

DR ANSHULA DESHPANDE

MDS, MBA PGDIPRL, PHD

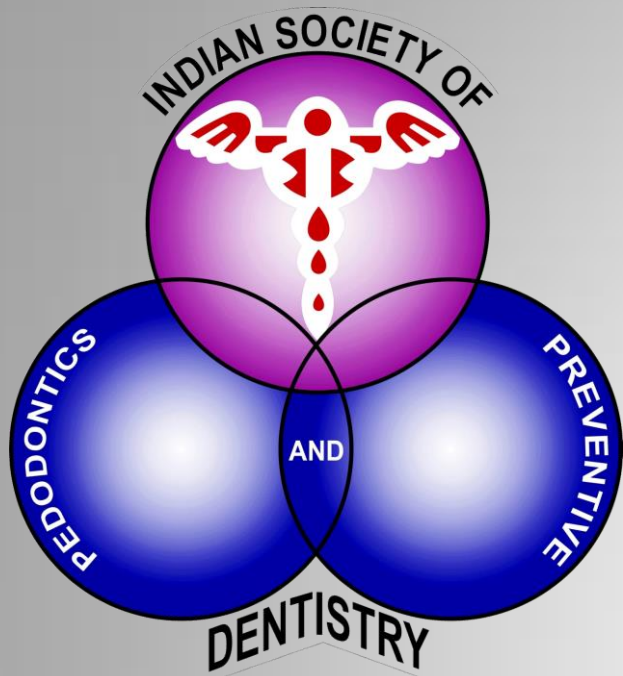
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Sumandeep Vidyapeeth Vadodara, INDIA



PROF. ANSHULA DESHPANDE

- ◉ She is an devoted academician and clinician in the field of Pediatric Dentistry.
- ◉ She has acquired **MBA** in Clinical Research Management and **Postgraduate Diploma in Intellectual Property Rights Law**.
- ◉ She has recently completed her **PhD** in Education and her research area was Self Directed learning and Learning strategies by Dental students
- ◉ She has done her **BDS** and **MDS** from Manipal University.
- ◉ She was awarded VidyaTandon memorial Gold Medal as best out-going Post-graduate student in Pedodontics & Preventive Dentistry for the year 2004, Manipal University
- ◉ Awarded internationally through International Association of Dental Research/Colgate “**Research in Prevention Award 2006**” (Only one from Asia) at 85th General Meeting of IADR at New Orleans, Louisiana, USA. 21-24 March 2007.
- ◉ She has also received **best paper and poster awards** in 40th and 36th ISPPD conference and 13th ISPPD convention. She has been awarded University Research Award 2018 for her contribution to research.
- ◉ She has been invited as **Guest speaker** in more than 20 forums at both National and International Levels.





CROWNS IN PEDIATRIC DENTISTRY



Disclaimer:

- Resources quoted are recommended, however other resources may be available and can be referred.
- This is an educational presentation with no financial support .
- Patients and parents consent taken for the identifiable pictures, and source of pictures are from references quoted or Open access resources.

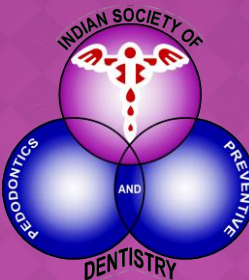
WRITING THE THEORY PAPER



- ◉ Manage your time well designated **time based on marks weightage**
- ◉ Good and **legible handwriting** has no substitute.
- ◉ **Do not write same things** for lengthening the answer
- ◉ **Draw diagrams** wherever possible
- ◉ Write answers of **Post graduate level with best evidence** for it
- ◉ **Quote the authors** wherever necessary

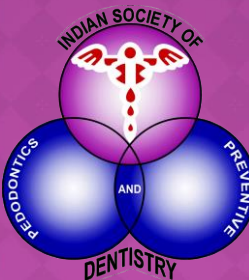
INTENDED LEARNING OUTCOMES

1. Adept to **differentiate between** Direct; Divergent; and Indirect /Evaluative **questions**.
2. Able to analyse and organise the **answer content** with relevant line diagrams
3. Competent to concise most relevant and best evidence pertaining to the Crowns in Paediatric dentistry.
4. Remember important references related to Crowns in Pediatric Dentistry



QUESTIONS: STAINLESS STEEL CROWNS

- ◉ Write in detail about the indications contraindications procedure and modification of Stainless Steel Crown with review of literature
- ◉ Stainless Steel Crowns (repeated)
- ◉ Classify crowns used in pediatric dentistry and how to do tooth preparation and crown adaptation for ssc?
- ◉ Preformed crowns
- ◉ Extracoronal restorations
- ◉ Interim restorations for hypomineralized molars



STAINLESS STEEL CROWNS

Direct Q

Write in detail about SSC with review of literature

Stainless Steel Crowns

Divergent Q

Preformed crowns

Semipermanent restoration

Indirect / Evaluative Q

Extracoronary restorations

Hall's Technique

Interim restorations for hypomineralized molars

CLASSIFICATION OF PREFORMED CROWNS

According to materials used:

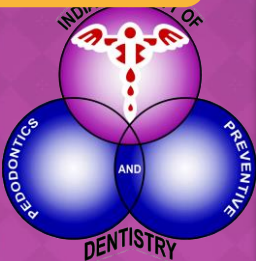
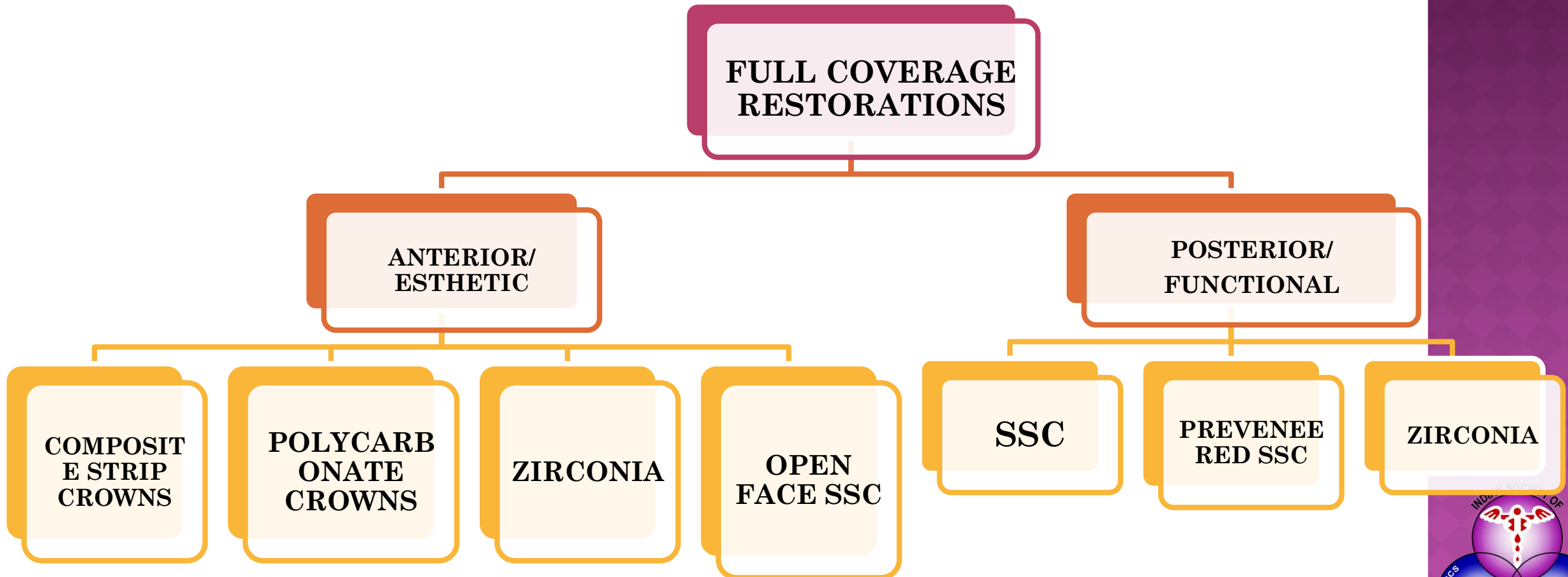
1. Stainless steel crowns
2. Nickel chromium crowns
3. Aluminum Crowns
4. Tin Silver alloy
5. Polycarbonate crowns
6. Pedo strip crowns

According to location:

1. Crowns for anterior teeth
2. Crowns for posterior teeth



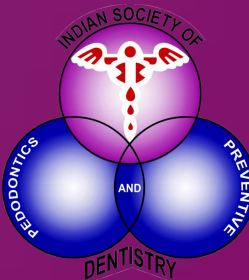
CLASSIFICATION





DIRECT Q

Write in detail about SSC
with review of literature /
Stainless Steel Crowns



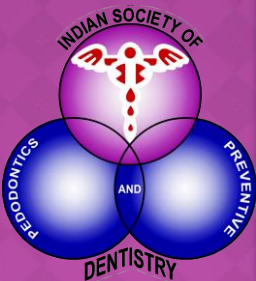
STAINLESS STEEL CROWN CONTENT

1. Introduction
2. History
3. Classification
4. Composition
5. Indications & Contraindications
6. Advantages & Disadvantages
7. Size for SSC
8. Armamentarium
9. Technique
10. Modifications
11. Hall's technique
12. References



INTRODUCTION

- Maintenance of the primary dentition in a healthy condition is important for the overall well being of the child.
- Treatment of the severely destructed teeth poses a challenge for the pediatric dentist **as 3 important FACTORS** have to be kept in mind,
 1. **Patient's behavioral management,**
 2. **Preservation of the tooth structure and**
 3. **Parental satisfaction.**



INTRODUCTION...

- ◉ Dental decay in children's teeth is a significant public health problem, affecting **60% to 90%** of school children in industrialized countries (**WHO Report 2003**)
- ◉ Many **options** exist to repair carious teeth in paediatric patients, from stainless steel crowns to its various modifications to other esthetic crowns like strip crowns and zirconium crowns which are rising in their popularity.
- ◉ Considering the breakdown of tooth we have to opt for full coverage restorations as well.

HISTORY TO PRESENT



It all began with
curiosity..

STAINLESS STEEL CROWNS

- ◉ The preformed metal crown (**PMC**), more commonly known as the stainless steel crown (**SSC**), has been used for approximately 50 years.
- ◉ Preformed metal crowns (PMCs) for primary molar teeth were first described in **1950** by **Engel**, followed by **Humphrey**.



1970

- ◉ The initial crown preparation was suggested by Mink and Bennet which is still being used.

- ◉ Mc Evroy advised modification of SSC technique for SSC arch length or space loss

1977

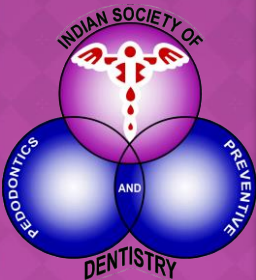
THE SSC STORY...!!



- It began as a fairly crude metal tube closed on one end with a prestamped facsimile of a molar occlusal surface.
- It required a significant amount of time and skill to trim, festoon, crimp and harden the margins to custom fit the tooth.
- *Today's crown is much easier to place and often requires minimal modifications from its manufactured form.*

CLASSIFICATION: 1. BASED ON COMPOSITION

1. Stainless Steel crown (Unitek and Rocky Mountain crowns)
2. Nickel-Base crowns (Ion Ni-chro from 3M)
3. Tin –base crowns
4. Aluminum -base crowns



Composition

Stainless steel crowns (18-8) Austenitic type (Rocky mountain, Unitek)

- 17-19% chromium
- 10-13% nickel
- 67% iron
- 4% minor elements

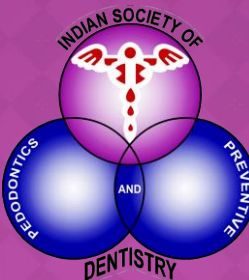
Nickel base crowns (InConell 600 alloy, 3M)

- 72% nickel
- 16% chromium
- 6-10% iron
- 0.04% carbon
- 0.35% manganese
- 0.2% silicon

Brook & King. Dent Update 9:25, 1985.

