

树脂冠修复乳前牙的临床效果评价

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[摘要] **目的:** 评价对活髓乳前牙复面洞和多面洞龋坏采用 Strip crowns 透明成形冠进行复合树脂全冠修复的临床效果。**方法:** 纳入的研究对象为 2016 年 1—12 月接受全身麻醉下牙齿治疗, 且因乳前牙复面洞或多面洞龋坏需行树脂全冠修复的患儿。术中使用选择性酸蚀技术、Universal Bond 粘接剂、3M Z350 树脂制作全冠。术后 6、12 和 18 个月复查, 由非治疗医师采用改良的美国公共卫生署 (United States Public Health Service, USPHS) 标准进行单盲评价。**结果:** 共有 127 例儿童的 418 颗牙齿纳入统计, 年龄为 1.17~5.75 岁 (平均 3.22 岁), 其中 70 例男性, 57 例女性。树脂冠 6 个月时的保留率为 97.8%, 12 个月时的保留率为 93.6%, 18 个月时的保留率为 89.2%。18 个月时共有 28 颗 (6.7%) 树脂冠完全脱落, 17 颗 (4.1%) 部分脱落, 4 颗 (1.0%) 树脂冠发生继发龋, 6 颗 (1.4%) 牙齿出现牙髓感染。修复体外观及邻接关系恢复较好, 色泽协调性佳, 可明显改善美观。93.1% 的树脂冠牙龈健康, 有 29 颗 (6.9%) 牙龈轻度红肿。有 47 颗 (11.2%) 树脂冠因菌斑堆积出现颜色变化, 抛光可去除着色。树脂冠脱落主要与进食咬物相关。**结论:** 树脂冠是修复乳前牙大面积龋坏和多面洞龋坏的较好方式, 功能运动是导致脱落的重要原因。由于制作树脂冠技术敏感性高, 需要儿童全程配合, 更适用于年龄较大且可配合的儿童以及接受镇静或全身麻醉的儿童。

[关键词] 乳前牙; 儿童; 牙冠; 龋齿

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Clinical performance of resin-bonded composite strip crowns in primary incisors

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ABSTRACT Objective: To evaluate the clinical success of the treatment of maxillary anterior primary incisors caries with composite resin strip crowns. **Methods:** Children who presented with severe early childhood caries and were treated comprehensive caries under general anesthesia from January to December 2016 were enrolled in this study. Composite crowns using preformed celluloid crown (3M ESPE, USA) called as “strip crown technique” were applied to treat vital primary incisors with two or multiple surface cavities. Selective etchings of enamel, Universal Bond adhesive and 3M Z350 resin were used to make strip crowns. The patients returned at the end of 6, 12 and 18 months and received clinical and radiologic examinations. Dentists who did not attend the treatment evaluated the strip crowns clinically by modified United States Public Health Service (USPHS) criteria. **Results:** Four hundred eighteen restorations, placed in 127 children aged 1.17–5.75 years (average of 3.22), were evaluated. The overall retention rate was 97.8% at the end of 6 months, 93.6% at 12 months and 89.2% at 18 months. After 18 months, 28 restorations (6.7%) were totally lost and 4.1% were rated as having lost some resin material. Only four teeth (1.0%) had secondary caries at the end of 18 months and 1.4% teeth had pulpal pathology requiring root canal treatment. Composite crowns had good performance in contour and adjacent contact and improved aesthetics significantly. Twenty-nine teeth (6.9%) showed mild gingivitis and 93.1% showed healthy gingival. 11.2% of the teeth demonstrated color change because plaque accumulation and the polish could remove the stains. The complete loss of strip crowns was mainly related to eating bites. **Conclusion:** Strip crowns performed well for restoring primary incisors with large or multi-surface caries for periods of over 18 months. The strip crowns can be a durable and aesthetic restoration for vital carious primary incisors with adequate tooth structure after caries removal. Functional movement

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is an important cause of complete loss. Because of the high technical sensitivity and its requirement of the cooperation of children, strip crowns are more suitable for older and cooperative children as well as children receiving dental treatment under sedation or general anesthesia.

