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Clinicians Report® Reprint
Serving Dentistry 35 YEARS
Reprinted November 2012, with permission, from Volume 5 Issue 11, November 2012, Pages 1, 3–4
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Pediatric Crowns Are Growing Up

Gordon's Clinical Bottom Line: For years, stainless steel crowns have been used in pediatric dentistry, esthetically leaving much to be desired. However, parents and children alike would prefer to have tooth-colored crowns, which until recently have not always been readily available or cost-effective. While these newer crowns appear more natural, their characteristics are markedly different. Will they be satisfactory to you and your patients? Are they easier to place or better than stainless steel crowns? *This report answers those questions for you, and makes suggestions concerning the best tooth-colored pediatric crown options for your practice.*

Newer tooth-colored pediatric crowns provide higher parent and patient satisfaction compared to traditional stainless steel crowns

- **Crowns** for pediatric patients are underutilized, most likely because of their cost. Other restoration options generally do not provide comparable strength, especially in cases of caries extending beyond ideal restorative parameters.
- **Indications for pediatric crowns*** include:
  - Large/multi-surface caries or lesions
  - Interproximal caries extending beyond line angles
  - Following pulpotomy or pulpectomy
  - High-caries-risk children *(e.g., questionable long-term follow-up)*
  - Intermediate restoration of fractured tooth
  - Patients with bruxism
  - Cervical decalcification
  - Developmental defects *(e.g., hypoplasia, hypocalcification)*
  - Patients requiring general anesthesia or sedation; Cases include non-compliance and/or indicative medical history *(e.g., patients whose developmental or medical problems will not improve with age)*
  - Use as an abutment for a space maintainer *(i.e., "crown and loop")*
- **Additional anterior pediatric crown indications*** include:
  - Incisal edge involvement
  - Poor moisture control *(i.e., difficulty in maintaining dry field for specific case)*
- **Stainless steel crowns** are not esthetically acceptable, yet continue to be widely used in dentistry.

This report discusses the advantages and disadvantages of each type of pediatric crown, outlines useful clinical guidelines, and refers readers to CR's website to compare brands currently available.

CR Pediatric Crown Survey Summary

- **Place pediatric crowns:** 51% of 772 dentists *(n=772)*
- **Crowns are what portion of pediatric restorations you place?** *(n=396):* ≤ 10% *(according to 66% of dentists)*
- **Dentists report parents are most concerned with** *(n=396, multiple responses allowed):* expected fee *(48%)*, comfort of the child during treatment *(41%)*, and color of crown *(23%)*
- **Crown location** *(n=396):* ≥ 90% posterior *(according to 78% of dentists)*
- **Pediatric crown types placed most** *(n=396):* stainless steel *(91%)*, polymer* *(5%)*, stainless steel veneered with tooth-colored material *(3%)*, zirconia *(1%)*, others *(1%)*
- **Place tooth-colored crowns** *(n=396):* 27%
- **Satisfaction with clinical acceptability of current tooth-colored pediatric crowns** *(n=176):* yes *(33%)*, no *(67%)*
- **Complaints for current tooth-colored pediatric crowns** *(n=396, multiple responses allowed):* inability to crimp/contour sufficiently *(26%)*, chipping/separation of white veneer material *(22%)*, less durability *(18%)*, more aggressive crown prep *(16%)*
- **Percentage of anterior crowns tooth-colored** *(n=107):* ≥ 90% *(according to 71% of dentists)*
- **Percentage of posterior crowns tooth-colored** *(n=107):* ≤ 10% *(according to 75% of dentists)*
- **Allergies to stainless steel pediatric crowns** *(n=396):* rarely/never *(according to 94% of dentists)*
- **Pediatric crown brands placed most** *(n=396, multiple responses allowed):* 3M ESPE Primary Stainless Steel Crowns *(66%)*, 3M ESPE Unitek Primary Stainless Steel Crowns *(37%)*, 3M ESPE Strip Crown Forms *(15%)*, NuSmile Signature *(4%)*
- **Longest service period perceived** *(n=396):* stainless steel *(according to 98% of dentists)*
- **Stainless steel prefabrication preferences** *(n=396, multiple responses allowed):* pre-contoured *(63%)*, pre-trimmed *(42%)*, pre-crimped *(40%)*, no pre-alteration desired *(30%)*
- **Open-faced stainless steel crown placement†** *(n=396):* rarely/never *(according to 96% of dentists)*

