

**Management of decayed primary and young permanent molars with preformed titanium – Nitride Coated Crowns - A Case Series**

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**Abstract**

Present case series aims to illustrate the advantages of using TiNC in primary and young permanent molars.

**Keywords:** TiNC, SSC, Early childhood caries

**Introduction**

Early childhood caries is a devastating disease and is much prevalent in younger age groups and most often effecting the primary anterior and molars and aids in reducing the child’s quality of life. Various effective techniques have been achieved in restoring such cavities

with resin filling materials, secondary dentin materials and preformed pre-contoured crowns.

In last few decades the primary teeth have been restored beautifully by stainless steel crowns and had taken a wide successful boom in Pediatric and Preventive dentistry. This because of its esthetic and ergonomic design, SSC was first reported in 1950 by Engel and Humphery.<sup>1</sup> they choose to restore extensive damage teeth like severe caries, developmental defected teeth, and traumatic fractures.

Due to its durability, high strength and high retention properties SSC is primarily recommended in pulpectomies and pulpotomies. There are wide variety of full coverage crowns in the market like SSC's, resin – veneered crowns (RVC's), and zirconia crowns which are known for their esthetics and mechanical properties. The major disadvantage of SSC is surface roughness which aids in bacterial accumulation on the surface of the crown. So, in order to reduce bacterial attachment and resist corrosion the SSC is coated with Titanium Nitride.

In recent times, a new material has been introduced for full coverage crowns surface coated with titanium – nitride (TiNC). TiN- coating makes crown look golden yellow color, which has excellent biological and mechanical properties.

This case series illustrates the advantages of using TiNC in primary and young permanent molars.

### Case series

**Case Report 1:** A 6-year-old child came to Simply Smilez Dental and Implant Centre with a complain of severe pain and swelling in the left lower first primary molar since a month. On clinical examination there was extensive disto-occlusal caries with intra oral swelling associated with the respective tooth 74. Figure 1



Figure 1: Preoperative view showing periapical abscess

The tooth was sensitive to cold and sweet with signs of sinus tract. Radiographically the tooth had extensive distal caries approaching pulp with a huge periapical radiolucency. The tooth was diagnosed as chronic irreversible pulpitis, and treatment procedure planned was to perform a complete pulpectomy followed by a TiNC crown. Complete parental consent was obtained from the parents and child was desensitized using TeDiE technique and slow infusion local anesthetic agent was administered and pulpectomy procedure was performed using met apex plus (Figure 2) followed by post end restoration by bulk fill resin-based composites (SHOFU BEAUTIFUL BULK).



Figure 2: Postoperative view

In the next visit, we decided to restore the primary molar 74 with performed titanium nitride coated stainless steel crown. The crown size was selected prior initiating the tooth preparation by measuring the mesio distal width dimensions of the tooth with the help of a divider, in this case we selected a crown size of 4.

The crown was trial fit first to check for the appropriate size and occlusal preparation was done taking reference of adjacent teeth and 1 – 1.5 mm of occlusal reduction was performed. Proximally 1.5 mm reduction was done

through mesial and distal contact points. Special care was taken to avoid damage to neighboring teeth while preparation. The thickness of the SSC and TiNC may differ accordingly so mild proximal reduction has to be implemented (Figure 3 & 4). Subgingival feather finish line was given 0.5 – 1mm to obtain retention and final all the lines angles were polished using Pro 1EF BUR.



Figure 3 & 4: Showing varies thickness of SSC and TiNC crowns

Crown was properly contoured and crimped to fit snugly and inserted to the check the occlusal bite and necessary adjustments were made before cementation. All the blood residues and metal shavings produced crown trimming are cleaned, hemostasis of marginal gingiva is achieved and resin modified GIC is used for cementation of the crown. Figure 5



Figure 5: TiNC crown cementation

Follow up was done after 15 days the tooth was completely asymptomatic and had no signs of periapical abscess and crown showed no plaque accumulation. Figure 6



Figure 6: Follow up after 15 days

**Case Report 2:** A 6-year-old child reported to our clinic in Hyderabad complaining of pain in lower right back region from a week, clinical examination shows disto occlusal caries which is deep in origin. Child gives history of throbbing pain which is gradual in onset and aggravating during chewing food and relieves on medication. Radiographically distoocclusal caries was extending into the pulp with mild radiographic changes at the apex. Figure 7



Figure 7: Preoperative View

On clinical and radiographic examination, the tooth was diagnosed as acute irreversible pulpitis. The treatment

opted was to do a complete pulpectomy and followed by TiNC crown restoration. Parental consent was taken regarding the procedure and child was desensitized throughout the procedure by TeDiE technique.