KEY WORDS Primary incisors; Child; Tooth crown; Dental caries

根据《全国第四次口腔健康流行病学调查》，中国儿童龋病仍处于高发状态，3岁组儿童的龋患率为50.5%，龋失补牙数为2.28，龋补充填比为1.5%；4岁组儿童的龋患率为63.0%，龋失补牙数为3.40，龋补充填比为2.9%；5岁组儿童的龋患率为70.9%，龋失补牙数为4.24，龋补充填比为4.1%^[1]。儿童口腔科医生仍面临巨大的龋病治疗任务和难题，尤其是乳前牙的多面龋或环状龋，其充填修复需要兼顾美观和强度，除了经典的直接充填修复以外，近年来报道的乳牙树脂全冠修复是一项重要的治疗手段^[2]。

龋坏乳前牙的全冠修复适用于以下情况：累及多面的龋，累及切缘的龋，广泛的颈部脱矿，牙髓治疗后，釉质发育不全，难以控制潮气或出血，大的单面龋损，龋损虽不严重的高龋易感者，以及不能配合完成Ⅲ类龋洞充填的儿童^[3-4]。

早期儿童龋患者较易发生再发龋或继发龋，有研究表明，接受全身麻醉下牙齿治疗的儿童或龋齿高发的儿童与无龋儿童相比，在后期有更高的患龋率，是适宜使用树脂冠的人群^[5]。

乳切牙的修复中，树脂成形冠套具有良好的即刻术后美观效果，且能较容易、快速地修复牙齿外形，然而其技术敏感性较高，血液或唾液污染会影响其粘接，牙龈出血会影响材料的颜色，去腐后需要有足够的牙体组织保留以保证粘接面积和牙齿的抗力^[4]。

以往的报道中系统性评价树脂冠临床表现的研究较少，尤其在龋高发全身麻醉下牙齿治疗的患者中。本研究的目的是采用改良的美国公共卫生署 (United States Public Health Service, USPHS) 标准，评价乳前牙复面洞和多面洞龋坏使用 Strip crowns 透明成形冠进行复合树脂全冠修复的临床效果。

1 资料与方法

1.1 研究对象

本研究为前瞻性研究，收集2016年1—12月期间在北京大学口腔医院门诊部儿童口腔科接受全身麻醉下牙齿治疗的1~6岁儿童。

纳入标准：(1)按美国麻醉师协会评级为Ⅰ级或Ⅱ级^[6]；(2)至少有1颗上颌乳中切牙或侧切牙因龋坏需要进行树脂冠修复；(3)术后能够复查。

排除标准：(1)去腐后剩余牙体组织不足2 mm；(2)前牙反骀。

1.2 全身麻醉下的牙齿治疗过程

参考《口腔医学行业标准规范及指南》中“全身麻醉及镇静下儿童牙齿治疗技术管理”的规范和指南^[7]，进行术前评估及全身麻醉下牙齿治疗。采用统一的全身麻醉操作过程：面罩吸入5%（体积分数）七氟醚、50%（体积分数）一氧化二氮和氧气混合气体，儿童安静后静脉注射丙泊酚2~3 mg/kg，麻醉诱导后经鼻气管插管。麻醉维持采用静脉、吸入复合方式，连接麻醉机半紧闭吸入2%（体积分数）七氟醚+50%一氧化二氮+氧气，保留自主呼吸，每小时静脉持续泵入丙泊酚4~6 mg/kg，静脉开放后一次性静脉推注地塞米松0.2~0.4 mg/kg，术中检测各项生命体征并进行记录。

术后清洗口腔、鼻腔及气管内分泌物，确认口腔内无异物和活动出血，脱氧后血氧饱和度大于96%，患者开始哭闹或呼之睁眼后拔管。儿童在复苏室留观至少2 h，达到离院标准后由家长陪同离开。

1.3 树脂冠制作过程

以橡皮障隔湿，去净腐质后中切牙剩余牙体组织至少为临床冠的1/2~2/3，侧切牙至少有2 mm高度的牙体组织以保证足够的粘接面和强度。洞底达牙本质深层时，采用光固化玻璃离子 (Lime-Lite light cure cavity line, Pulpdent corporation, USA) 进行洞衬，圆钝牙尖避免应力集中。选择合适大小的透明冠，试戴，修整至外形、邻接协调，冠边缘齐龈，若与邻牙邻接过紧，则选择小一号透明冠。如果多个前牙需要进行树脂冠制作，则同时试戴透明冠，合适后进行下一步治疗。比色选择适宜颜色的3M Z350树脂 (Filtek Z-350 Universal Restorative, 3M ESPE, St Paul, MN, USA)。