Pediatric Crowns Are Growing Up *(Continued)*

Comparing Pediatric Crown Options *(Crown types listed in order of most-used per CR survey)*

Materials	Average price/crown‡	Advantages	Limitations
Stainless Steel	$6.25	• High strength and reliability • Minimal tooth reduction decreases risk of pulpotomy need • Flexibility of material allows for: 1) contour and/or crimp for increased retention, and 2) option of open-faced crown technique †	• Low esthetic value • Allergenic potential due to nickel content
Polymer *	$5.00	• Minimal tooth reduction required for strip crowns • Flexibility of select polycarbonate brands allows in-office crimping	• Lower strength; often questionable for posterior locations • Some polymerized polymers will not bond to subsequently placed resin
Veneered Stainless Steel *(tooth-colored surface)*	$24.00	• High esthetic value due to veneering material • Edges without veneering material may be crimped for retention if passive fit not desired • Some brands allow clinicians to customize pre-veneered contour and crimp of crown, as well as extent of veneered surface coverage	• Risk of veneering material cracking/chipping from either crimping metal edges nearby or from wear during service • Added tooth-colored layer necessitates deeper tooth prep, increasing risk of pulpotomy need • Allergenic potential due to nickel content
Zirconia	$26.75	• Highest strength of any pediatric crown type • High esthetic value, due to monolithic ceramic formulation	• Challenging to isolate making effective bonding technique-sensitive • Crimping not an option, thus retention must be otherwise achieved • Deeper tooth prep required, increasing risk of pulpotomy need
Aluminum *(veneered with tooth-colored material)*	$8.80	• High esthetic value *(similar to veneered stainless steel)* • Minimal tooth reduction decreases risk of pulpotomy need • Flexibility of unique tooth-colored coating allows for in-office contour and crimp for increased retention	• Lower strength of aluminum may lead to shorter service • Thin tooth-colored coating may wear through during service

* *General description, including: polycarbonate, acrylic resin, and strip crowns*

† *Visible facing removed, then replaced with bonded plastic or resin-based composite*

‡ *Single-crown price, or equivalent (calculated from lowest quantity sold); improved large-quantity pricing also available for some brands. Value shown was calculated from large sample size of available brands.*

Clinical Tips

- **Inform patient of possible pulpotomy.** Because of the proximity of primary pulp to the exterior tooth surface, pulpotomies are more likely for crowns which require aggressive tooth preparations for: 1) fitting and/or retention purposes, or 2) extensive tooth decay.
- **Isolate restoration site** with rubber dam or other technique. For suggestions, see *Clinicians Report* December 2011.
- **Provide retention** when seating crown by cutting a retentive tooth prep; crimp when possible. Bonding is less effective on primary than on permanent teeth.
- **Choose a biocompatible crown** option for each patient. Nickel found in many metals *(including stainless steel)* is the most common allergen in dentistry. Those sensitive to metal should not receive stainless steel crowns. Risk for pediatric patients is considered less due to short-term use of primary crowns; however, each exposure to allergens increases likelihood of future biocompatibility issues.
- **Delegate to trained staff** tasks such as trimming, contouring, and crimping, so crown is ready to seat when clinician enters the room.
- **Posterior crowns require strength** when occlusion is present. Posterior strip crowns *(i.e., clear, thin forms filled with resin/composite)* should be used with extreme caution. Some pediatric crown brands are contraindicated for heavy bruxism and/or single-point occlusion because of lower strength.
- **Fully cure composite** when seating strip crowns. For clinical tips on effective light curing, see *Clinicians Report* May 2012.
- **Avoid extracting primary teeth.** Retaining primary teeth keeps other teeth in relatively normal position and prevents severe tooth drift. A "crown and loop" space-maintaining setup with wire and solder is usually not clinically effective. For occlusion questions, consult with an orthodontist.
- **Refer non-compliant children** to a pediatric dentist when appropriate.

