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·临床研究·

大块复合树脂联合透明预成冠美学修复乳切牙的临床评价

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【摘要】 目的 探讨大块复合树脂联合透明预成冠用于患儿乳切牙美学修复的临床评价。**方法** 预先设计临床前瞻性随机对照研究方法，选取入组患者90例（患牙123颗），随机数表法分为A、B、C三组，试验组A组为SF（SonicFill）大块复合树脂联合透明预成冠（30例，患牙41颗），对照组B组为Tetric N-Ceram Bulk Fill大块复合树脂联合透明预成冠（29例，患牙39颗）和C组为3M Z350 XT通用纳米树脂联合透明预成冠（31例，患牙43颗），采用视觉模拟评分法量表（VAS）和改良USPHS标准于术后12个月进行临床效果评价。**结果** 术后12个月，A组的评价指标均优于B、C组，差异均具有统计学意义，包括：边缘完整性（$\chi^2=10.847$，$P=0.028$），边缘台阶（$\chi^2=7.799$，$P=0.020$），边缘变色（$\chi^2=10.391$，$P=0.034$），表面状态（$\chi^2=11.476$，$P=0.021$）；继发龋（$\chi^2=10.447$，$P=0.034$）。A组家长对整体轮廓（$\chi^2=10.238$，$P=0.037$）、形态质地（$\chi^2=11.521$，$P=0.021$）的满意度评价均优于B、C组，差异均具有统计学意义，3组家长对颜色满意程度评价无显著性差异（$\chi^2=0.990$，$P=0.610$）。**结论** SonicFill大块复合树脂联合透明预成冠用于乳切牙美学修复短期效果较好，患儿家长满意度较高。

【关键词】 大块复合树脂；直接修复；乳切牙；流动复合树脂；透明预成冠；牙体缺损；树脂修复治疗；美学修复
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Clinical evaluation of bulk-fill composite resin combined with transparent preformed crown for aesthetic restoration of deciduous incisor

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【Abstract】 Objective To explore the clinical effect of bulk-fill composite resin combined with transparent preformed crowns for aesthetic restoration of deciduous incisor of children. **Methods** A predesigned clinical prospective randomized controlled research method was used to select 90 patients (123 teeth). The random number table method was divided into three groups: A, B, and C. Group A was treated with a bulk-fill composite resin of SF (SonicFill) combined with a transparent preformed crown (41 teeth in 30 cases), and group B was treated with a large block of Tetric N-Ceram Bulk Fill Composite resin combined with transparent preformed crowns (39 teeth in 29 cases). Group C was treated with 3M Z350 XT universal nano resin combined with transparent preformed crowns (43 teeth in 31 cases). The visu-

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al analog scale (VAS) and the modified USPHS standard were used to evaluate the completeness, marginal steps, marginal discoloration, surface condition, secondary caries and satisfaction of the parents with prostheses after 12 months. **Results** Twelve months after the operation, the evaluation indexes of group A were better than those of group B and group C, and the differences were statistically significant, including edge integrity ($\chi^2 = 10.847$, $P = 0.028$), edge step ($\chi^2 = 7.799$, $P = 0.020$), edge discoloration ($\chi^2 = 10.391$, $P = 0.034$), surface state ($\chi^2 = 11.476$, $P = 0.021$), and secondary caries ($\chi^2 = 10.447$, $P = 0.034$). The satisfaction of parents in group A on the overall contour ($\chi^2 = 10.238$, $P = 0.037$), shape and texture ($\chi^2 = 11.521$, $P = 0.021$) were better than those in group B and group C, and the differences were statistically significant. There was no significant difference in the evaluation of color satisfaction among the three groups ($\chi^2 = 0.990$, $P = 0.610$). **Conclusion** SonicFill bulk-fill composite resin combined with transparent preformed crown is good for short-term aesthetic restoration of deciduous incisor, and parental satisfaction is high.

