International Journal of Dental Sciences
www.dentaljournal.in
E-ISSN: 2663-4708, P-ISSN: 2663-4694
Received: 11-10-2020; Accepted: 26-10-2020; Published: 13-11-2020
Volume 2; Issue 4; 2020; Page No. 13-15

Stainless steel crown: An update

Pratik Surana[1*], Ruchi Gopal[2], Sadia Aafreen[3], Shubham Gupta[4], Aparajita Singh[5]
[1] Senior Lecturer, Department of Pedodontics and Preventive Dentistry, Maitri College of Dentistry and Research Center, Durg, Chhattisgarh, India
[2] Senior Lecturer, Department of Pedodontics and Preventive Dentistry, Rungta College of Dental Sciences and Research, Bhilai Chhattisgarh, India
[3] Consultant Pedodontist, Bhilai, Chhattisgarh, India
[4] MDS, Pedodontics and Preventive Dentistry, RK Dental Clinic, Raniganj, West Bengal, India
[5] Private Practitioner, Pune, Maharashtra, India

Abstract
Stainless steel crowns (SSC) are the most commonly used restorative material in primary teeth and it is often used as an interim restoration in permanent teeth in certain condition. It was first described by Engle and popularized by Humphrey in1950. SSC is the most durable restorative material which is mainly indicated after pulp therapy, or in multi-surface carious tooth. Present review of literature aims to provide insight view of stainless steel crown.

Keywords: Stainless steel crown, prefabricated crown, Primary teeth

Introduction
Stainless steel crowns (SSC) are the most commonly used restorative material in primary teeth and it is often used as an interim restoration in permanent teeth in certain condition. It was first described by Engle and popularized by Humphrey in 1950 [1]. Croll *et al* (2003) [2] stated that placement of SSC is very easy and it can be completed in single visit.[2] Along with that SSC are durable, wear resistant and attached firmly to tooth until exfoliation. Present review of literature aims to provide insight view of stainless steel crown.

Characteristics of Stainless Steel Crown [1]
1. High chromium content provides corrosion resistance
2. Strength increases from manipulation (Crimping or Contouring) with pliers
3. Heating does not increase their strength
4. They are work harden
5. Soldering reduces their corrosion resistance

Table 1: Composition of stainless steel crowns [2]

Content	Percentage
Chromium	17-19%
Nickel	9-13%
Iron	67%
Minor element (Carbon, Silicon, manganese	4%

Indications [3]
1. After pulp therapy (Pulpotomy/Pulpectomy)
2. Multi surface caries restoration
3. Developmental defect of tooth e.g. Amelogenesis imperfecta, Dentinogenesis imperfecta, enamel hypoplasia.
4. Fractured tooth
5. Wasting disease e.g. Bruxism
6. Weaken abutment of space maintainer

Contraindication [4]
1. Non-restorable tooth
2. Patient with nickel allergy
3. Tooth near to exfoliation

Advantage of Stainless steel crown
As compared to other commonly used restorative material like amalgam, SSC is superior as it requires lesser chair side time, cost effective, better durability, maintenance of morphologic form to preserve the health of gingival tissues, and have the ability to preserve arch length. Randal *et al*. (2002) [4] published a review of literature; consisted of five studies on the performance of multi-surface amalgam restorations over SSC, which included a total of 1210 crowns and 2201 amalgams, followed for 2 to 10 years. All five studies concluded that stainless steel crown restorations were superior to the multi-surface amalgam restorations on primary molars [4].

Disadvantage of Stainless steel crown [1, 4]
Unesthetic look due metallic appearance is the only disadvantage of SSC.

Clinical procedure
Crown selection: Before starting the tooth preparation crown

can be selected by measuring the mesiodistal width of the tooth space with dividers or crown can be selected after the crown preparation by trial and error method. A correctly selected crown should cover the prepared crown completely and should resist it removal. [1]

Achieving anesthesia: it is necessary to avoid discomfort during tooth preparation and during crown adaptation [1].

Occlusal Reduction: Occlusal reduction is done to provide space for adaptation of SSC. It should be done prior to proximal reduction to evade invisibility of preparation areas due to blood contamination. There should be at least 1 to 1.5 mm of space ideally to adapt stainless steel crown on tooth.

Table 2

Occlusal reduction for primary tooth suggested by various Authors	
Author	Recommendation
Humphrey (1950) [5]	Cups should be reduced if necessary
Mink and Bennet (1968) [6]	1–1.5 mm uniform reduction
Mathewson (1974) [7]	1-1.5 mm
Troutman and Kennedy (1976) [8]	1.5–2 mm
Rapp (1966) [9]	Preparation height 4 mm from gingival margin

Proximal Reduction: Proximally, tooth reduction is made through the mesial and distal contact areas using fine, long, tapered diamond bur, held slightly proximal reduction should extend below gingival margin to avoid ledge formation. Precaution should be taken to avoid damage to adjacent tooth while proximal preparation [1, 4].

Buccal and Lingual Reduction: Minimal or no reduction requires for buccal or lingual surfaces as it aid in retention because of undercuts.
Buccal reduction requires especially for buccal bulge of the first primary molar [1, 4].