ADA Billing Code	Average Dental Fee *(2011 ADA national survey)*
D2930: Prefabricated Stainless Steel Crown – Primary Tooth *(Stainless steel crown)*	$231.32
D2934: Prefabricated Esthetic Coated Stainless Steel Crown – Primary Tooth *(Veneered stainless steel crown)*	*no data* *
D2933: Prefabricated Stainless Steel Crown with Resin Window *(Open-faced stainless steel crown)*	*no data* *
D2932: Prefabricated Resin Crown *(Polymer)*	*no data* *
D2390: Resin-Based Composite Crown, Anterior *(Anterior strip crown)*	$344.41
D3220: Therapeutic pulpotomy excluding final restoration – removal of pulp coronal to the dentinocemental junction and application of medicament	$163.99
D2999: Code by Report *(Zirconia OR Aluminum veneered with tooth-colored material. For these two crown types, specifically ask for the "alternative benefit" of ADA codes D2930 and D2934, respectively. A new code D2929 (Prefabricated porcelain/ceramic crown – primary tooth) should cover zirconia starting 1/1/2013.)*	*no data* *
D9215: Local Anesthesia *(Although most procedures require only local anesthesia, some dentists choose to supplement with nitrous oxide—ADA code D9230—for more difficult cases.)*	$24.98

* *Average dental fee data not available for select ADA codes due to low use percentage among those surveyed.*

Note: Use of ADA billing code D2950 (core buildup, including any pins) does not generally result in reimbursement when applied to primary teeth, since this is a listed exclusion.

CR Conclusions: Pediatric crown options have become more diverse, especially within the last decade. Stainless steel continues to dominate because of low price, ease of use, and strength, despite allergenic potential. Stainless steel crowns are also offered in convenient pre-crimped/contoured/trimmed format, although nearly 1/3 of dentists surveyed prefer to custom fit instead. Other crown types, including stainless steel veneered with tooth-colored material and zirconia, are becoming increasingly popular for multiple reasons, mainly esthetics. Those who do not place tooth-colored pediatric crowns *(73% of those surveyed)* may want to gradually diversify their inventory to include esthetic options. CR invites you to compare multiple pediatric crown brands listed on CR's website: www.CliniciansReport.org. Although tooth-colored pediatric crowns have improved, CR survey results indicate they still merit clinical improvement to compete with traditional stainless steel.

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November 2012, Volume 5 Issue 11: Addendum
"Pediatric Crowns Are Growing Up"

Pediatric Crown Comparison (Brands listed in alphabetical order for each crown material type)