【Key words】 bulk-fill composite resin; direct repair; deciduous incisor; flowable composite resin; transparent preformed crown; tooth defect; resin repair treatment; aesthetic restoration

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龋病和因外伤导致的乳牙牙体组织缺损是儿童常见的口腔疾病，常见于学龄前儿童，尤其是上颌乳前牙。乳牙龋病若不及时治疗，容易发展为牙髓或根尖周病，会影响继承恒牙胚的发育和萌出，广泛多颗乳牙龋病可能会引发机体其他组织（如颌骨）感染[1]。乳切牙的大面积牙体组织缺损和乳牙早失会影响儿童正确发音、美观与口腔健康，甚至影响患儿心理健康[2]。

大块复合树脂材料的临床应用是目前研究的热点，SonicFill大块复合树脂是粘度可变型树脂，通过改性优化纳米混合填料，改良基质单体以及独特的光引发剂特性，使得大块复合树脂一次可固化4 mm[3]。目前国内外学者对大块复合树脂对成人后牙牙体缺损修复研究较多[4-6]，对儿童乳切牙美学修复研究国内报道甚少，故本文探究大块复合树脂联合透明预成冠用于乳切牙美学修复的临床效果，为临床乳切牙直接树脂美学修复提供参考。

1　资料和方法

1.1　临床资料

选取2017年11月至2018年11月期间来院就诊患者，共纳入患儿90例，其中男42例，女48例，年龄3～5岁，共123颗患牙，其中乳中切牙72颗，乳侧切牙51颗。制定随机数表法，分为A（试验组）、B（对照组）、C（对照组）3组，其中，A组使用SonicFill（SF）大块复合树脂联合透明预成冠（30例，患牙41颗），B组使用Tetric N-Ceram Bulk Fill大块复合树脂联合透明预成冠（29例，患牙39颗），C组使用3M Z350 XT通用纳米树脂联合透明预成冠（31例，患牙43颗）。

纳入标准：①患牙牙体组织单个面大面积缺损，涉及相邻2个牙面以上或累及切缘和切角；②患牙牙面变色、颜色异常影响美观者；③发育缺陷牙体形态异常；④牙髓炎和根尖周炎已完成完善的根管治疗且炎症有效控制者；⑤患儿或其监护人均知情同意，且已签署知情同意书。排除标准：①牙体缺损面积较大，达到牙龈缘附近，无法牙体制备有效固位形者；②因外伤根折或牙根吸收达2/3；③不良咬合习惯、咬合功能异常；④患儿不配合、无法有效隔湿者。本研究经锦州市口腔医院医学伦理委员会批准（锦州市口腔医院，201705715）。

1.2　材料与器械

SonicFill大块复合树脂（Kerr，美国），Tetric N-Ceram Bulk Fill大块复合树脂（Ivoclar Vivadent，列支敦士登），3M Z350光固化树脂（3M，美国），3M透明预成冠（3M，美国），OptiBond Versa粘接剂（Kerr，美国），TheraCal LC（Bisco，美国），SOF-LEX抛光套装（3M，美国）。Kavo声波手机（Kerr，美国），光固化机（VOLA Led光固化机，皓齿，美国），单镜头反光数码相机（EOS 60D，Canon，日本）、微距镜头（EF 100mm f/2.8L IS USM，Canon，日本）、微距环形闪光灯（MR-14EX Ⅱ，Canon，日本）。

1.3　临床操作与研究方法

首先安装橡皮障，采用“劈障法”即在对应牙位区域先打两个打孔，大约间隔1～2 cm，用眼科剪剪开障布中间部分，指压就位，两端用楔线固

定。如乳磨牙有龋病一同治疗者，连同障夹远端固定，更加稳固。试戴透明树脂冠时，只需把障布往下压，不用拆除，暴露牙龈部分即可，可缩短临床操作时间。采用高速牙科手机和低速球钻或挖匙去除患牙龋坏部分的腐质，深龋近髓者进行间接盖髓，牙髓炎及根尖周炎的患牙行完善的根管治疗后，用聚羧酸锌水门汀垫底，去除无机釉薄壁弱尖。牙体预备；近远中邻面用金刚砂车针均匀磨除0.5～1 mm（存在生理间隙者可不进行预备），轴向聚合度为0°，羽状肩台，点线角圆钝。选取对应牙位的透明预成冠，试冠并修整颈部边缘并依照邻牙高度和咬合关系确定冠高度，冠套边缘位于龈下0.5～1 mm，用探针在透明预成冠腭侧近切缘处制作排溢孔。在牙面动力涂布OptiBond Versa粘接剂Ⅰ液20 s，轻吹稀薄5 s，动力涂布OptiBond Versa粘接剂Ⅱ液15 s，中等风强吹5 s，光固化20 s。