采用35%（体积分数）磷酸选择性酸蚀牙釉质30 s，冲洗30 s，吹干，所有牙面涂布 Universal Bond 粘接剂，施力涂擦20 s，轻吹5 s，光固化10 s。透明冠 (3M-ESPE Dental Products, Seefeld, Germany) 内放入3M Z350树脂，压实至无气泡，套入所治疗牙齿，调整位置，用探针去除多余树脂，光固化20 s，拆除透明冠套，修整外形并抛光。

1.4 评价方法和统计学分析

术后6、12和18个月对树脂冠进行评价。临床效果评价由另一名独立的、非治疗医师采用改良的USPHS进行(表1)，仅使用口镜和探针，内容包括：

继发龋、修复体保留情况、术后敏感或牙髓感染、颜色匹配和牙龈炎症,将疗效评定为:A,满意;B,可接受;C,不满意^[8]。拍摄X线片对牙髓和根尖情况进行评价。树脂冠未发生完全脱落和部分脱落的牙数占总牙数的比例为保留率。

2 结果

共有127例儿童的418颗牙齿纳入统计,年龄为1.17~5.75岁(平均3.22岁),其中70例男性,57例女性。81例儿童做了4颗上前牙树脂冠,11例做了3颗树脂冠,26例做了2颗树脂冠,9例做了

1颗树脂冠。

树脂冠6、12、18个月USPHS评价结果见表2。

6个月时有5颗牙齿出现修复体的折裂和部分脱落,12个月和18个月时分别新增了6颗部分脱落的树脂冠。6个月时有4颗树脂冠完全脱落,6~12个月期间有20颗完全脱落,12~18个月期间有4颗完全脱落。脱落时间的中位数为7.5个月,脱落原因为咬物(21颗)和外伤(7颗),脱落牙位为右上侧切牙、右上中切牙和左上侧切牙各8颗,左上中切牙4颗。6个月时树脂冠的完全保留率为97.8%,12月时为93.6%,18个月时为89.2%。

表1 改良的USPHS评价标准
Table 1 The modified USPHS criteria

| Characteristic | Rating | Criteria |
|--|--------|--|
| Secondary caries | A | No evidence of caries contiguous with the margin of the restoration |
| | B | Caries evident contiguous with the margin of the restoration |
| Presence of restoration failure | A | Crown appears normal, no cracks, chips, or fracture |
| | B | Partly but noticeable areas of loss of material |
| | C | Complete loss of crown |
| Postoperative sensitivity and pulpitis | A | No postoperative sensitivity |
| | C | Postoperative sensitivity, spontaneous pain, pulpitis, no response to electrical activity test |
| Color match | A | No mismatch in color, shade and translucency between restoration and adjacent tooth structure |
| | B | Mismatch between restoration and tooth structure within the normal range of color, shade and translucency |
| | C | Mismatch between restoration and tooth structure outside the normal range of color, shade and translucency |
| Gingival health | A | No obvious signs of inflammation |
| | C | Marginal gingivitis |

USPHS, United States Public Health Service. A, satisfaction; B, acceptable; C, dissatisfaction.

表2 树脂冠6、12、18个月USPHS评价结果($n=418$)
Table 2 USPHS ratings of restorations after 6, 12, and 18 months ($n=418$)

| Characteristic | Rating | 6 months, n (%) | 12 months, n (%) | 18 months, n (%) |
|--|--------|-------------------|--------------------|--------------------|
| Secondary caries | A | 418 (100.0) | 417 (99.8) | 414 (99.0) |
| | B | 0 (0) | 1 (0.2) | 4 (1.0) |
| Presence of restoration failure | A | 409 (97.8) | 383 (93.6) | 373 (89.2) |
| | B | 5 (1.2) | 11 (1.5) | 17 (4.1) |
| | C | 4 (1.0) | 24 (4.9) | 28 (6.7) |
| Postoperative sensitivity and pulpitis | A | 418 (100.0) | 413 (98.8) | 412 (98.6) |
| | C | 0 (0) | 5 (1.2) | 6 (1.4) |
| Color match | A | 416 (99.5) | 386 (92.3) | 371 (88.8) |
| | B | 2 (0.5) | 32 (7.7) | 47 (11.2) |
| | C | 0 (0) | 0 (0) | 0 (0) |
| Gingival health | A | 409 (97.8) | 397 (95.0) | 389 (93.1) |
| | C | 9 (2.2) | 21 (5.0) | 29 (6.9) |

USPHS, United States Public Health Service. A, satisfaction; B, acceptable; C, dissatisfaction.