Materials	Brand *Company*	Price/ Crown*	Photo	Sizes and Shapes available Sizes: 0–7 • Shapes: L/R, Up/Low, or Universal Anterior	 Posterior	Highest Average Thickness (mm) *Location*	Reduction requirements (per manufacturer)	Crimping Evaluation	Key Features (per manufacturer)
Stainless Steel	Hu-Friedy PEDO CROWNS *Hu-Friedy*	$7.20		N/A	1st and 2nd Molars: Up/Low, L/R (2-7)	0.11 mm *Mesial / Buccal*	No recommendation; reduction at discretion of clinician	Crimps well on all edges	Pre-trimmed, Pre-crimped, Slightly shorter than other brands (less required trimming), More narrow mesial-distal width than other brands
	Primary Stainless Steel Crowns *3M ESPE*	$8.44		N/A	1st and 2nd Molars: Up/Low, L/R (2-7)	0.13 mm *Mesial*	Occlusal: 1.0-1.5 mm Proximal: 1.0 mm Buccal/Lingual: reduction not routine Subgingival: 1.0 mm	Crimps well on all edges	Pre-trimmed, Pre-crimped, Belled shape
	Unitek Primary Stainless Steel Crowns *3M ESPE*	$8.44		Upper Incisors: L/R (1-6) Cuspids: Up/Low (1-6)	1st and 2nd Molars: Up/Low, L/R (1-7)	Posterior †: 0.17 mm *Lingual*	Occlusal: 0.5-1.0 mm Proximal: 1.0 mm Buccal/Lingual: reduction not routine Subgingival: 1.0 mm	Crimps well on all edges	Thick occlusal surface to prevent bite-through, More shallow occlusal anatomy for less tooth reduction, Parallel walls
Polymer General description, including: polycarbonate, acrylic resin, and strip crowns	PedoNatural Crown *PedoNatural Crown*	$9.45		Upper Centrals: L/R (2-4) Upper Laterals: L/R (3-4) Upper Cuspids: L/R (2-3) ‡	1st and 2nd Molars: Up/Low, L/R (2-6)	Anterior: 0.57 mm *Incisal* Posterior: 0.87 mm *Occlusal*	Occlusal/Incisal: 2.0 mm Facial/Lingual: 1.0 mm Proximal: open contact areas Subgingival: 1.0 mm	Crimps well on all edges §	Crimpable (unique flexible polycarbonate), Coloration universal (translucent cement shade recommended), No dry-field issues (all materials hydrophilic)
	Strip Crown Forms *3M ESPE*	$8.74		Upper Incisors: L/R (1-4)	N/A	0.3 mm *Labial*	Minimal reduction required on incisal and proximal surfaces	Not applicable: Form removed after composite curing conducted	Easily removed, Leaves smooth composite surface, Can be used with either chemical or light-cured composite
Stainless Steel veneered with tooth-colored material	NuSmile Signature *NuSmile Pediatric Crowns*	Anterior: $17.98 Posterior: $29.95		Upper Incisors: Universal (1-6) Cuspids: Universal (0-6)	1st and 2nd Molars: Up/Low, L/R (1-7) Size 1 used for cases with mesial-distal space loss	Anterior: 1.11 mm *Labial* Posterior: 1.31 mm *Occlusal*	Anterior: Incisal: 2.0 mm Subgingival: 1.5–2.0 mm Circumferential: 25–30% Posterior: Occlusal: 2.0 mm Buccal: 1.5–2.0 mm Subgingival: 2.0 mm Circumferential: 30%	Not applicable: Metal lingual edge crimping not indicated since passive fit is desired	2 shades, 2 lengths (anterior), Custom RX crowns provide additional customization options to specify pre-veneered contour and crimp of crown, as well as extent of veneered surface coverage
Zirconia	EZ-Pedo *EZ-Pedo*	Anterior: $25 Posterior: $35		Upper Incisors: L/R (1-6) Lower Incisors: Universal (1-4) Upper Cuspids: L/R (1-6) - contralateral use possible	1st and 2nd Molars: Up/Low, L/R (2-7) *Prime-sized (narrow mesial-distal) 1st molar options also available for space loss situations*	Anterior: 0.46 mm *Distal* Posterior: 0.73 mm *Occlusal*	Incisal: 1.5-2.0 mm Occlusal: 2.0 mm Facial: 0.5-1.0 mm Lingual: 0.75-1.25 mm Circumferential: 20-25% Subgingival: 1.0-2.0 mm	Not applicable: Passive fit indicated	Zir-Lock interior retentive grooves; Zir-Plus exterior surfacing provides maximum esthetics with minimum wear, EZ-Seat crown contour promotes less tooth reduction, Non-thinning margins decreases risk of microfractures during seating, Multiple patents (includes Zir-Lock), Autoclavable
	NuSmile ZR *NuSmile Pediatric Crowns*	$21.95		Upper Incisors: L/R (0-6) Lower Incisors: Universal (1-4) *Cuspids available Jan. 2013* **	*Molars available Jan. 2013* **	0.78 mm *Incisal*	Incisal: 2.0 mm Circumferential: 20% (0.5–1.25 mm) Proximal: aligned parallel to slightly-converging-incisally Subgingival: 2.0 mm	Not applicable: Passive fit indicated	2 shades available, Translucency set to prevent dark color show-through, Polished instead of glazed to reduce wear on opposing dentition, Autoclavable
Aluminum veneered with tooth-colored material	Pedo Pearls *Java Crowns*	$8.80		Upper Incisors: Central - Universal (1-4) Lateral - Universal (1-5) Cuspids: Universal (1-4)	1st and 2nd Molars: L/R (3-5)	Anterior †: 0.31 mm *Labial*	Similar tooth preparation to stainless steel	Crimps well on all edges (Note: No visible damage to tooth-colored material)	Trimmable and crimpable, Thinner than stainless steel veneered with tooth-colored material, Infinite shelf life