A组：在Kavo声波手机作用下将SonicFill大块复合树脂注入透明预成冠内；B组：将采用合适牙面颜色Tetric N-Ceram Bulk Fill大块复合树脂充填到透明预成冠内；C组：采用合适牙面颜色的3M Z350 XT通用纳米树脂充填到透明预成冠内。预成冠就位后，分别去除多余树脂，唇腭侧及近远中面分别光照20 s，探针颈部挑破冠套并去除整个冠套，修整调𬌗，3M ESPE打磨抛光套装单方向抛光。以上操作均由同一医师完成，临床操作在橡皮障下或无法上橡皮障者开口器棉卷有效隔湿下进行。

1.4　效果评价

效果评价分为医生评价与患儿家长评价两部分，①医生评价：术后12个月年由1名具有医师资格的医生（非操作者）和1名口腔专业的研究生对修复体按改良的美国USPHS量表[7]（表1）从边缘完整性、边缘台阶、边缘变色、表面状态、继发龋进行评估；②患儿家长评价：使用视觉模拟评分法量表（visual analogue scale，VAS）对整体轮廓、颜色满意程度、表面形态质地进行评分，不满意为10分，非常满意为0分，其中0～2分为“优”，3～5分为“良”，6～8分为“中”，大于8分小于10分为“差”。让患儿家长标出对修复体满意程度的相应位置并记录，评分越低则满意度越高。

表1　改良USPHS标准

Table 1　Modified USPHS criterion

Project	Grade	Content
Edge integrity	A	The prosthesis closely adheres to the adjacent tooth tissue, and there are no visible gaps at the edges that can hook the probe.
	B	The probe can be hooked when it traverses the dental interface of the restoration, but there is no dentin or base exposed at the edge.
	C	The dentin or base at the edge of the restoration and the tooth is exposed.
Edge step	A	The anatomical shape of the restoration and the tooth edge is not consistent, but there is no overhang.
	B	The prosthesis and the tooth edge have overhangs.
Discolored edges	A	The interface between the restoration and the tooth did not change color.
	B	There was discoloration at the interface between the restoration and the tooth, but the discoloration did not penetrate into the pulp along the edge of the restoration.
	C	The discoloration of the edge of the restoration penetrates towards the pulp.
Surface condition	A	The surface of the prosthesis is free of defects, smooth, and has no irritation to adjacent soft tissues.
	B	The surface of the restoration has slight unevenness and small depressions, but it can be redressed.
	C	The surface of the restoration has serious depressions and abnormal grooves, which cannot be repaired.
	D	The surface of the restoration was cracked or fell off.
Secondary caries	A	There was no secondary caries on the edge of the restoration.
	B	The edges of the restoration are softened, opaque, potentially damaged or demineralized, or the probe can be hooked at the white spot where the acid is etched.
	C	Caries appear on the edges and the original restoration must be repaired or replaced.

1.5　统计学方法

采用SPSS 21.0软件数据处理，计数资料以频数表示，采用χ^2检验。$P<0.05$表示差异具有统计学意义。

2　结　果

2.1　患牙与修复体保存效果评价

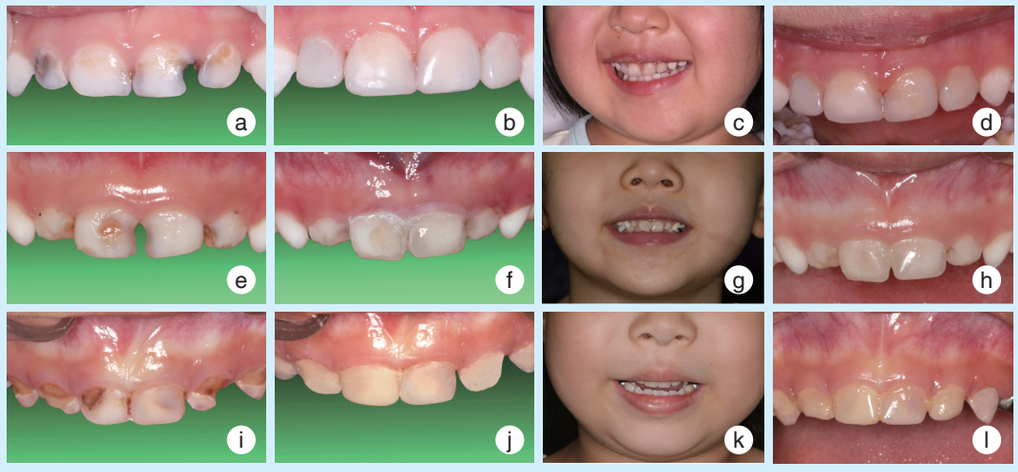
术后12个月，各组失访各1例（共3颗牙），总复诊率96.7%（87/90）。A组的评价指标均优于B、