Child was anesthetized by slow infusion syringes from septodont and access was prepared and pulpectomy procedure was performed with met apex plus by incremental condensation and followed by SDR flow plus as post end restoration. Figure 8 & 9



Figure 8 & 9: Showing pulpectomy followed by SDR flow plus restoration

The crown selection was done using measuring the mesiodistal width of the molar and appropriate crown size no 5 selected. The crown preparation was done using same norms as followed in case of SSC's and then proceeded for the cementation using resin modified glass ionomer cement. Figure 10



Figure 10: TiNC crown cementation

**Case Report 3:** A 6-year-old child reported to our clinic in Hyderabad complaining of pain in lower right region from a month, clinical examination reveals proximal caries in the region of 84 and access opening was done on tooth number 85 and also gives history of previous

dental history where the child didn't cooperate for the pulpectomy done on 85. Parents gives history of throbbing pain which occurs while eating and occasionally at the night. Figure 11



Figure 11: Preoperative view

Radiographically examinations show deep distoocclusal caries and incomplete pulpectomy on 84 and 85 regions respectively, on clinical and radiographically examination the teeth 84 & 85 was diagnosed as chronic irreversible pulpitis.

The treatment plan was to do a complete pulpectomies and restore them with dual TiNC crowns, parental consent was obtained and child was properly desensitized by positive reinforcements and TSD technique and we could positively mould the child and do the pulpectomies for both teeth.

The crowns placements were carried on the next visit, child was again anesthetized and crown selection was done followed by crown preparation as mentioned before and the dual crowns were placed and checked for the occlusion before cementation. Figure 12



Figure 12: Occlusion before cementation

Once the occlusion was checked properly cementation was carried out using resin modified glass ionomer cement and the remnants was removed using floss.

Figure 13



Figure 13: Dual TiNC crowns after cementation

**Case Report 4:** A 2-year-old child report to our Simply Smilez Dental Clinic in Hyderabad, parents of the child started complaining of severe tooth pain in upper and lower back regions. On clinical examination child showed extremely negative behaviour and luckily, we had to sedate (Pedicloryl) her orally for examination.

On examination we notice multiple decayed teeth in all four quadrants of the mouth effecting all first and second deciduous molars. On radiographic evaluation we came

to a diagnosis that all the teeth were severely damaged and the final diagnosis was concluded as chronic irreversible pulpitis. Figure 14



Figure 14: Preoperative view

The treatment plan was to do a full mouth rehabilitation under general anaesthesia, parental consent was taken thoroughly and parents was explained about the treatment completely. Pre-anaesthetic check-up was done prior to the day of the treatment and whole complete parameters was checked.

On the next visit the child was kept 8 hours of NBM (no food by mouth) before the procedure and child was given sedation under the presence of Paediatric Anesthesian, nasal intubation was done and all pre operative photographs was taken prior to the procedure.

Figure 15



Figure 15: Nasal intubation

Pulpectomies were done for all the teeth and SDR flow plus was restored as post end restoration. And left upper molar was restored by preventive resin restoration. All the teeth were prepared for crown preparation and the steps were followed properly and isolation was done and TiNC crowns were cemented, and after the whole procedures were completely done we proceeded for extraction of 64. Figure 16



Figure 16: Postoperative view showing TiNC crowns after cementation

The child was again followed up after 6 months to check the clinical status and any bacterial accumulation over the crown surface. Figure 17



Figure 17: TiNC crowns after 6 months showing no bacterial accumulation.

**Case report 5:** A 11-year-old child reported to our clinic in Hyderabad complaining of pain in lower left posterior tooth from past a month, patient gives of throbbing pain, continuous in nature and aggravates during night and relieves on medications. Patient also gives a history of past dental history where she had undergone root canal from the same tooth.

The clinical examination the tooth was filled with temporary cement and was tender on percussion vertically and laterally. The radiographic examination

shows under filled root canals and no proper coronal and apical seal and a periapical radiolucency associated with mesial and distal roots. Figure 18