** Single-crown price, or equivalent (calculated from lowest quantity sold); improved large-quantity pricing also available for some brands*

† Other available version (posterior/anterior) not evaluated by CR; manufacturer reports other version to have similar manufactured result

‡ Although not officially indicated, clinicians may attempt to use upper lateral crowns for lower centrals/laterals and upper cuspids for lower cuspids.

§ Must use manufacturer-provided bull-nosed crimping pliers to bend margin in; traditional crimping pliers will adversely thin margins

*** Crown material formulation may differ from that of already-available products of this brand*

Additional brands available (not evaluated by CR):

Stainless Steel
- A.T. Stainless Steel Crowns by Success Essentials
- AceroXT Stainless Steel Crowns by AceroXT
- DENOVO Stainless Steel Crowns by DENOVO Dental

Polymer
- DirectCrown by DirectCrown Products
- Pediatric Strip Crowns by Success Essentials
- Pedo Jacket Crowns by Success Essentials

Stainless Steel veneered with tooth-colored material
- Cheng Crowns by Cheng Crowns
- Flex Crowns by Success Essentials
- Kinder Krowns Next Generation by Kinder Krowns

Zirconia
- Kinder Krowns Zirconia by Kinder Krowns

What is CR?

WHY CR?

CR was founded in 1976 by clinicians who believed practitioners could confirm efficacy and clinical usefulness of new products and avoid both the experimentation on patients and failures in the closet. With this purpose in mind, CR was organized as a unique volunteer purpose of testing all types of dental products and disseminating results to colleagues throughout the world.

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Research funds come from subscriptions to the *Gordon J. Christensen Clinicians Report®*. Revenue from CR's "Dentistry Update®" courses support payroll for non-clinical staff. All Clinical Evaluators volunteer their time and expertise. CR is a non-profit, educational research institute. It is not owned in whole or in part by any individual, family, or group of investors. This system, free of outside funding, was designed to keep CR's research objective and candid.

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Each year, CR tests in excess of 750 different product brands, performing about 20,000 field evaluations. CR tests all types of dental products, including materials, devices, and equipment, plus techniques. Worldwide, products are purchased from distributors, secured from companies, and sent to CR by clinicians, inventors, and patients. There is no charge to companies for product evaluations. Testing combines the efforts of 450 clinicians in 19 countries who volunteer their time and expertise, and 40 on-site scientists, engineers, and support staff. Products are subjected to at least two levels of CR's unique three-tiered evaluation process that consists of:

1. Clinical field trials where new products are incorporated into routine use in a variety of dental practices and compared by clinicians to products and methods they use routinely.
2. Controlled clinical tests where new products are used and compared under rigorously controlled conditions, and patients are paid for their time as study participants.
3. Laboratory tests where physical and chemical properties of new products are compared to standard products.

Clinical Success is the Final Test

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CRA Foundation® changed its name to CR Foundation® in 2008.

This team is testing resin curing lights to determine their ability to cure a variety of resin-based composites.

Every month several new projects are completed.

THE PROBLEM WITH NEW DENTAL PRODUCTS.

New dental products have always presented a challenge to clinicians because, with little more than promotional information to guide them, they must judge between those that are new and better, and those that are just new. Due to the industry's keen competition and rush to be first on the market, clinicians and their patients often become test data for new products. Every clinician has, at one time or another, become a victim of this system. All own new products that did not meet expectations, but are stored in hope of some unknown future use, or thrown away at a considerable loss. To help clinicians make educated product purchases, CR tests new dental products and reports the results to the profession.

HF-550/1212