C组，差异均具有统计学意义，包括：边缘完整性（$\chi^2=10.847$，$P=0.028$），边缘台阶（$\chi^2=7.799$，$P=0.020$），边缘变色（$\chi^2=10.391$，$P=0.034$），表面状态（$\chi^2=11.476$，$P=0.021$）；继发龋（$\chi^2=10.447$，$P=0.034$）。见表2、图1。

表2　术后改良USPHS标准评价结果

Table 2　Evaluation results of modified USPHS standard after operation

Evaluation index	Group A（n=29）				Group B（n=28）				Group C（n=30）				χ^2	P
	A	B	C	D	A	B	C	D	A	B	C	D		
Edge integrity	26	3	0	–	20	6	2	–	19	4	7	–	10.847	0.028
Edge step	28	1	–	–	24	4	–	–	21	9	–	–	7.799	0.020
Discolored edges	29	0	0	–	25	2	1	–	22	7	1	–	10.391	0.034
Surface condition	29	0	0	0	25	3	0	0	22	5	3	0	11.476	0.021
Secondary caries	29	0	0	–	26	2	0	–	23	4	3	–	10.447	0.034



a: preoperative photos of patients in group A; b: postoperative photos of patients in group A; c: postoperative facial images of patients in group A; d: intraoral photos after 12 months of patients in group A; e: preoperative photos of patients in group B; f: postoperative photos of patients in group B; g: postoperative facial images of patients in group B; h: intraoral photos after 12 months of patients in group B; i: preoperative photos of patients in group C; j: postoperative photos of patients in group C; k: postoperative facial images of patients in group C; l: intraoral photos after 12 months of patients in group C

Figure 1　Evaluation of the preservation effect of restorations and affected teeth

图1　修复体与患牙保存效果评价

2.2　患儿家长评价

患儿家长对整体轮廓、颜色满意程度、表面形态质地进行评分，A组家长对整体轮廓（$\chi^2=10.238$，$P=0.037$）、形态质地（$\chi^2=11.521$，$P=0.021$）的美学效果满意度评价均优于B、C组，差异均具有统计学意义，3组家长对颜色满意程度评价无显著性差异（$\chi^2=0.990$，$P=0.610$）。见表3。

表3　患者家长对修复方法美学效果满意度评价

Table 3　Evaluation of the satisfaction of the patient′s parents on the aesthetic effect of the repair method

Evaluation index	A group（n=29）				B group（n=28）				C group（n=30）				χ^2	P
	Excellent	Good	Medium	Poor	Excellent	Good	Medium	Poor	Excellent	Good	Medium	Poor		
Overall profile	28	1	0	0	25	3	0	0	22	4	4	0	10.238	0.037
Color satisfaction	28	1	0	0	26	2	0	0	27	3	0	0	0.990	0.610
Surface morphology and texture	29	0	0	0	25	3	0	0	23	3	4	0	11.521	0.021

3　讨　论

3.1　乳前牙美学修复的考虑因素

近年来，以口腔美学缺陷（颜色、形态、空间等）主观需求的越来越多，乳前牙龋和牙外伤的治疗原则是主要是牙齿美学及功能的修复。由于学龄前儿童通常不能配合口腔治疗，因此在选择修复方法时儿童的行为表现是一个重要的因素，乳前牙的美学修复流程应简化，甚至病例收集的摄影拍照时间都不应过长。成人常规使用结扎牙线固定橡皮障，而在儿童的临床操作很多时候结扎线会引起出血和不适，会污染粘接界面，导致粘接失败。治疗的时候使用结扎线可能会减慢安放和去除橡皮障的速度，导致临床操作时间过长，儿童往往不能长时间配合。本文采用的是橡皮障“劈障法”[8]，此法不仅安放方便，儿童接受度较高，牙齿暴露充分有利于树脂充填治疗。

3.2　乳前牙美学修复的效果评价

对于复合树脂修复的效果评价，国内专家学者以公布了评判标准和技术指南[9-10]。由于乳牙和恒牙不同，对乳前牙美学修复评价本文选用应用较多的改良USPHS/Ryge标准[7]。临床操作按照乳前牙树脂透明成形冠套的操作步骤。

