of a lead apron reduces the radiation dose to the patient by only 1% to 2%.
7. **F** In comparative studies of INSIGHT and Ultra-speed dental radiology films, the diagnostic performance of INSIGHT has been shown to be significantly superior to that of Ultra-speed.
8. **T** Leakage radiation is a term used to describe x-rays coming from the x-ray source that are not part of the useful beam and are incompletely absorbed by the materials in the tube head.
9. **T** For digital cephalometric systems that use CCD technology, the radiation dose to the patient is greatest for settings that use continuous exposure of the detector versus settings that use pulsed exposure of the detector.
10. **T** If dental staff members are performing radiographic imaging safely, then there should essentially be no measurable radiation dose found on their radiation badges.
11. **T** X-radiation is designated as a known carcinogen by the U.S. Food and Drug Administration.
12. **T** No dental radiograph should be prescribed without the patient first undergoing a professional clinical evaluation.
13. **T** In general, the likelihood of untoward effects associated with any given dose of x-radiation is 3 to 5 times greater in a child or young teenager compared to an adult.
14. **T** According to the National Council on Radiation Protection and Measurement, medical radiation exposure accounted for 48% of the total radiation load on the U.S. population in 2006.
15. **F** The updated guidelines entitled ADA/FDA Guide to Patient Selection for Dental Radiographs apply to both asymptomatic patients and those who have signs or symptoms of disease.
16. **F** As far as radiation dose to the patient, digital imaging is always a low-dose alternative to film imaging in dental radiography.
17. **T** Under the Intersocietal Accreditation Commission, facility accreditation for advanced imaging procedures, such as cone-beam CT, is required to receive Medicare payment for services.
18. **T** Good common sense plus a true concern for special needs patients are key elements for successful dental imaging or assuring each family about the patient's quality of care.
19. **T** In the dental assessment of special needs patients, the dentist should be aware that many disabilities have characteristic oral clinical associations.
20. **T** Some special needs patients with severe physical disability may have open bites, poor tooth position, and large tongues that complicate film or sensor placement for dental imaging.

1. **T** During intraoral radiography, many patients are more comfortable when digital sensors are used rather than film.
2. **T** In dental radiography, the goal of rectangular collimation is to restrict the area or shape of the x-ray beam so that the surface being covered by the beam is as close to the size of the image receptor as possible.
3. **T** The ideal distance between the patient's skin and the focal spot (where x-rays are produced inside the machine) should be ≥200 mm (≥8 inches).
4. **T** During dental radiography, a patient will receive approximately 50% less radiation with rectangular collimation than with circular collimation.
5. **T** When using rectangular collimation, very few errors will be encountered if proper aiming devices or image receptor holders are used correctly.
6. **T** In a study by Parrot and Ng, the number of radiographs requiring retake was equal for intraoral radiographs taken with a circular collimator and an image receptor holder and those taken with a rectangular collimator and an image receptor holder aiming device.
7. **T** Never ask a patient to "bite" on the biteblock, especially children.
8. **F** Disposable Styrofoam image holders are well suited for the paralleling technique.
9. **F** The radiation necessary to make one digital intraoral radiograph is significantly less than that needed for the fastest analog-direct intraoral film.
10. **T** If all geometric angulations are correct when performing the bisecting angle technique, an intraoral radiographic image similar to the one obtained through the paralleling technique can be produced.
11. **T** For endodontic treatments in which endodontic instruments are positioned in the root canals, special image holders have been developed that allow the use of rectangular collimation and parallel technique imaging.
12. **T** Although children present unique challenges in dental radiography, it is still possible to achieve good quality radiographic images for them.
13. **T** In cone-beam CT, the images can be viewed in all 3 dimensions (sagittal, axial, and coronal dimensions) with no distortion.
14. **T** The radiation dose from most cone-beam CT units is a small amount with respect to non-occupational limits for radiation exposure.
15. **F** If the entire head is imaged using cone-beam CT, dental practitioners are responsible for reading only those structures with which they are comfortable and familiar.
16. **F** Other than a qualified dentist, no special personnel need be consulted when installing a cone-beam CT unit.
17. **T** Goals of the Image Gently® and Image Wisely® campaigns are to develop dental radiography protocols that maximize the diagnostic yield while minimizing the radiation dose to children and adults.
18. **T** Dental practitioners appear to be more comfortable with treatment planning all aspects of dental treatment when using 3D imaging than when using conventional 2D imaging.
19. **T** If a dentist sees carotid calcifications and possible stenosis on a cone-beam CT image, then the image should be referred for interpretation by an oral and maxillofacial radiologist.
20. **F** In the United States, each state has at least one oral and maxillofacial radiologist.

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