12 个月时出现了第一颗继发龋,18 个月时累计有 4 颗树脂冠发生继发龋。有 6 颗牙齿在术后 18 个月内出现了牙髓感染,其中 5 颗在术后 6~12 个月转变为慢性牙髓炎,进行根管治疗,另 1 颗在术后 18 个月转归为慢性根尖周炎,根管治疗后病变消失。

树脂冠修复后,即刻且较好地恢复了牙齿的生理解剖外形,获得良好的美观效果,患者及家长比较满意(图 1)。6 个月时,不到 3% 的树脂冠在龈缘有红肿表现,与口腔卫生清洁不到位有关,12 个月时牙龈炎的发生率为 5%,18 个月时为 6.9%(图 2)。



A, a 3.5-year-old girl, severe early childhood caries, preoperative image of anterior teeth showed multiple surfaces caries; B, preoperative maxillary full arch imaging; C, photos of composite strip crowns of #52, #51, #61, and #62 teeth taken immediately postoperatively showed good performance in crown contour, color match, and surface texture; D, maxillary full arch imaging immediately after operation; E, rating A in color match, crown contour, gingival health, and margins taken at 12-month evaluation; F, rating A in USPHS taken at 18-month evaluation.

图 1 一例 3.5 岁女童树脂冠修复情况及复查情况

Figure 1 Strip crowns for primary incisors in a 3.5-year-old girl

3 讨论

由于粘接面积有限、乳牙硬组织结构的特点以及儿童配合度差等原因,乳前牙龋坏的直接树脂修复脱落率较高,是一直以来困扰儿童口腔科医生的难题。儿童在镇静或全身麻醉下采用树脂冠进行牙齿治疗越来越普遍,而国内的相关研究则显不足。本研究发现,采用树脂冠修复活髓乳前牙 18 个月的树脂冠保留率为 89.2%,与 Kupietzky 等^[9]报道的 18 个月树脂冠完全保留率 88% 非常相近,并显著高于有些研究报道的直接充填保留率^[10-11]。Al-Eheideb 等^[10]报道,直接充填 12 个月的成功率仅为

68.3%,而树脂冠为 97.1%。李永吉等^[11]观察至 18 个月发现,直接充填的保留率仅为 67.4%,而树脂冠 100.0% 成功。Kupietzky 等^[12]的另一项观察时间平均为 31.3 个月的研究中,1.5~2.0 年的树脂冠保留率为 83%,3 年以上的保留率为 78%,145 颗牙中有 2 颗发生牙髓炎需要治疗。Ram 等^[13]的研究观察期为 24~74 个月,保留率超过 80%,中切牙的脱落率 11%,侧切牙的脱落率 7.5%,四面洞的失败率高于单面洞或两面洞。Duhan 等^[14]在 9 个月的观察中发现,树脂冠的保留率高于直接树脂修复以及不锈钢背板的树脂冠。树脂冠良好的保留情况有助于临床医师采用这种方式进行乳前牙龋坏的修复。



A, a 4-year-old girl, severe early childhood caries, preoperative image of anterior teeth showed multiple surfaces caries; B, photos of composite strip crowns of #52, #51, #61, and #62 teeth taken immediately postoperatively; C, rating A in color match and crown contour taken at 6-month evaluation, but mild marginal gingivitis; D, rating A in color match and crown contour taken at 12-month evaluation.