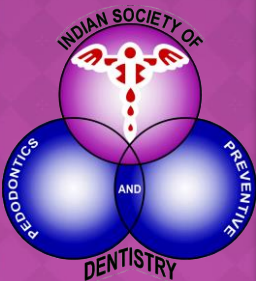
COMPOSITION

- ◉ **Iron (67%), carbon, chromium (17-19%), nickel (10-13%), manganese and other metals (4%).**
- ◉ Chromium oxidizes - “**passivating film**”
- ◉ The term “stainless steel” is used when the chromium content exceeds 11% and is generally in the range of **12 to 30%**.
- ◉ SSC contain about 18% chromium and 8% nickel as well as small amounts of other elements and are considered as **18-8 stainless steel**.



- ◉ Due to its allergic potential, nickel affects 10% of the total general population.
- ◉ **Feasby et al. (1988)** reported an increased nickel positive patch test in children 8-12 years who received old formulation Ni-Cr crowns.
- ◉ This is no longer the issue with current composition.

Kulkarni et al. (2016) evaluated the release of Ni-Cr from space maintainers and SSC and revealed that the release is well below the average dietary intake (200-300 ppm/day) and were incapable of causing any toxic effects.



CLASSIFICATION: 2. BASED ON MORPHOLOGY

According to form and contour:

1. **UNTRIMMED** e.g. Rocky mountain
2. **PRE-TRIMMED** e.g. Unitek stainless steel crowns,
3. **PRE-CONTOURED** e.g. Unitek stainless steel crowns, 3m Crowns

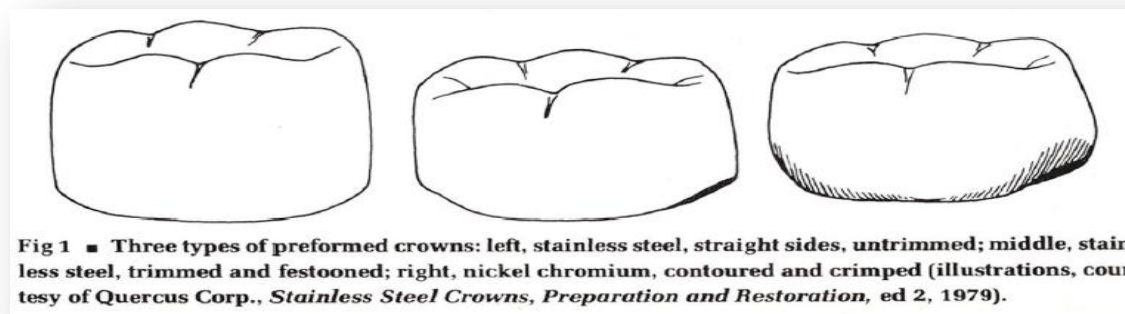
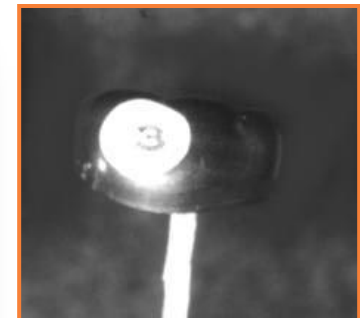
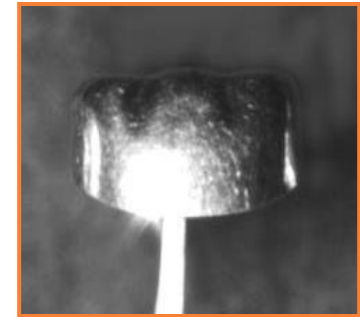
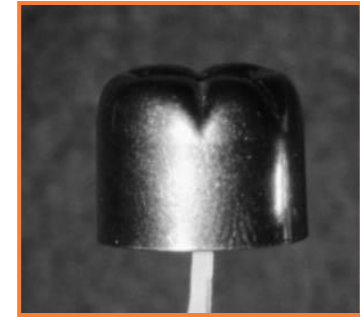


Fig 1 ■ Three types of preformed crowns: left, stainless steel, straight sides, untrimmed; middle, stainless steel, trimmed and festooned; right, nickel chromium, contoured and crimped (illustrations, courtesy of Quercus Corp., *Stainless Steel Crowns, Preparation and Restoration*, ed 2, 1979).

Mathewson.: Fundamental of pediatric dentistry. 3rd ED. Quintessence Publishing Co. Shicago, 1995

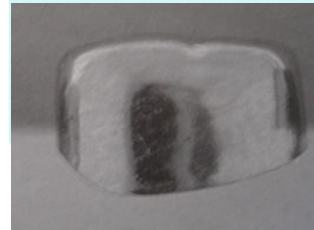
Untrimmed crowns (e.g. Rocky Mountain)

- neither trimmed nor contoured
- longer
- lot of adaptation
- time consuming



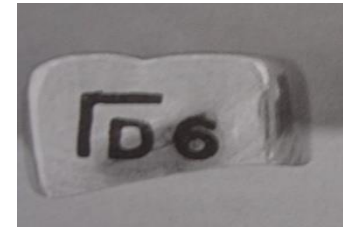
Pre trimmed crowns (e.g. Unitek stainless steel crowns, 3M and Denovo crowns)

- straight, non-contoured sides
- but shorter
- festooned
- require contouring



Pre contoured crowns (e.g. Ni-Cr Ion crowns, Unitek stainless steel crowns, 3M)

- Festooned, Pre Contoured & Pre trimmed
- minimal amount of adjustment necessary
- more difficulty in adaptation since trimming will result in removal of manufacturers gingival crimp

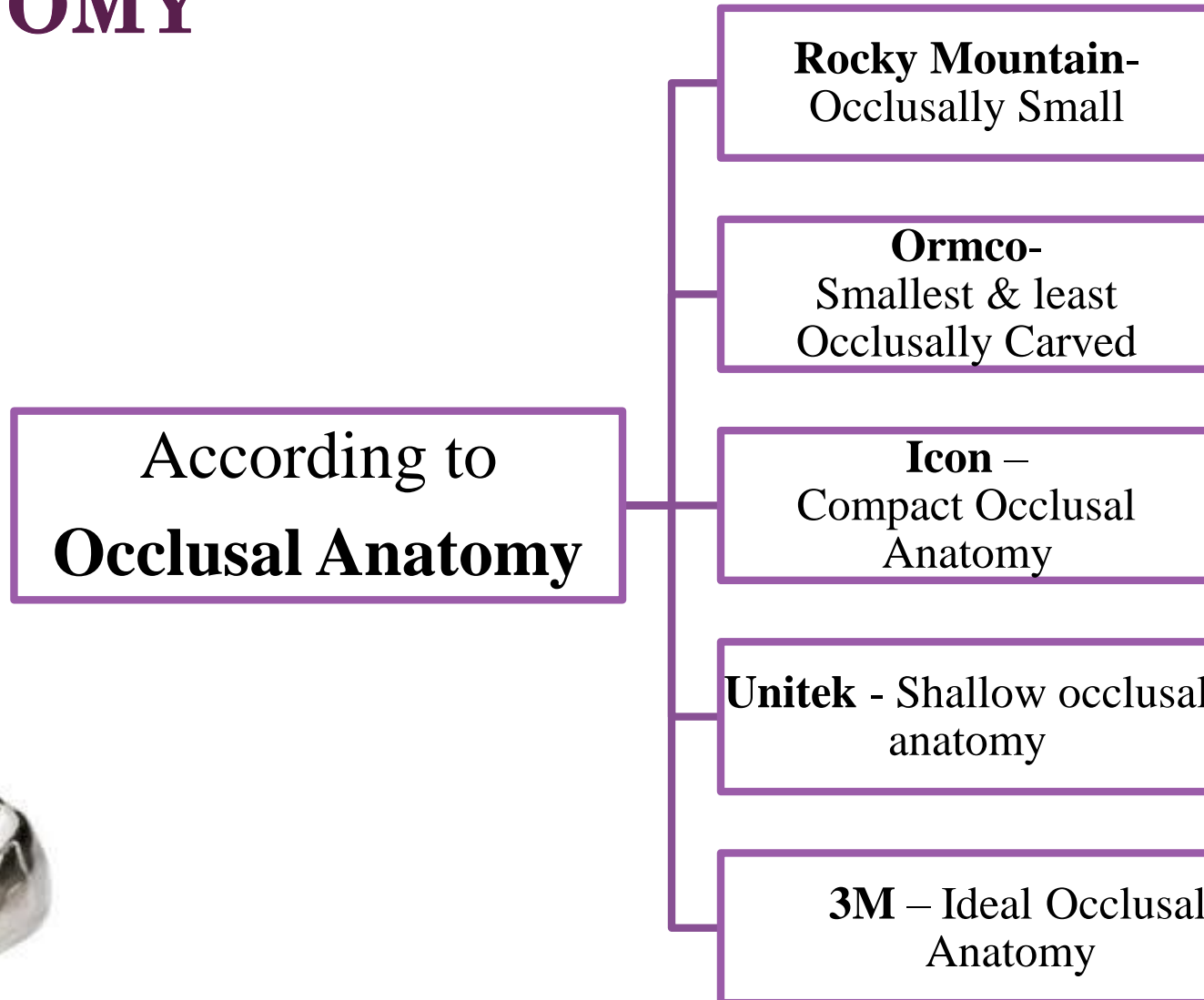


Preveneered SSC

- Aesthetic posterior crowns
- Resin based composite bonded to the buccal and occlusal surfaces
- Allow only minimal crimping

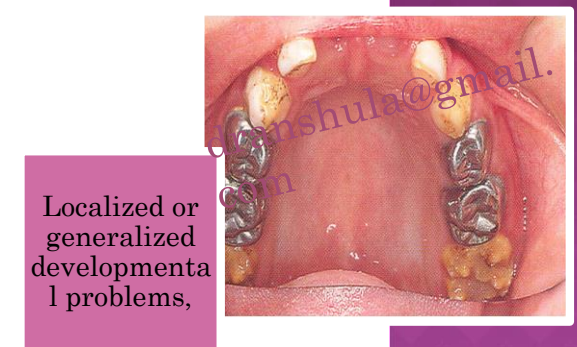
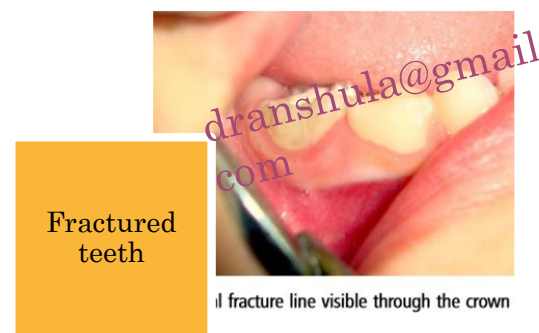
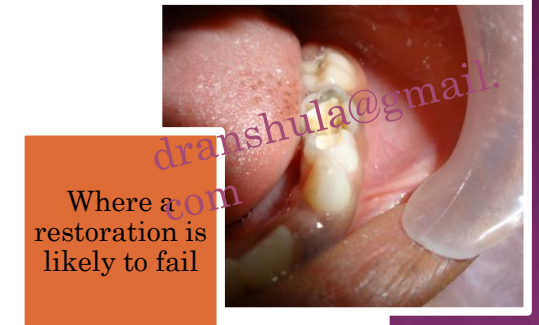


CLASSIFICATION: 3. BASED ON OCCLUSAL ANATOMY

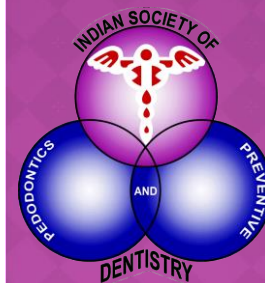


INDICATIONS: 1.PRIMARY MOLAR TEETH

1. After pulp therapy;
2. Multisurface caries
3. Pt's at high caries risk;
4. Where a restoration is likely to fail (eg, proximal box Extended beyond the anatomic line angles;
5. Fractured teeth;
6. Teeth with extensive wear (bruxism);
7. Abutment for space maintainer.