Crown adaptation: Although SSC are prefabricated but most of the crown requires contouring and crimping to achieve tight fitting of crown. Contouring involves inward bending of the gingival third of the crown margin to restore anatomic features of the natural crown and to reduce marginal circumference to achieve good fitting. Crimping involves inward banding of crown periphery 0.5- 1 mm with the help of #800-417 crimping plier [1, 4].

Crown cementation: Glass ionomer cement or polycaboxylate cement are most commonly used for cementation. Fill 2/3rd of inner aspect of the crown with cement. Excess cement should be removed with help of the floss [1, 4].

Table 3: Modification of stainless steel crown

Author	Modification
Nash (1981) [10]	Multiple crowns can be placed in same visit. When multiple crowns are to be placed in the same quadrant, the adjacent proximal surfaces of the teeth being prepared should be reduced slightly more than usual.
Mc Evoy (1977) [11]	Adjacent stainless steel crown with arch length loss**:** proximal space loss flattening of contacts of SSC done with straight Howe pliers.
Mink &Hill (1971) [12]	Oversized crown or undersized tooth: The undersized tooth or the oversized crown commonly occurs due to a longstanding interproximal caries. To reduce the crown of circumference, a V cut is made on the buccal surface of crown. The cut edges of crown are re-approximated to reduce crown circumference.
	Under sized crown: If crown is undersized, then crown may be cut on the buccal or lingual surface, additional piece of 0.004 inch stainless steel band material may be welded into place to increase the crown circumference.
	Open contact: it can be managed by selecting a larger crown or exaggerated interproximal contour by using a #112 ball and socket.
	Deep subgingival caries: managed by soldering an extension of steel band material
Croll (1980) [13]	Restoration of bruxism: This condition causes excessive occlusal wear, which results into decreased vertical height. In such condition occlusion can be increased by the addition of a layer of solder from the inner surface of crown
Hartmnn (1983) [14]	Open faced SSC: to improve appearance of anterior SSC labial surface trimmed away to leave a crown perimeter, which is then restored with a resin veneering with composite

Table 4: Complication: Various complications can occurs while crown preparation and adaptation of stainless steel crown. [1, 4]

Complication	Reason
Crown tilt	Over preparation of crown can result into crown tilt
Interproximal ledge	Ledge formed due to improper sub-gingival preparation that interfere with seating of crown
Over extension of the crown	Over extension of crown appear as gingival blanching; which can leads to loss periodontal apparatus problems due to food lodgement.
Ingestion/inhalation of crown:	Accidental ingestion of crown can occur due to uncooperative behavior of child or negligence from dentist.
Poor margins	When the crown is poorly adapted, its marginal integrity is reduced which results in increase plaque retention and subsequent gingivitis increases with marginal discrepancy.

Conclusion

The present review of literature provides insight view of stainless steel crown with their modification. However esthetic is the concern with SSC; but due to its durability, cost effectiveness it remains choice of the restorative material for pedodontist. The stainless steel crown provides a broad array of use in clinical pediatric dentistry and will continue to be an asset in the management of the primary as well as young permanent teeth.

References

1. Babaji P. Crowns in Pediatric Dentistry. 1st ed. Jaypee Pub Ltd, 2015, 2.
2. Croll TP, Epstein DW, Castaldi CR. Marginaladaptation of stainless steel crowns. Ped Dent. 2003; 25(3):249-52.
3. Sajjanshetty S, Patil PS, Hugar D, Rajkumar K. Pediatric preformed metal crowns - An update. J Dent Allied Sci. 2012; 1(2):29-32.
4. Randall RC. Preformed metal crowns for primary and permanent molar teeth: review of the literature. Pediatr Dent. 2002; 24:489-500.
5. Humphrey WP. Use of chrome steel in children's dentistry. Dent. Surv. 1950; 26:945-53.
6. Mink JR, Bennett IC. Th e stainless steel crown. J Dent Child. 1968; 35:186-96.
7. Mathewson RJ, Lu KH, Falebi R. Dental cement retentive force comparison on stainless steel crown. J Calif Dent Assoc. 1974; 2:42.
8. Kennedy DB. The stainless steel crown. Pediatr. Oper. Dent. Bristol J Wright and Sons Ltd, 1976.
9. Rapp R. A simplified, yet precise technique for the placement of stainless steel crowns on primary teeth. J Dent Child. 1966; 33:101-12.
10. Nash DA. The nickel-chromium crown for restoring posterior primary teeth. J Am Dent Assoc. 1981; 102:44
11. McEvoy SA. Approximating stainless steel crowns in spaceloss quadrants. ASDC J Dent Child. 1977; 44:105-107.
12. Mink JR, Hill CJ. Modification of stainless steel crown for primary teeth. J Dent Child. 1971; 38(3):197-205.
13. Croll TP. Increasing occlusal surface thickness of stainless steel crowns: A clinical technique. Pediatr Dent. 1980; 2:297-299.
14. Hartman CR. The open-faced stainless steel crown: An aesthetic technique. ASDC J Dent Child. 1983; 50:31-33.