术后12个月医师对修复体及患牙保存效果评价结果显示，A组的边缘完整性、边缘台阶、边缘变色以及继发龋的效果均优于B、C组。SonicFill大块复合树脂在声波手机作用下使得树脂具有流动性，使充填更充分，与牙体组织良好适应性和贴合性，能减少微渗漏的产生，提供更好的边缘密合性。研究表明，粘度可变型SonicFill大块复合树脂的填料比（wt%）为83，而Tetric N-Ceram Bulk Fill大块复合树脂填料比（wt%）为77，前者有效改善机械物理性能，降低聚合收缩率，在前牙牙体预备过程中，无须制备洞缘短斜面，但需橡皮轮抛光，因此SonicFill大块复合树脂组的边缘台阶评价更优。SonicFill大块复合树脂比高粘度大块树脂和通用纳米树脂具有更好的边缘适合性，良好的边缘封闭可以有效阻止继发龋的发生，提高树脂直接修复的使用寿命[11]。对于控制通用纳米树脂的固化深度，保证树脂冠的完全固化，根据国内专家指南与共识[10]，有以下几个方面：选用充足光固化强度LED固化灯、足够的光固化时间（20～40 s）；尽量减少光固化灯与复合树脂的距离；软启动聚合方式等。另外，乳牙透明预成冠牙体预备方法，只预备邻面，用金刚砂车针均匀磨除0.5～1 mm，在C组中透明预成冠内部充填树脂为2 mm，去除多余树脂，唇腭侧及近远中面分别光照20 s，这样在恢复牙体形态的同时保证了树脂冠的完全固化。

考虑学龄前儿童年龄较小，认知能力有限，以及儿科“医生-患儿-家长”三角医患关系因素以及龋病的分级管理[12]，对患儿家长的评价采用VAS，对整体轮廓、颜色满意程度、表面形态质地进行评分，A组患儿家长对修复体的整体轮廓、表面形态质地满意度评价优于B、C组。SonicFill大块复合树脂采用改性纳米混合填料，良好的物理机械性能，具有独特的光学特性，光固化后树脂具有较高的耐磨性和挠曲强度，使得树脂修复体表面光滑，稍作抛光或无须抛光，因此，效果优于其他两组。3组患儿家长对颜色满意程度无显著差异，SonicFill大块复合树脂和3M Z350 XT通用纳米树脂都具有A1、A2、A3 3种颜色，Tetric N-Ceram Bulk Fill大块复合树脂有IVA、IVB、IVW 3种颜色，3种树脂都可以为患儿的颜色匹配提供更多的选择，因此颜色效果相差不大。综上所述，SonicFill大块复合树脂可获得较理想的短期临床效果，患儿家长满意度较高。

3.3　乳前牙美学修复材料选择的考量

当乳切牙牙体组织大面积缺损时，直接树脂充填无法保证其抗力形、固位形及美观性，树脂分层堆塑临床耗时较长，患儿的配合度很难得到保证，操作难度增加。临床应用较多根据材料分为树脂冠类、金属预成冠、陶瓷冠类等[13]。金属预成冠因美观问题常应用于乳磨牙[14]。乳牙全瓷冠有美观性好、表面光滑不易堆积菌斑等优点，但因无法卷曲边缘修剪、牙体预备量大，全瓷冠多为氧化锆等成品冠，对粘接技术要求高，以及是否磨损对颌牙仍存在争议[15]。随着大块复合树脂在牙体修复中广泛临床应用[16]，SonicFill大块复合树脂在Kavo声波手机作用下使得树脂粘度明显下降，具有流动性，注入透明预成冠，当注入完成后手机不在工作，树脂粘度恢复可塑性，可避免注入时产生气泡和较长的准备时间，可以一次固化4 mm深度，具有聚合收缩小、边缘密合性好以及拥有低粘型和高粘型树脂的优点[17]。乳牙粘接系统的选择，传统的多步骤全酸蚀粘接系统在恒牙牙本质粘接中有显著优势，但在乳牙牙本质粘接中这种优势并没有那么明显，自酸蚀粘接系统在儿童口腔操作更为适合[18-20]。本研究中选用的OptiBond Versa自酸蚀型粘接剂，无需酸蚀冲洗，对乳牙牙本质粘接操作简便等。总之，本研究显示SonicFill大块

复合树脂联合透明预成冠用于乳切牙美学修复短期效果较好，患儿家长满意度高。

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