Randall RC. Preformed metal crowns for primary and permanent molar teeth: review of the literature. Pediatric Dentistry. 2002 Sep;24(5):489-500.



abutment for
space
maintainers &
habit breaking
appliances

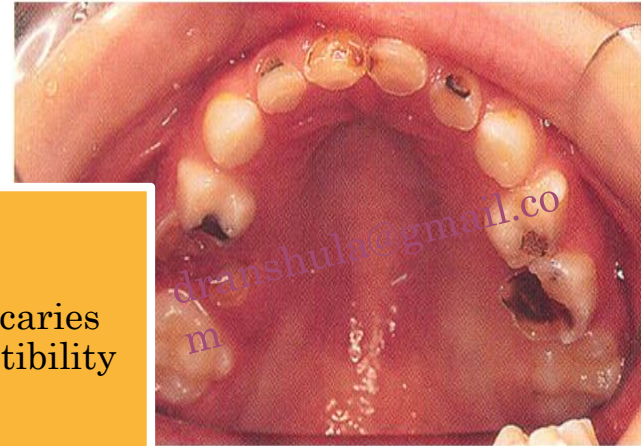


Extensive tooth
surface loss due
to Attrition,
Abrasion,
Bruxism



◎ **Pinkerton-** children who are unlikely to attend regular recall appointments or who are unlikely to be reliable preventive patients. **(Indication)**

High caries
susceptibility



Pinkerton JR. Editorial. Intraprofessional controversies: reflections on the stainless steel crown. *ASDC J Dent Child*. 2001;68:292-293.

INDICATIONS: 2. PERMANENT MOLAR TEETH



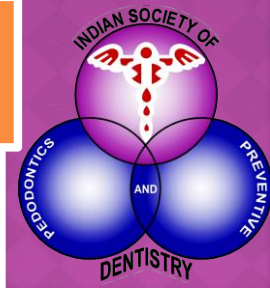
Interim restoration of a broken-down or traumatized tooth

When financial considerations are a concern

Teeth with developmental defects (dentin dysplasia, sensitivity)

Restoration of a permanent molar which requires full Coverage but is only partially erupted

Young permanent molars following endodontic treatment



INDICATIONS: 3.ANTERIOR PRIMARY TEETH



**Interim restoration
traumatized tooth**

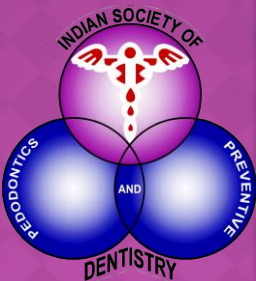
**When financial
considerations are a concern**

**Morphological and occlusal
considerations**

CONTRAINDICATIONS

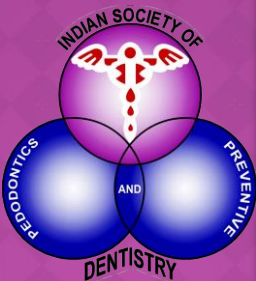
1. Non restorable and severely broken down teeth
2. As a permanent restoration in a permanent teeth
3. Primary teeth exhibiting more than $\frac{1}{2}$ of root resorption
4. The tooth with excessive mobility
5. Primary tooth is approaching exfoliation (3-6 months).
6. Patients with nickel allergies
7. Restorable tooth by conventional measure

Garg V, Panda A, Shah J, Panchal P. CROWNS IN PEDIATRIC DENTISTRY: A REVIEW. Journal of Advanced Medical and Dental Sciences Research. 2016 Mar 1;4(2):41.



ADVANTAGES

1. Their **lifespan** is the same as that of an intact primary tooth.
2. They provide **protection** to the residual tooth structure that may have been weakened after excessive caries removal.
3. The **technique sensitivity** or the risk of making errors during their application **is low**.
4. Their long-term **cost effectiveness** is good.
5. They have a **low failure rate**.
6. **Modifiability and Fit**



RETREATMENT

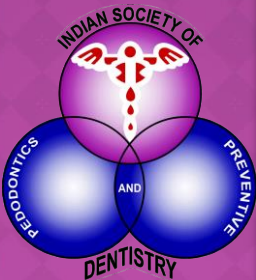


MAXILLARY CROWN ON MADIBULAR

Loss of tooth structure due to dental
caries

DISADVANTAGES

1. Unsightly metallic appearance.
2. Cannot be used when the tooth is only partially erupted.
3. Gingival hyperplasia



Setting
my mind
on Dental
instruments
was like
falling in
Love

dranshula@gmail.com



ARMAMENTARIUM



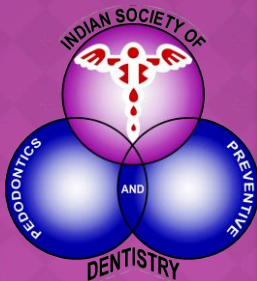
SSC (kidz crowns)



Primary anterior teeth (kidz crowns)



Permanent molar (3M)



SIZE FOR SSC

TOOTH	SIZES	WIDTH RANGE (MM)
Upper 1 st primary molar	2- 7	7.2 to 9.2
Upper 2 nd primary molar	2-7	9.2 to 11.2
Lower 1 st primary molar	2-7	7.4 to 9.4
Lower 2 nd primary molar	2-7	9.4 to 11.4
Upper 1st permanent molar	2-7	10.7 to 12.8
Lower 1st permanent molar	2-7	10.8 to 12.8

- ▶ Sizes 4 & 5 are most often used



ARMAMENTARIUM

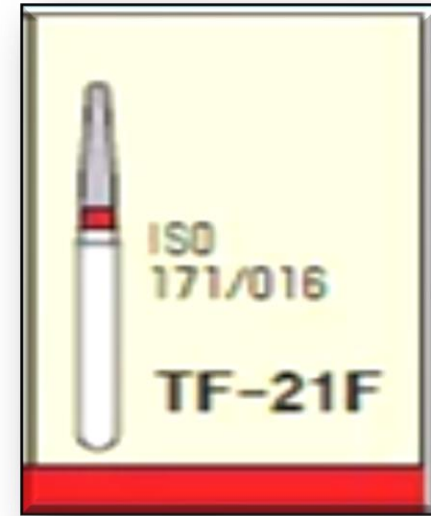
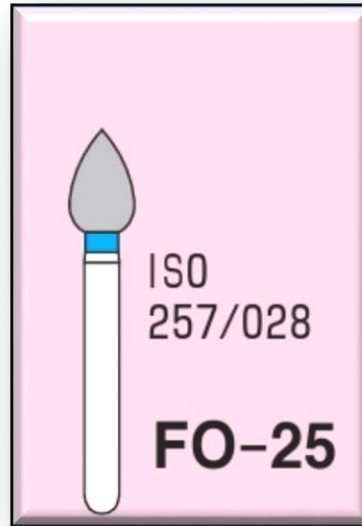
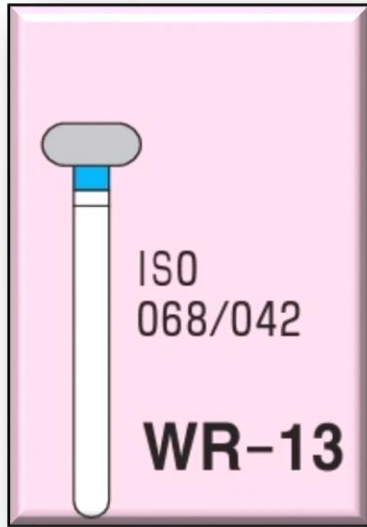
Burs and stones:

- ◉ No. 169L or No. 69L F.G.
- ◉ No. 6 or No. 8 R.A.
- ◉ No. 330 F.G.
- ◉ Tapered diamond F.G.
- ◉ Round bur
- ◉ Flame shaped diamond bur
- ◉ Long thin tapered
- ◉ Green stone or heatless stone/rubber wheel
- ◉ Rough polishing wheel
- ◉ Wire wheel-for finishing crown



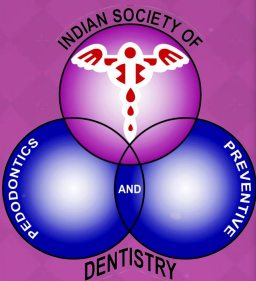
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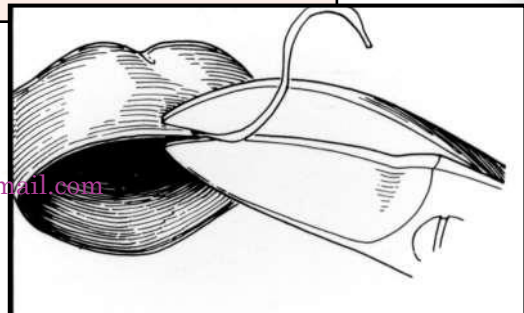
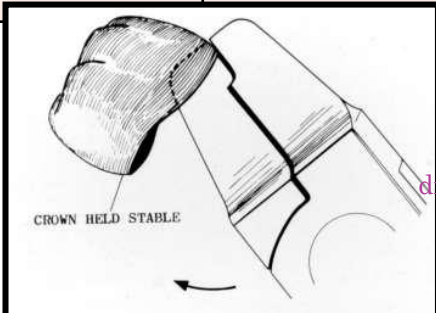
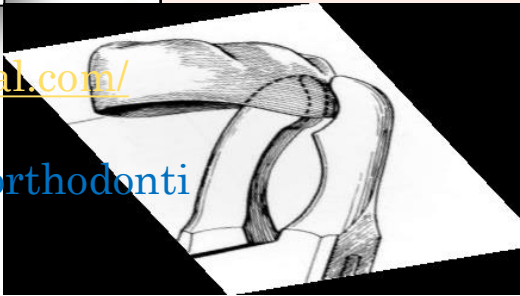




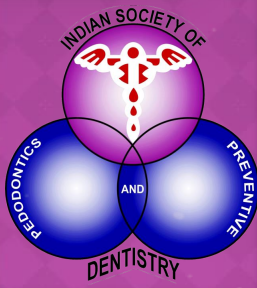
Hu-friedy	GDC
<p>SLIM CROWN & BAND CONTOURING PLIERS 678-221MC</p>	<p>JHONOSON CONTOURING 3000/59</p>
<p>BAND CRIMPING PLIERS 678-225</p>	<p>CROWN CRIMPING PLIER 3000/225</p>
<p>CURVED CROWN & GOLD SCISSORS SCGC</p>	<p>CROWN & BAND TC CURVED 12.0 CM S5039</p>



Source:
<https://www.gcdental.com/>
<https://www.hu-friedy.com/products/orthodontics>



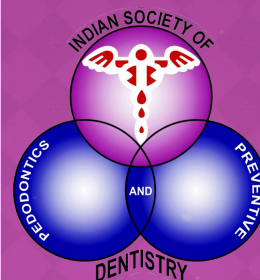
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Brand Company	Sizes and Shapes available Sizes: 0–7 • Shapes: L/R, Up/Low, or Universal		Highest Average Thickness (mm) Location
	Anterior	Posterior	
Hu-Friedy PEDO CROWNS <i>Hu-Friedy</i>	N/A	1st and 2nd Molars: Up/Low, L/R (2-7)	0.11 mm <i>Mesial / Buccal</i>
Primary Stainless Steel Crowns <i>3M ESPE</i>	N/A	1st and 2nd Molars: Up/Low, L/R (2-7)	0.13 mm <i>Mesial</i>
Unitek Primary Stainless Steel Crowns <i>3M ESPE</i>	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 <i>Lingual</i>