图2 一例4岁女童树脂冠修复情况及复查情况

Figure 2 Strip crowns for primary incisors in a 4-year-old girl

本研究将树脂冠用于龋坏较严重的乳前牙修复,去腐后剩余牙体组织高度只要不小于2 mm 均行树脂冠修复并纳入观察,缺损较大且为活髓的多为侧切牙。在术后6个月内,有4颗树脂冠脱落,6~12个月时树脂冠脱落明显增多至20颗,分析其原因可能为短期内患儿还较好地遵循医嘱,儿童和家长都比较关注牙齿,避免用树脂冠嚼较硬的食物,随着时间延长,可能忽视了医嘱而用前牙咬物,受力是导致脱落的首要原因。因此,树脂冠要求在去腐后有足够的牙体组织剩余以保证足够的粘接面积,以减少脱落率。本研究中继发龋的发生率很低(<1%),是全冠的重要优势,对于龋易感的全身麻醉下治疗牙齿的儿童尤为重要,可显著减少短期内再治疗的需要。

树脂冠在牙齿外形恢复上优势明显,这与本研究在全身麻醉下进行有关。有研究发现,全身麻醉下制作的树脂冠的边缘密合性和外形成功率(分别为90%和86%)高于在镇静下制作的树脂冠(63%和65%)^[15],树脂冠的表面质地明显优于直接树脂修复^[13-14,16]。Ram等^[13]的研究发现,树脂冠的颜色和质地均表现良好或可以接受,96%中切牙和98%侧切牙没有影响美观的点蚀或变色。

本研究中树脂冠的牙龈出现充血发红的比例为6.9%,是术后需要重视的问题,树脂冠的边缘抛光不良可能导致牙颈部更多的菌斑聚集,因此可能产生更多的牙龈炎症。若预成的冠套明显大于牙齿,也会在颈部形成树脂悬突,修整抛光不充分容易导

致颈部的牙龈炎症。有研究也发现树脂冠的轻度牙龈炎比例高达43%~56%,中度牙龈炎为0~1%^[9,12]。树脂冠边缘密合性较差的位置是容易发生继发龋、边缘着色和牙龈炎症的地方,可以通过避免形成龈下边缘、术后高质量的抛光和保持口腔卫生进行预防。

树脂冠的颜色改变源于树脂本身有色降解产物的形成、磨损导致的表面形态改变和外源性着色^[9,17]。Dietschi等^[16]的研究表明,树脂表面抛光可减低被染色的易感性。树脂冠具有较佳、较易获得的抛光效果,因此术后树脂冠颜色与邻牙的匹配性保持较好,不易有外源性着色。Kupietzky等^[9]的研究中7颗牙齿为碘仿类糊剂根管充填后做树脂冠,部分导致树脂冠的黄色改变,颜色匹配不可接受的比例为5%。

为了观察树脂冠是否对牙髓状态有影响,本研究并未将牙髓治疗后的牙齿纳入,进行树脂冠修复的乳牙均为活髓牙。术后18个月内发生牙髓感染的概率为1.4%,处于较低水平。牙髓炎症的发生与术前牙齿的牙髓状态有关,与树脂冠无明显关联。制作树脂冠时,不在去腐之后进行牙体预备,不增加牙髓损伤的风险。在Kupietzky等^[9,12]的两项研究中,一项观察时间18个月(112颗),另一项观察时间平均31.3个月(145颗),需行牙髓炎治疗的比例仅为1%,其他牙齿的影像学评价均为成功。

目前的乳前牙全冠有树脂贴面的开面不锈钢冠、预成树脂冠套、预成瓷冠或氧化锆冠等。对于前

牙的充填,目前患儿家长似乎相对于功能而言更注重美观上的改进,树脂冠比开面不锈钢冠更受欢迎^[12]。预成氧化锆冠的强度是其中最佳的,但需要备牙较多,要求剩余牙体组织的量较多,或需要配合桩的应用,对术者技术要求也较高,有研究表明其12个月的保留率为95.3%,24个月的保留率为80.2%^[18]。

预成冠套制作的树脂冠需在口腔内直接操作,包括反复试戴、直接粘接修复及抛光,其过程相对于直接充填修复更为复杂,技术敏感性更高,要求接受树脂冠修复的儿童在治疗过程中全程配合,否则将无法完成,这在一定程度上限制了它的临床应用,目前主要用于年龄较大且可配合以及接受镇静或全身麻醉下牙齿治疗的儿童。

综上所述,本研究结果显示对龋坏严重的乳前牙进行树脂冠修复18个月的保留率为89.2%,保持牙齿功能的同时恢复其美观效果,修补简单,使其在脱落之前减少再治疗的需要,减少牙髓的并发症,在乳前牙的龋坏修复中具有较好的应用前景。由于树脂冠技术敏感性高,操作相对复杂,更适用于临床治疗中可配合的儿童以及接受镇静或全身麻醉下牙齿治疗的儿童。

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