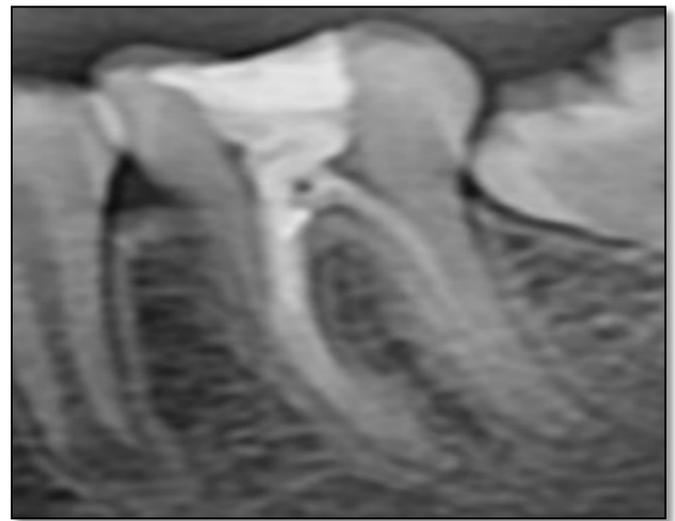


Figure 18: Preoperative view

On clinical and radiographically examination the tooth was diagnosed as chronic apical periodontitis and we thought to proceed to reroot canal for the tooth no.36 followed by semi-permanent crown TiNC crown.

Access was redefined and infected gutta percha was removed using retreatment files (Dentsply) and estimated the working length using apex locator and started the bmp process and canals were shaped up to size 25.06% along with irrigation.

The irrigation protocol was carried out by 4 irrigants (5.25% NaOCl, 17%EDTA, 40% Citric acid, 2% CHX) in each canal with 1min of activation. All the irrigants was washed out by saline in between and all the canals were dried using 6% paper points. Obturation was carried using AH plus sealer and warm vertical condensation was done. Post operative view shows Vertucci type VI configuration on mesial root and canal confluence on the distal roots. Figure 19



Figure 19: Postoperative view showing Type VI configuration

Post end restoration was done with SDR flow plus and crown preparation was done for semi-permanent crown. Prior to preparation the crown was selected using mesio distal width and size selected was 5. And prior to cementation crown was checked for any occlusion and proceeded for cementation. Figure 20



Figure 20: TiNC semi-permanent crown

### Discussion

Rocky mountain first introduced the SSCs in year 1947. Later Engel and Humphrey introduced it into pediatric dentistry in 1950, from past 70 years the SSCs were

been used extensively to restore primary and permanent molars have multi surface caries involvement.<sup>2</sup>

Various research studies and clinical trials have shown the efficiency of SSCs as semi-permanent restorative therapy for primary teeth.<sup>3</sup>in spite of advantages and benefits SSCs also have some drawbacks like poor esthetics, surface roughness, and bacterial adhesion on to the surface which is poorly received by patients, parents and practioners.<sup>4</sup>

In this present case series, we have used Korean shinghung crowns. According to the manufacturer, TiNC's are made up of TiN- coated instead of SiO<sub>2</sub> which is overlaid on SSCs. TiNCs have very thick outer layer (4-6 μm) than SSCs (1μm). The major advantage of this is TiNCs have higher hardness when compared to SSCs due to the thickness.

There are many comparative studies showing there is no biological hazard in case of TiNC but where as in SSCs the Ni and Cr were reportedly noticed as allergy inducing agents.<sup>5</sup>

The mean micro hardness of enamel in primary molars is 367.7 – 396.4HV<sup>7</sup>, in vitro mean hardness of SSC is 161.8 HV, if the hardness is more than enamel tooth may get worn out or crown may get perforated vice versa.<sup>6</sup> But when we compare TiNCs the hardness is higher than SSCs which is 180 HV.

One more differentiative factor of TiNCs is the unique color compared to SSCs. TiNCs are chosen over SSCs by parents and children because of their shiny golden yellow color benefits which is very esthetic when compared to SSCs.

Messer and Levering confirmed that the color sustainability was higher in TiNCs crowns when compared to SSCs, as SSCs have shown worn out easily after repeated brushing movement on the surface.<sup>8</sup>

The major drawbacks of SSCs and TiNCs is in conditions of greater occlusal forces like bruxism where maximum bite force is reached over 400N which leads to fatigue accumulation and peeling or coating or eventually perforation. Which is an important factor considering selection of TiNCs crowns.

Introduction of TiNCs in pediatric dentistry was been very meaningful and has very wide range of benefits when compared to SSCs. It could be a better choice in children having oral habits as its compressive strength is way much higher than SSCs.

There are no such Biohazards made on the materials as they are corrosion resistant and biocompatible.

### **Conclusion**

It is known in near future that TiNCs are best accepted in pediatric dentistry as a replacement for traditional SSCs to restore primary and young permanent molars. The interesting thing what we observed in this case series is that the TiNCs have a lot of advantages over SSCs like perfect coronal seal, mean hardness, high compressive strength, corrosion resistant, high color sustainability, no surface roughness when compared to SSCs, no bacterial accumulation and extraordinary compatibility to tissues. So TiNCs are the best compatible and sufficiently stable and easy crowns when compared to SSCs.

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