<https://www.cliniciansreport.org/uploads/files/164/201211PedoCrowns.pdf>

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**BY CHOOSING OUR
PATH, WE CHOOSE
OUR DESTINATION**

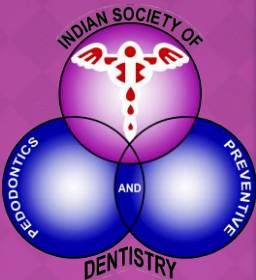
STAINLESS STEEL CROWN

Case selection



4 important **FACTORS** have to be kept in mind,

1. **Patient's behavioural management,**
2. **Dental Age**
3. **Preservation of the tooth structure and**
4. **Parental motivation and satisfaction.**



TECHNIQUE

- ◉ Evaluate the preoperative occlusion:
- ◉ Selection of crown
- ◉ Tooth preparation
 - Anterior
 - Posterior
- ◉ Final adaptation of the crown
- ◉ Finishing
- ◉ Polishing
- ◉ Crown fit
- ◉ Cementation



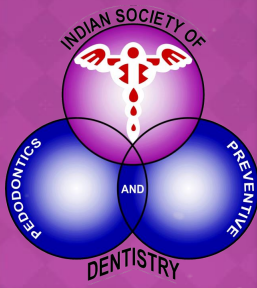


**BOOKS TRAIN
YOUR
IMAGINATION TO
THINK BIG**

BOOK REVIEW FOR STEPS OF TOOTH PREPARATION

ASPECT	MATHEWSON	MCDONALD	SHOBHA TANDON	NIKHIL MARWAH
Occlusal Reduction	1-1.5mm	1mm	1.5-2mm	1-1.5mm
Mesial and Distal Surface/ Proximal Reduction	Break the contact	-	Break the contact	Break the contact
Margin Preparation	Rounding the margins	Rounding the margins	Round off margins	Rounding the margins
Bucco-Lingual Reduction	No reduction	Not required	Minimal	0.5mm

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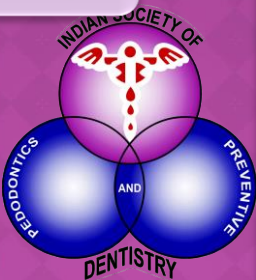
OCCLUSAL FIRST OR PROXIMAL FIRST

- ⦿ Full et al. considered that **preparing the occlusal surface first** allows better access to the proximal areas of the tooth

Full CA, Walker JD, Pinkham JR. Stainless steel crowns for deciduous molars. *JADA*. 1974;89:360-364.

- ⦿ Other authors recommended preparing the mesial and distal slices before reducing the occlusal.

Mink JR, Bennett IC. The stainless steel crown. *J On Dent Assoc*. 1968;45:420-430.



PLACEMENT OF SEPARATORS

Wedging

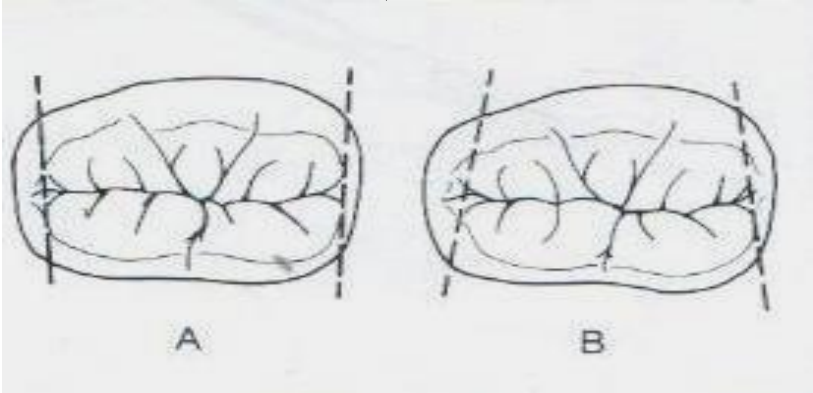
□ Advantages:

- Better access and to reduce risk of iatrogenic damage to adjacent teeth
- It also helps to depress gingival tissue and rubber dam



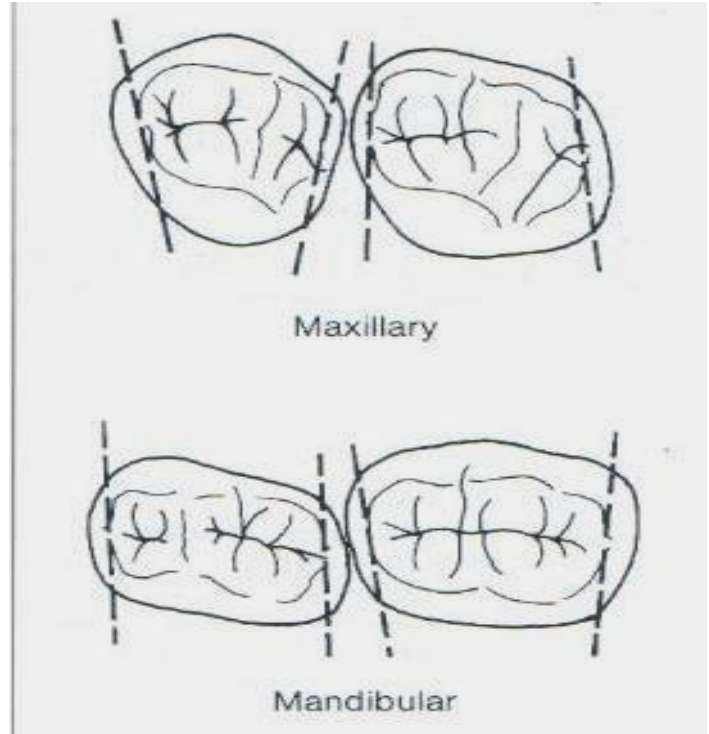
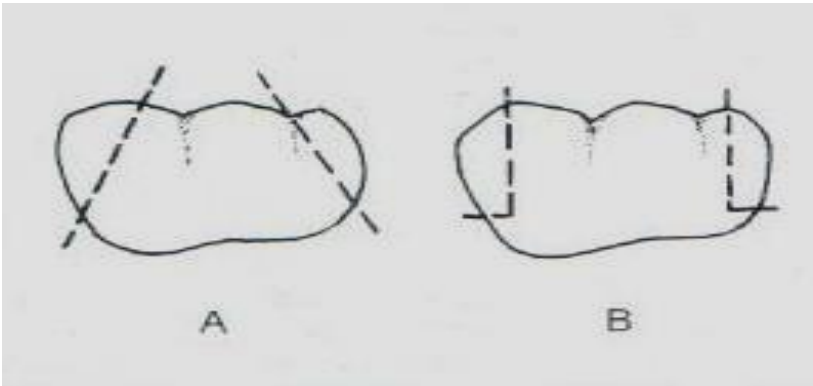
A: Proper slice

B: Improper slice

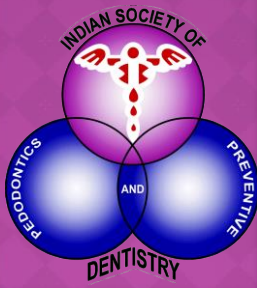


A: Excessive taper

B: Shoulder creation



Optimum slices



SELECTION OF SIZE

Spedding has advocated adhering to 2 important principles that will help to produce well-adapted SSC consistently.

The operator must establish the correct occluso-gingival crown length;

The crown margins should be shaped circumferentially to follow the natural contours of the tooth and the marginal gingivae.

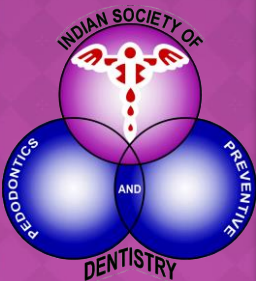
The crown should be reduced in height, if necessary, until it clears the occlusion and is approximately 0.5 to 1 mm beneath the free margin of the gingival tissue.

The precontoured and festooned crowns currently available often require very little, if any, modification before cementation.

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RE-CRIMPING

TITLE	Comparison of Marginal Circumference of Two Different Pre-crimped Stainless Steel Crowns for Primary Molars After
AUTHORS JOURNAL	Hossein Afshar, Mehdi Ghandehari, Banafsheh Soleimani Journal of Dentistry, Iran 2015. LEVEL: 4
AIM	To assess the changes in the circumference of 3M ESPE and MIB pre-crimped stainless steel crowns (SSCs) for primary maxillary and mandibular first and second molars following re-crimping
CONCLUSION	Considering the significant reduction in the marginal circumference of precrimped SSCs following re-crimping, it appears that this manipulation must be necessarily performed for MIB and 3M pre-crimped SSCs. By <u>using 3M SSCs, higher marginal adaptation can be achieved following crimping.</u>



ASPECT	MATHEWSON	MCDONALD	SHOBHA TANDON	NIKHIL MARWAH
<p style="text-align: center;">CROWN SELECTION</p>	<ul style="list-style-type: none"> • M-D diameter • Light resistance to sitting • Proper occlusal Height 	<p style="text-align: center;">Smallest crown that completely covers the tooth preparation</p>	-	<p>M-D diameter. Light resistance to sitting. Proper occlusal Height.</p>
				<p><i>Different ways to select:</i></p> <ol style="list-style-type: none"> 1) Trial and error. 2) Measurement of M-D by boley guage or Vernier Caliper

...
the tooth, ending gingivally in a feather
cal and lingual reduction must be done to
he proper size crown, but too little reduc-
result in the use of too large a crown.


ess steel crown margin must go beyond
e finish margin of the proximal surface
No ledges should be apparent on the
listal or the buccal and lingual sides be-
ould prevent crown placement (Fig 16-6).
ring is adapted from Myers (1976), sum-
stainless steel crown preparation:

d lines of Fig 16-7, A point out the correct
n of the intended slices. The slice on Fig
correct, but the taper is extreme. Crown

crown and adaptation.

3. Minimal but adequate reduction is needed on the buccal and lingual surfaces. The mesial and distal slices are just beneath the contacts, leaving adequate areas for retention. After the line angles are rounded, the outline of the tooth should be apparent. The contour should conform to the internal contour of the stainless steel crown. Here the old axiom prevails, "You cannot fit a square peg [the crown preparation] into a round hole [the internal structure of the crown]."

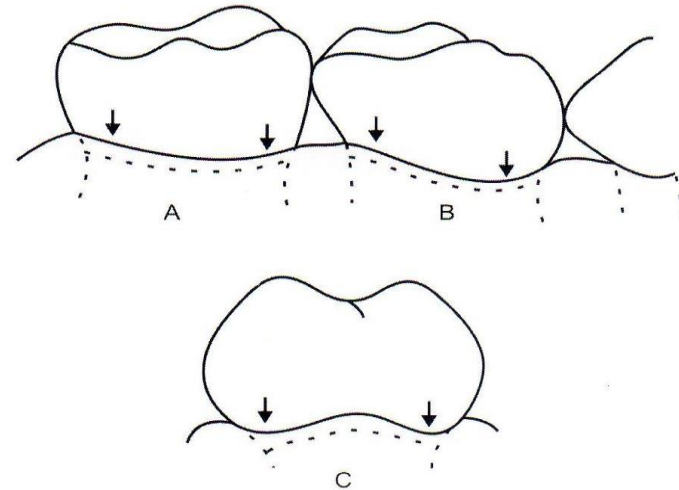
It is important to remember that the tooth preparation influences the retentive properties of the crown. Mathewson et al (1974) demonstrated that the crown preparation is a significant part of the crown's retentive potential. Others have evaluated the same principle, supporting the premise (Savide et al, 1979).



axiom prevails, "You cannot fit a square peg [the crown preparation] into a round hole [the internal structure of the crown]."

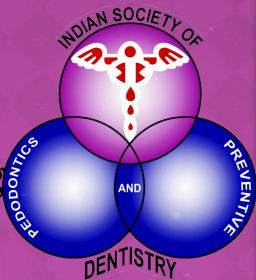
ADAPTATION OF CROWN

Gingival contour



- A. Gingival contour of 2nd molar – ‘smile’
- B. Gingival contour of 1st molar – ‘stretched s’
- C. Proximal gingival contour of molars – ‘frown’

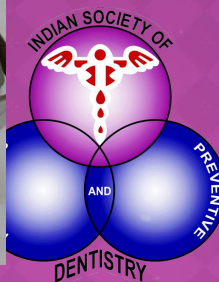
Mathewson.: Fundamental of pediatric dentistry. 3rd ED. Quintessence Publishing Co. Shicago, 1995




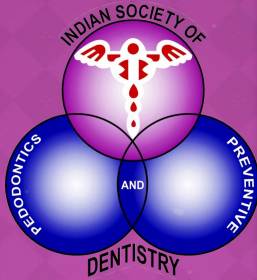
ASPECT	MATHEWSON	MCDONALD	SHOBHA TANDON	NIKHIL MARWAH
<p>CROWN FINISHING</p>	<p>1) Green stone- Knife edge finish.</p>	<p>Rubber abrasive wheel can be used to finish crown margins</p>	<p>Round off at 30-45 degree</p>	<p>Reduce and round off all surfaces.</p>
	<p>2) Smooth & polish- Rubber wheel</p>			<p>How to check Clearance? Ask patient to bite on wax block and no marking of prepared tooth seen.</p>



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ASPECT	MATHEWSON	MCDONALD	SHOBHA TANDON	NIKHIL MARWAH
Before cementation	Cavity varnish to be applied before.	-	Cavity varnish to be applied before.	Cavity varnish to be applied before.
MATERIAL TO BE USED				
Vital teeth	<ol style="list-style-type: none"> 1. Reinforced ZOE 2. Polycarboxylate 3. Glass ionomer cement 	-	<ol style="list-style-type: none"> 1. Polycarboxylate 2. Glass ionomer cement 3. Zinc Phosphate cement 	<ol style="list-style-type: none"> 1. Polycarboxylate 2. Glass ionomer cement 3. Zinc Phosphate cement
Non-Vital teeth	Zinc Phosphate Cement	-		
How much cement to be filled?	 <p>Source of image: http://www.3m.com.au/intl/au/ESPE/Learning/assets/products/unitek/prod_unitek_tech_guide.html</p>		2/3 rd of crown	2/3 rd of crown



LABORATORY TESTING REPORTS ON SSCS AND LUTING CEMENTS

Sr no	Author	Year	Findings
1	Memapour M et al	2011	Least microleakage: RMGIC with bonding agent > polycarboxylate cement
2	Yilmaz Y et al	2004	Higher the crown retentive force, the lower the possibility of microleakage.
3	Subramaniam et al	2010	Crown retentive strength for the adhesive resin and RMGI cements were significantly higher than the conventional GIC
4	Erdemci et al	2014	The lowest microleakage scores were seen with the self-adhesive resin cement.
5	Yilmaz et al	2006	SEM showed intimate contact between the cements & tooth tissue, No significant difference was found between the two cements(GIC and RM GIC) , and the success rate for SSCs was over 99 percent.
6	Reddy et al	2010	Retentive strengths of zinc phosphate and GICs were significantly better than polycarboxylate cement.

AUTHORS	Aim (What they did ???)	Outcome (What they found ???)
Subramaniam P <i>et al</i> 2010	Evaluated and compared the retentive strength of three luting cements.	<i>Retentive strength of adhesive resin cement and resin modified glass ionomer cement was significantly higher.</i>
MM Veerabadharan <i>et al</i> 2012	Evaluated the effect of retentive groove, sand blasting and cement type on the retentive strength of stainless steel crowns in primary second molars	<i>Resin-modified glass ionomer cements (RMGIC's)</i>
Memarpour M <i>et al</i> 2011	Compare the ability of 5 luting cements to reduce microleakage at stainless steel crown (SSC) margins on primary molar teeth.	<i>Resin-modified glass ionomer cement yielded better results</i>
Sidhant Pathak <i>et al</i> 2016	Assessed and Compared the retentive strength of two dual-polymerized self-adhesive resin cements (RelyX U200, 3M ESPE & SmartCem2, Dentsply Caulk) and a resin-modified glass ionomer cement (RMGIC; RelyX Luting 2, 3M ESPE) on stainless steel crown (SSC).	<i>Dual-polymerized self-adhesive resin cements: SmartCem2 and RelyX Luting 2. Showed higher retentive strength</i>
Krishna Chaithanya Reddy 2017	Evaluated and Compared the micro leakage and tensile bond strength of stainless steel crowns cemented with GC Fuji I cement, Rely X luting 2 cement and new self-adhesive cement that is Smart cem 2 cement.	<i>Self-adhesive cements reduced micro leakage and increases the tensile bond strength.</i>

SEATING THE CROWN

- Seat the lingual side first
- Friction should be felt
- Gingival blanching- long crown
- Crown does not seat-
 - Inadequate occlusal reduction
 - Proximal ledge
 - Contact not broken

**Radiographic
confirmation of
gingival fit**



Lingual to
buccal
placement
and snap fit of
SS Crown

COMPLICATIONS

- ◉ Interproximal ledge
- ◉ Crown tilt
- ◉ Poor margins
- ◉ Inhalation or ingestion of crown
- ◉ Under extension of crown
- ◉ Over extension of crown

CLINICAL STUDIES ON SSCS AND GINGIVAL HEALTH

Sr no.	Author	Year	Findings
1	Sharaf et al	2004	Crowns with poorly adapted margins: gingivitis; variations in crown margin extension and radiographical adequacy: no effect on gingival health. Proximal contact area-open or closed, had no effect on gingival health
2	Kara NB et al	2014	Gingival index score , probing depth and GCF volume was lowest with SSC and NuSmile than Pedo Pearls .

Radiographic Confirmation of Gingival Fit



Left side

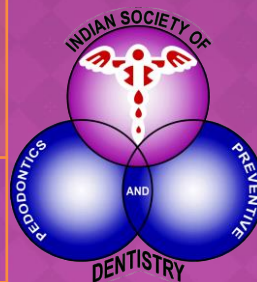
POST CEMENTATION INSTRUCTION

- ◉ Avoid heavy chewing with the crown for 24 hours.
- ◉ Maintain oral hygiene.
- ◉ Recalled after 6 months.



EVALUATION AT FOLLOW UP VISITS!

Crown retention	0 = Present, 1 = Absent
Customized modified gingival index	0 = healthy 1 = mild inflammation involving some papilla 2 = moderate inflammation involving entire papilla 3 = severe inflammation
Plaque index	0 = no plaque 1 = film at gingival margin 2 = moderate accumulation 3 = abundance of plaque
Gingival margin extension	0 = subgingival 1 = supragingival
Occlusion	0 = contact, marked and visible 1 = no contact
Alignment relative to arch form	0 = normal alignment 1 = rotated 2 = malaligned
Proximal contact	0 = good, resistance to floss 1 = poor, no contact



1. MODIFICATIONS OF STAINLESS STEEL CROWNS SIZES



Undersized
tooth



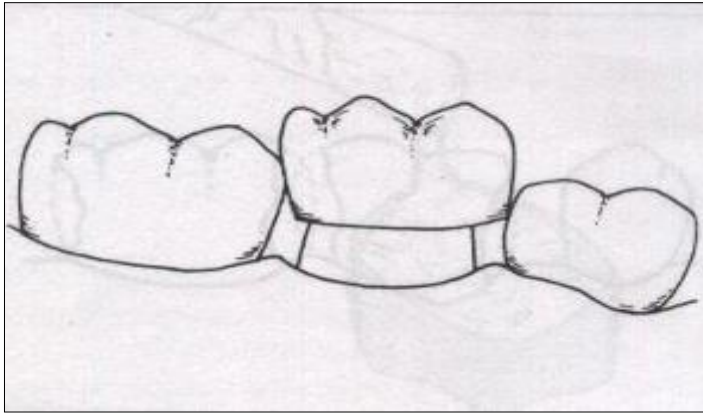
Oversized tooth



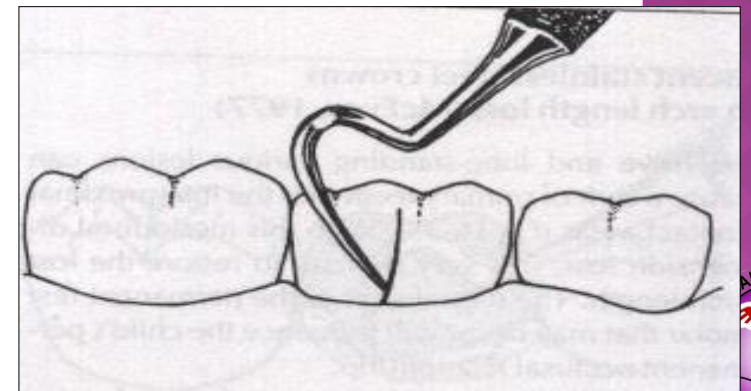
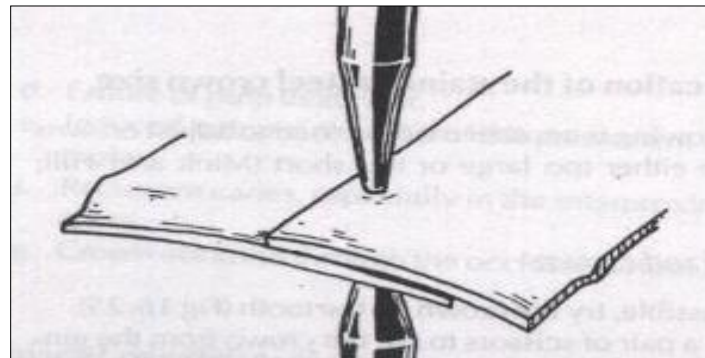
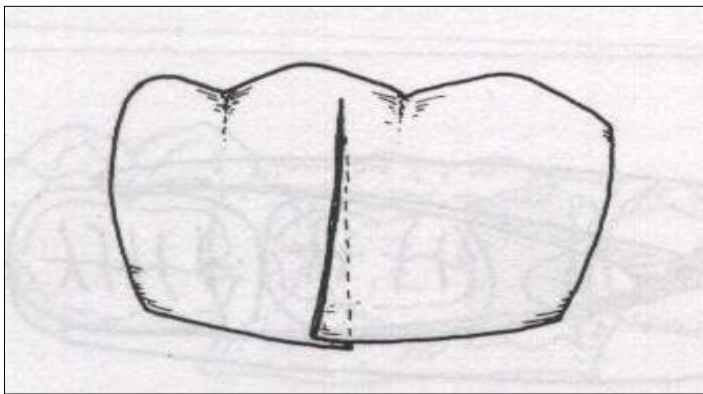
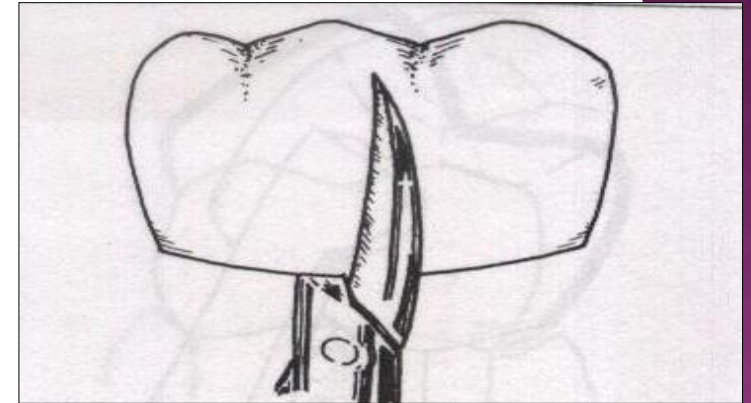
Open contacts

- ◉ In 1971 **Mink and Hill** reported several ways of modification of stainless steel crown when the crowns are either too large or too short.

OVERSIZED CROWN / UNDERSIZED TOOTH

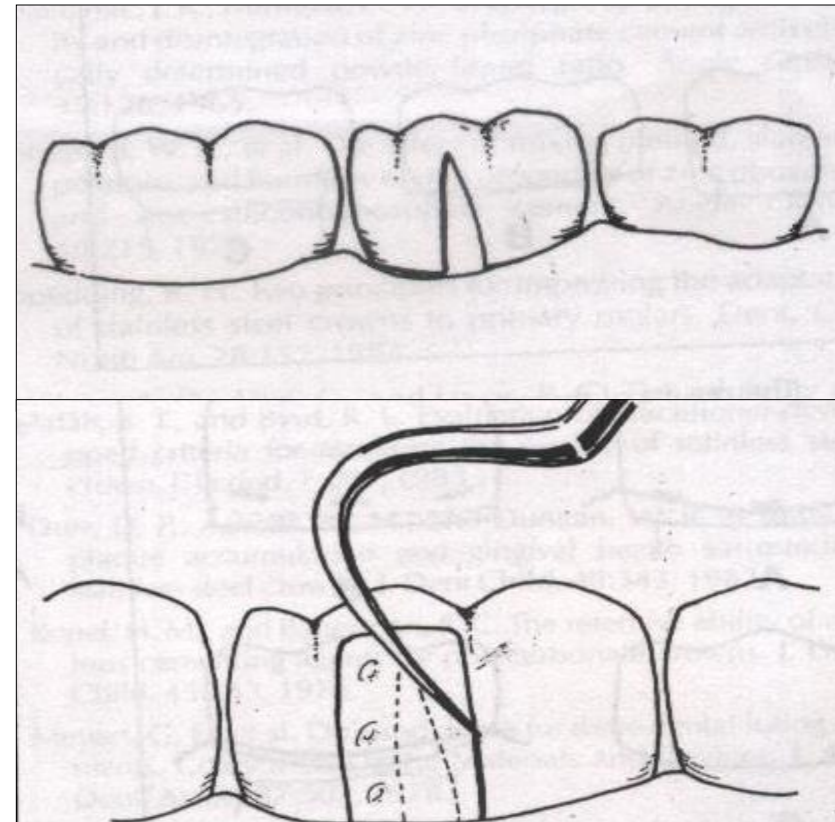
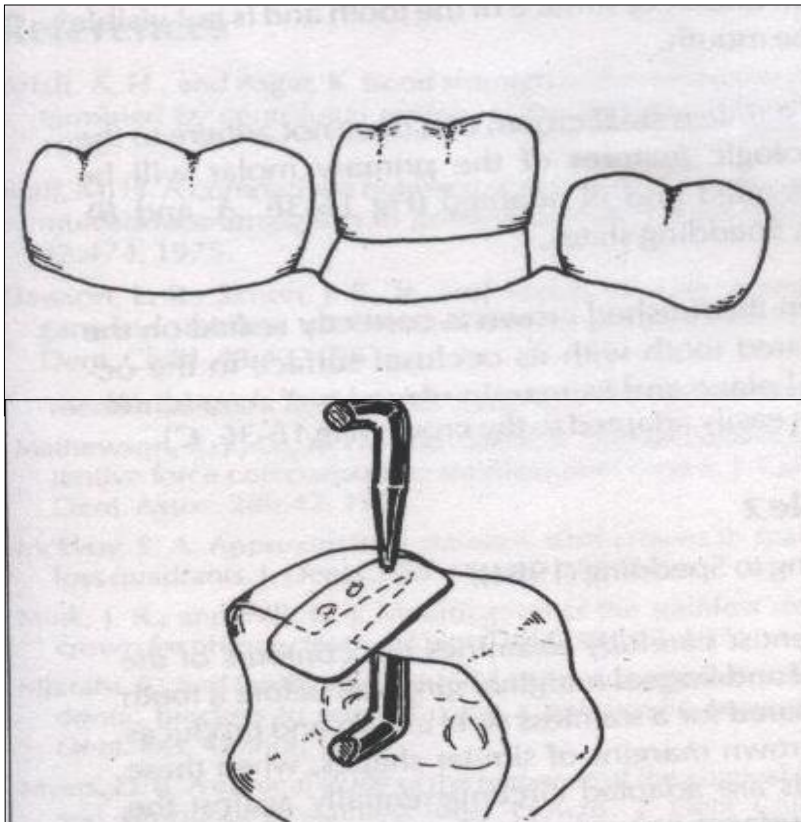


- ✓ 'V' cut on buccal surface of crown
- ✓ Cut edges reapproximated to overlap one another & spot welded



UNDERSIZED CROWN / OVERSIZED TOOTH

- ✓ Cut the crown on buccal/lingual side
- ✓ Additional piece of 0.004 inch SS band welded into the place



OPEN CONTACTS



- ✓ Selection of larger sized crown
- ✓ Exaggerated inter-proximal contour

2. MODIFICATIONS IN PLACEMENT

1. With adjacent SSC

2. SSC with adjacent class II restorations

3. Adjacent SSC with arch length loss

4. Before eruption of permanent molars

5. Multiple crowns in the same arch

6. Crown extension for deep sub gingival caries

7. Open faced SSC

8. Opposing supra-erupted tooth

9. Restoration of hypoplastic teeth

10. Bruxism

ADJACENT CROWNS (DAVID NASH, 1981)

- ✓ Prepare both in same visit
- ✓ Adjacent proximal surfaces should be *reduced slightly more than usual*



ADJACENT TO CLASS II AMALGAM

- ⦿ First crown reduction is completed and crown is adapted.
- ⦿ Cementation of crown.
- ⦿ Next do amalgam restoration with matrix band in place.
- ⦿ Remove the matrix band.
- ⦿ Final carving of amalgam.



ADJACENT SSC WITH ARCH LENGTH LOSS (McEvoy, 1977)

- ✓ Loss of mesio-distal dimension
- ✓ Additional reduction of proximal surfaces
- ✓ *Smaller sized* crowns preferred



BEFORE ERUPTION OF PERMANENT MOLARS

- ✓ Care for the *space needed for eruption of permanent molar*



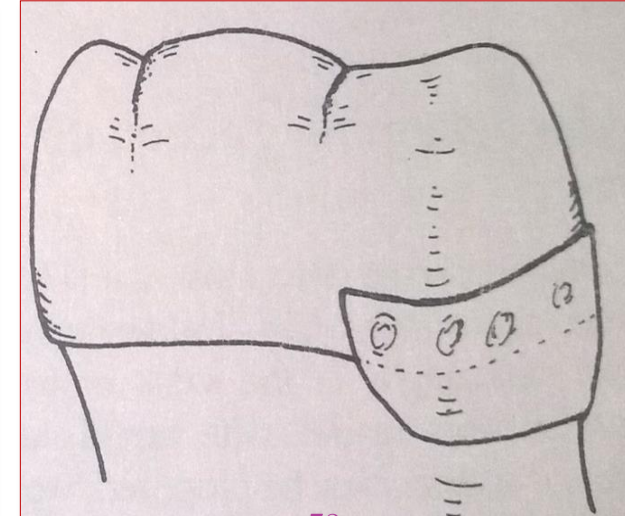
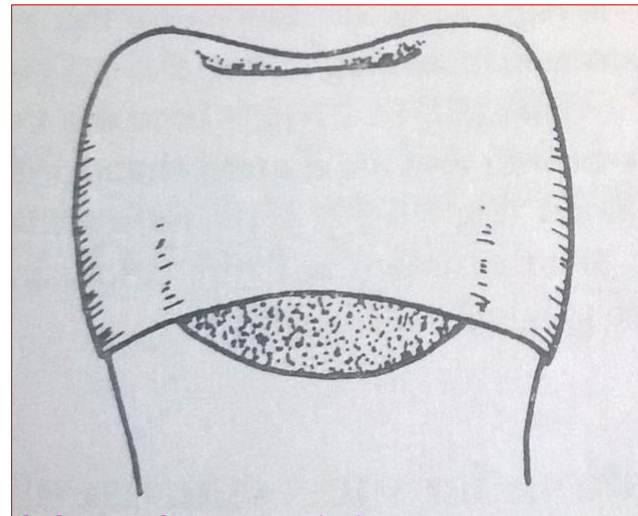
MULTIPLE CROWNS IN THE SAME ARCH

- ✓ Adapt and seat the crown on most *distal tooth first* and then proceed mesially



CROWN EXTENSION FOR DEEP SUB GINGIVAL CARIES

- ✓ Crown margins should be *overextended*
- ✓ Metal piece can be welded/soldered to crown
- ✓ Application of fluoride varnish on tooth structure before placement of SSC.



OPEN FACED SS CROWNS

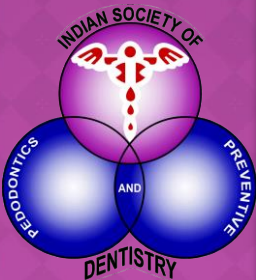
- ◉ **Mink & Hill 1973** –crowns in anterior primary teeth
- ◉ The labial surface trimmed away to leave a crown perimeter, which is then restored with a resin veneering
- ◉ Veneering over the labial / buccal surface of the stainless steel crown with composite resin is another option to improve the esthetics



Full Coverage Aesthetic Restoration of Anterior Primary Teeth Crest® Oral-B® at dentalcare.com Continuing Education Course, Revised March 26, 2015

ADVANTAGES

- The aesthetics are fair. (The metal shows through the composite facing.)
- They are very durable, wear well and retentive.
- The materials are fairly inexpensive.



DISADVANTAGES

- The time for placement is long as it involves a two-step process (crown cementation/ composite facing placement).
- Placement of the composite facing may be compromised when gingival hemorrhage or moisture is present or when the patient exhibits less than ideal cooperation

STAINLESS STEEL CROWN TECHNIQUE FOR ANTERIOR

- ◉ Select crown with mesio-distal incisal width by placing the incisal edge of a SSC against the unprepared tooth.
- ◉ Preparation is begun by slicing the mesial surface and slicing the distal surface and reduce the incisal edge by 1.5mm.



Full Coverage Aesthetic Restoration of Anterior Primary Teeth Crest® Oral-B® at dentalcare.com Continuing Education Course, Revised March 26, 2015

- Anterior crowns are manufactured with an ovoid shape with a small facio-lingual dimension. Change the shape to allow the crown to passively slip on the tooth. Squeeze the crown slightly mesio-distally with a pair of Howe no. 110 pliers to increase the facio-lingual dimension.





- ◉ Extend the window:
 - Just short of the incisal edge.
 - Gingivally to the height of the gingival crest.
 - Mesio-distally to the line angles.
- ◉ Using a no. 35 bur remove the cement to a depth of 1mm.
- ◉ Place undercuts at each margin with a no. 35 bur or with a no. ½ round bur.
- ◉ Smooth the cut margins of the crown with a fine green stone or white finishing stone



SSC IN PRIMARY ANTERIOR



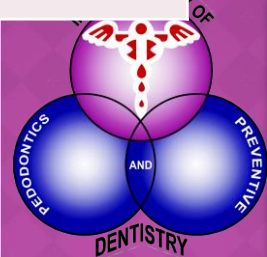
RESTORATION OF HYPOPLASTIC TEETH

- ✓ Occlusal wear → Decreased vertical height
- ✓ Layer of solder from the impression surface of crown can be added



MOLAR INCISOR HYPO-MINERALIZATION & SSC'S FOR HYPOPLASTIC POSTERIOR TEETH

Sr no.	Author	Year	Findings
1	Ghanim AM et al (A literature review)	2012	Listed SSCs as one of the restorative options in such cases.
2	Zagdwon et al	2003 (SSCs & Ni-Cr crowns)	NiCr crowns :minimal preparation design for the with supragingival margins; more technique sensitive SSCs required subgingival margins, more cost effective.



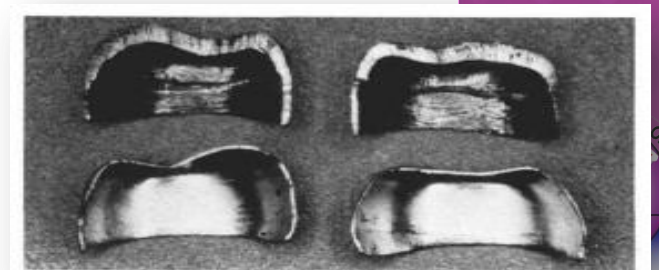
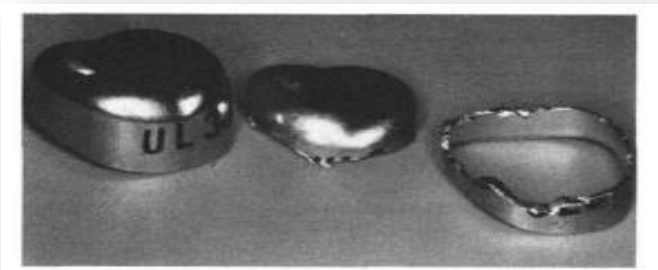
IN CASES OF BRUXISM

- ✓ **Layer of solder** from the impression surface of crown can be added



CROLL (1982) MODIFICATION FOR BRUXISM

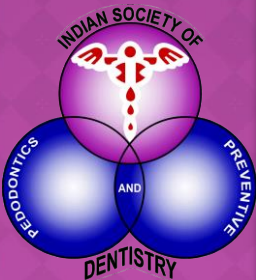
- Patients with tooth grinding habits may tend to wear through the occlusal surfaces of stainless steel crowns.
- A technique is described which prevents this problem by increasing metal occlusal surface thickness of the crown.



MODIFICATION OF PMC

- For the bruxing patient, it has been recommended to add solder to the internal occlusal surface to augment wear resistance.
- Crowns that have perforated from wear can be repaired using a resin composite or resin-modified glass ionomer.
- Alternatively, they can be replaced with a new crown

Randall C. Preformed metal crowns for primary and permanent molar teeth: review of the literature. *Pediatric Dentistry*, 2002. 24:5, 489-500



**SCIENTIFIC
EVIDENCE:
AN
IMPORTANT
FACT OF
DENTISTRY**

**STAINLESS
STEEL
CROWN
KEY ARTICLES**

ARTICLES

The use of stainless steel crowns

N. Sue Seale, DDS, MSD

Dr. Seale is regents professor and chairman, Department of Pediatric Dentistry, Baylor College of Dentistry, Dallas, Tex.

Correspond with Dr. Seale at sseale@tambcd.edu

Abstract

The stainless steel crown (SSC) is an extremely durable indication for use in primary teeth including: follow-up teeth with developmental defects or large carious lesions where an amalgam is likely to fail; and for fractured teeth. In the presence of clear cut, and caries risk factors, restoration longevity is a consideration in decisions to use the SSC. The literature on SSCs indicates that children at high risk exhibiting anterior

LITERATURE REVIEW

Preformed metal crowns for primary and permanent molar teeth: review of the literature

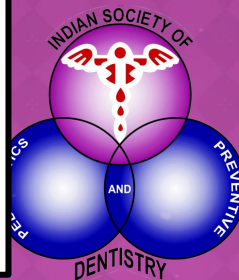
Ros C. Randall, PhD, MPhil, BChD

Dr. Randall is manager, Clinical Affairs, 3M ESPE, St Paul, Minn.

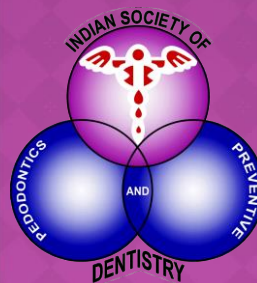
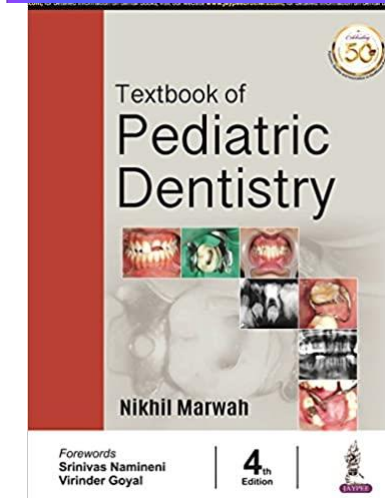
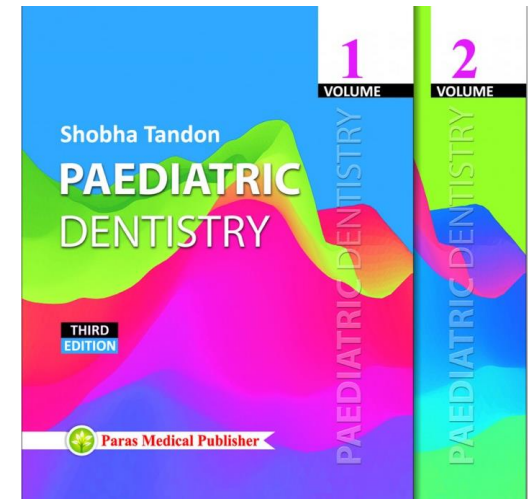
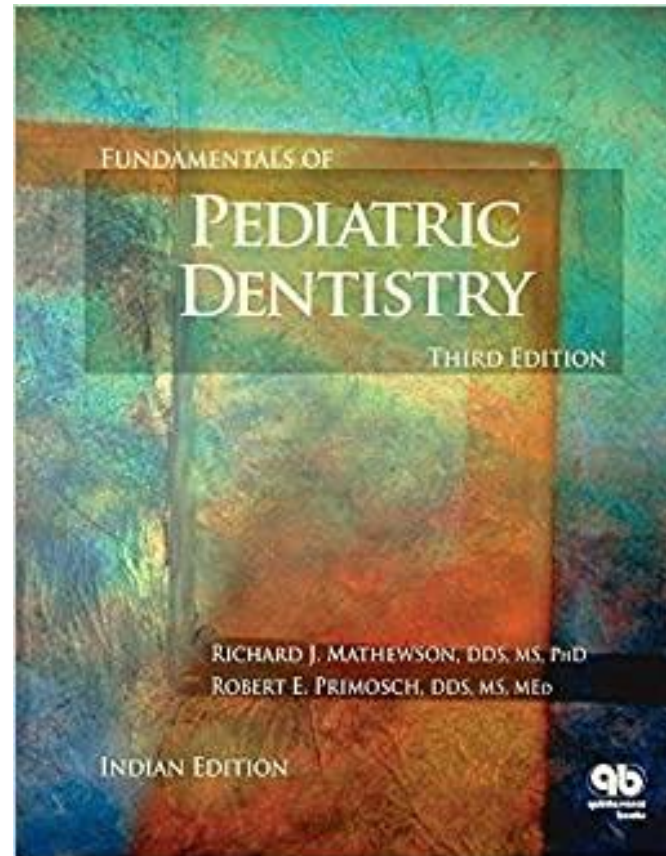
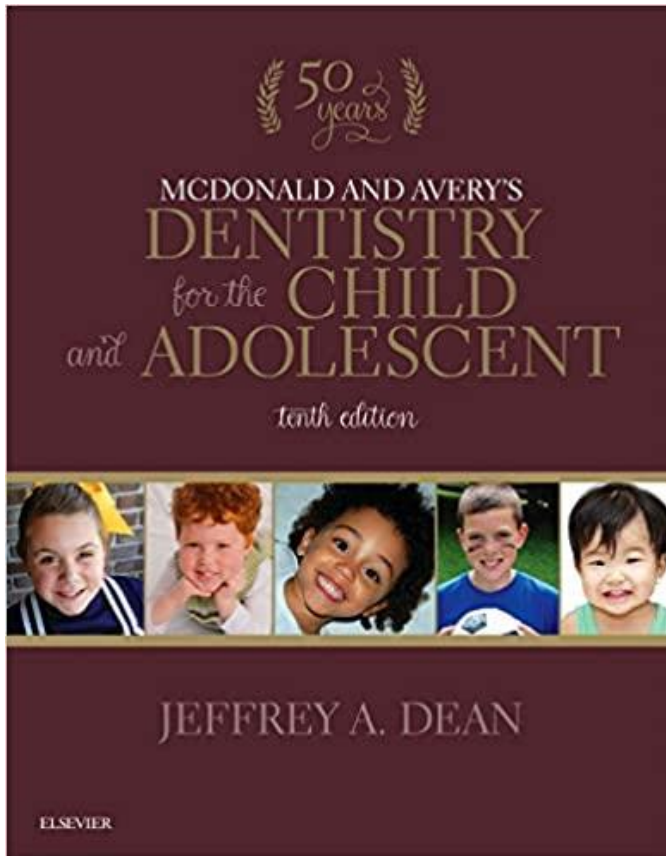
Correspond with Dr. Randall at rcrandall@mmm.com

Abstract

The aim of this study was to carry out a review of the use and efficiency of preformed metal crowns (PMCs) for primary and permanent molar teeth. A literature search of English language journals was carried out using MEDLINE. Papers that addressed areas related to the use of PMCs regarding indications for use, placement techniques, risks, longevity, cost effectiveness and utilization were included in the review. Eighty-three papers were traced which fulfilled the above criteria, the majority addressing PMCs in primary molar teeth. Over half the papers were concerned with placement techniques and indications for use, with fewer papers reporting on clinical studies. The clinical data on PMCs spanned a considerable number of years and involved heterogeneous populations of patients, different makes and designs of crown, and differences among the



BOOK



CLINICAL STUDIES ON SSCS FOLLOWING PULP THERAPY

Sr no	Author	Year	Findings
1	Al-Zayer <i>et al</i>	2003	Amalgam was nearly 8 times more likely to fail than SSC, and SSC resulted in a significantly better outcome than amalgam .
2	Guelmann <i>et al</i>	2005	Survival estimates for temporary restoration of pulpotomy-treated teeth were highest with SSC, ZOE/glass ionomer than for ZnOE.
3	Moskovitz <i>et al</i>	2005	SSC were clinically successful than a temporary restoration.
4	Hutcheson <i>et al</i>	2012	Composite-restored teeth needed more maintenance than SSC.

Search results

Items: 1 to 20 of 57 Selected: 18

Randomised Clinical Trial

Author & Year	Study Design	Intervention	Comparative group	Level (CBE M)	Outcome
Korolenko v MV (2019)	RCT	SCC (3MEspe)	Compomer filling	1b	SCCs to be restoration of choice especially for the first primary molars in children with severe early childhood caries.
Khurana D (2018)	RCT	Composite veneering done after sand-blasting SSCs & Composite veneering done after preparing retentive grooves on SSCs	Composite veneering done using the open face technique.	1b	The open window is the most successful of the three methods of veneering and may be clinically useful technique for dental practitioners and pediatric dentists.
Kratuonva evelina (2014)	RCT	Kinder Krowns (SSC)	NuSmile® (SSC)	1b	Posterior preveneered crowns have predictable durability at 12 months while offering natural appearance to restored teeth.
Nihal belduz Kara (2014)	RCT	SSC (3M ESPE)	aesthetic crowns OSSC VSSC NuSmile (NS) and a Pedo Pearls™ (PP) crown	1b	Our results suggest that SSC, an open-faced SSC, or a NuSmile pediatric crown should be the preferred crown type for restoring posterior primary teeth.

SYSTEMATIC AND OTHER LITERATURE REVIEWS

Sr no.	Author	Year	Findings
1.	Attari N <i>et al</i> (A systematic review)	1996 to 2005	SSC were indicated for restoring badly broken down primary molars.
2.	Innes NPT <i>et al</i> (A Cochrane review)	2007	SSC lasted longer than other fillings for primary molar teeth.
3.	Kramer N <i>et al</i> (A review of restorative materials)	2007	Recommended SSC after endodontic therapy and in severely decayed teeth.
4.	Uston KA <i>et al</i> (The stainless steel crown debate:review)	2011	Placement of SSC reduces overall chair side time for the patient. SSC should be avoided; a) In patients undergoing MRI of the head and neck. b) Patients with nickel allergy.

Search results

Items: 1 to 20 of 23

Systemic Reviews

Author & Year	Study Design	Methodology	Level (CBEM)	Outcome
Doua H. Altoukhi (2020)	SR	traditional crown preparation and conventional treatment options for carious primary molars. Hall Technique	1a	Hall technique can be an effective addition to the clinician's range of treatment options for carious primary molars.
Sealne N Sure (2015)	SR	stainless steel crowns (SSCs) from 2002 to the present as an update to an earlier review published in 2002.	1a	Within the confines of the studies reviewed, primary molar esthetic crowns and SSCs had superior clinical performance as restoratives for posterior primary teeth , and the Hall technique was shown to have validity
Nicola P (2007)	SR	compare clinical outcomes for primary molar teeth restored using PMCs compared to those restored with filling materials.	1a	The lower levels of evidence that have been produced, however, have strength in that the clinical outcomes are consistently in favour of PMCs, despite many of the studies placing PMCs on the most damaged of the pair of teeth being analysed.
N. Attari (2006)	SR	restoration of primary teeth with pre-formed crowns (PMC)	1a	Preformed metal crowns were indicated for the restoration of badly broken down primary molars and their success rate was superior to all other restorative materials
REINHARD HICKEL, (2005)	SR	longevity and reasons for failure of stainless steel crowns, amalgam, glass-ionomer, composite and compomer restorations in stress-bearing cavities of primary molars	1a	Stainless steel crowns are still the restorative procedure of choice for severely affected primary molars ; however, especially in smaller cavities, the adhesive technique with compomers and composites can be used in a great number of cases when the child is cooperative

SSC Vs ZC

Author & Year	Study Design	Intervention	Comparative group	Level (CBEM)	Outcome
Clark L (2016)	RCT	SSC	Cheng Crowns (CC); EZ Pedo (EZP); Kinder Krowns (KKZ); NuSmile (NSZ); and SSC.	1b	Zirconia crowns required more tooth reduction than stainless steel crowns for primary anterior and posterior teeth
Bashaer S. (2017)	RCT	Stainless steel crown	Zirconia Crown	1b	Plaque retention also the Zirconia Crowns shows improve performance than SSC. As both SSC and Zirconia crowns presented to be an excellent choice for posterior teeth restorations , however, we can conclude that Zirconia crowns performed better regarding gingival response to the material of restoration and plaque retention despite its high cost.
Walia T (2014)	RCT	composite strip crowns	pre-veneered stainless steel crowns (SSCs) and pre-fabricated primary zirconia crown	1b	Resin composite strip crown is a highly sensitive technique leading to lower retention rate. Pre-veneered stainless steel crowns showed increased incidence of facial veneer fracture. Zirconia crowns are highly retentive and biocompatible but cause low grade of abrasion of their opposing natural dentition at the 6-month follow-up

CAN SSC BE USED AS PREVENTIVE MEASURE?

YES

HALLS TECHNIQUE

- The Hall Technique is a method for using stainless steel crowns to manage carious primary molar teeth, by seating a correctly sized crown over the tooth and sealing the carious lesion in, using a glass ionomer luting cement.
- The technique is named after Dr Norna Hall, a general dental practitioner from Scotland, who developed and used the technique for over 15 years until she retired in 2006.
- In the mid-1990s, it was generally accepted that crowns were the most predictable restoration for primary molars, rarely failing.

Innes, N.P.T., Stirrups, D.R., Evans, D.J.P., Hall, N. and Leggate, M., 2006. A novel technique using preformed metal crowns for managing carious primary molars in general practice – A retrospective analysis. *British Dental Journal*, 200(8), pp. 451-454.

THE CROWN IS SEATED OVER THE TOOTH WITHOUT

X Local anaesthesia



X Caries removal



X Tooth preparation



WITH THE HALL TECHNIQUE, THE PROCESS OF FITTING THE CROWN IS QUICK AND NON-INVASIVE



22/3/2018

31/3/2018

- ❑ It requires careful case selection, a high level of clinical skill, and excellent patient management



Step 1: Placement of orthodontic separators



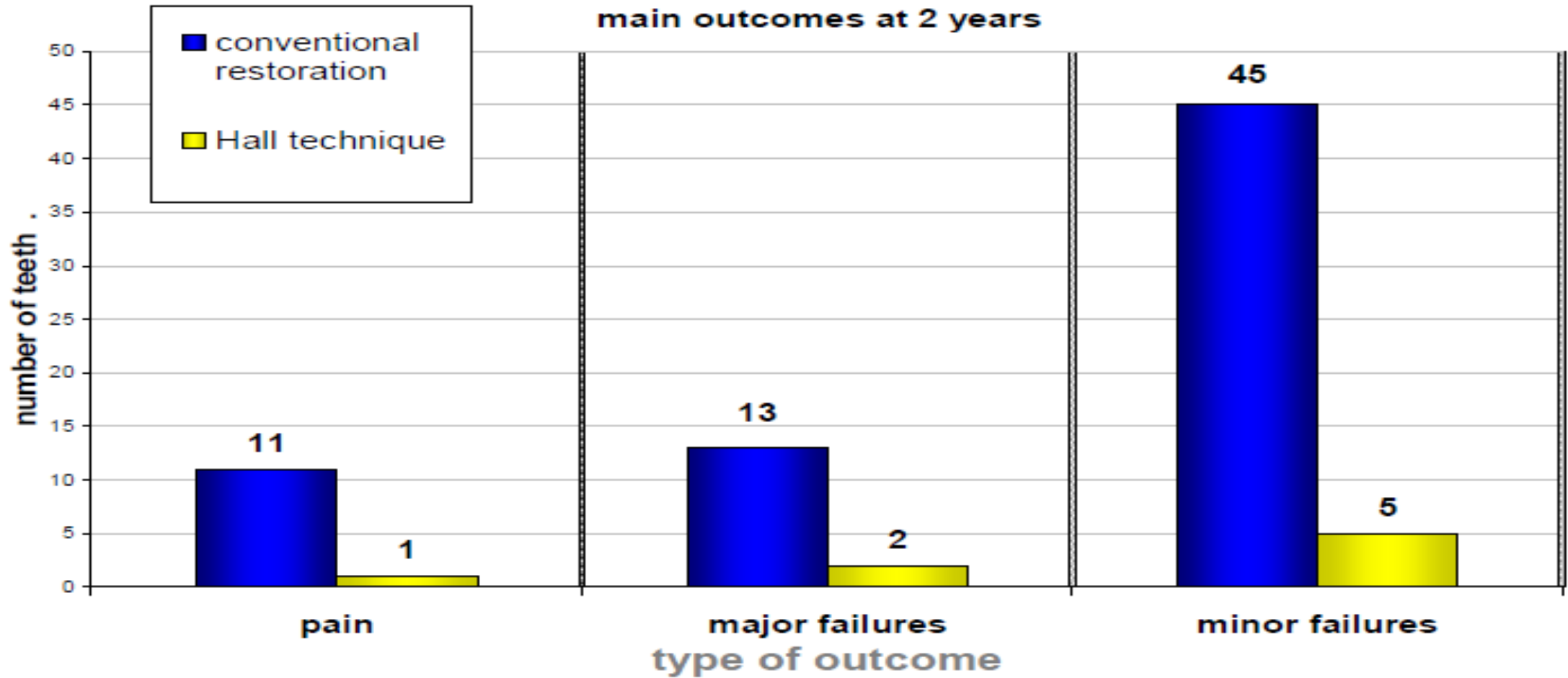
Step 2: Selection of smallest sized crown that covers all the cusps and approaches the contact points



Step 3: Adjustment of crown using band forming pliers if required



Step 4: Cementation of crown followed by removal of excess using floss



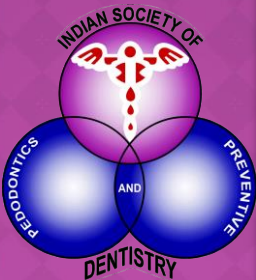
Innes, N.P.T., Stirrups, D.R., Evans, D.J.P., Hall, N. and Leggate, M., 2006. A novel technique using preformed metal crowns for managing carious primary molars in general practice – A retrospective analysis. *British Dental Journal*, 200(8), pp. 451-454.

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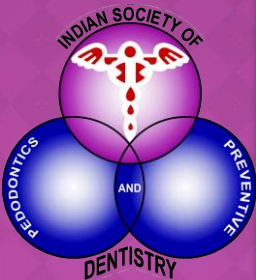
INDICATIONS OF HALLS TECHNIQUE :

- Class I lesions, non-cavitated
 - if patient unable to accept fissure sealant, or conventional restoration
- Class I lesions, cavitated
 - if patient unable to accept partial caries removal technique, or conventional restoration
- Class II lesions, cavitated or non-cavitated



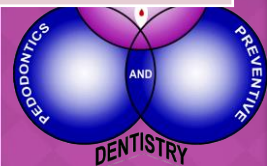
CONTRAINDICATIONS FOR FITTING HALL CROWNS :

- ◉ Irreversible pulpal involvement
- ◉ Insufficient sound tissue left to retain the crown
- ◉ Patient co-operation where the clinician cannot be confident that the crown can be fitted without endangering the patient's airway
- ◉ A patient at risk from bacterial endocarditis.
- ◉ Parent or child unhappy with aesthetics.



NEW TECHNIQUES OR MATERIALS SINCE THE LAST REVIEW ON HALL'S TECHNIQUE

Sr no	Author	Year	Findings
1	Innes NP et al	2006	Survival rate for SSC was 73 % at 3 years and 68 % after 5 years.
2	Santamaria RM et al,	2014	HT showed more favorable outcomes for pulp health and restorations than conventional ones.
	Ludwig et al	2014	The success of stainless steel crowns placed with the Hall technique: a retrospective study. similar success rate for SSCs placed with the traditional technique or the Hall technique.

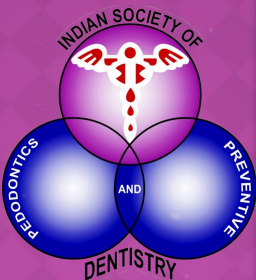


CONCLUSIONS



- ❑ Stainless steel preformed crowns are an integral part of Pediatric Dentist's armamentarium
- ❑ The future of PMCs is now assured and these newer crowns make an ideal restoration for carious primary teeth and should be in the armamentarium of every dentist.

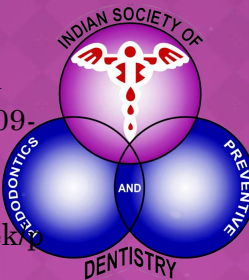
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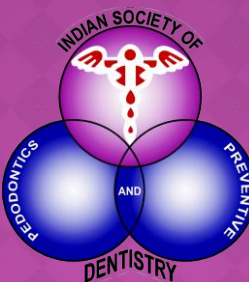
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THANKS!

Any questions?

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