

Creating Shiny Composite Surfaces Without Any Detours

方便快捷地获得光洁的树脂表面

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Fig. 1 A 16-year-old patient suffered a fracture of her left central incisor, with dentin involvement but without pulp exposure or root damage. Minor enamel splintering was visible at the incisal edge of tooth 11, but no treatment was needed

图1 16岁患者左侧中切牙折断, 牙本质暴露但未露髓, 牙根无损伤。11切端见微小的釉质裂纹, 但不需要处理

Composite fillings can be complicated to polish. After excess removal and finishing, up to 4 additional steps may need to be carried out to obtain a smooth, shiny surface. A more economical system involves the use of carbide finishers and only one high-shine silicone polisher.

There is no such thing as a "standard" technique of composite finishing and polishing. Composite surfaces are finished and polished to improve their aesthetic quality and protect them against the aggressive oral environment and the colonization by micro-organisms.

For excess removal, scalpels, scalers, or abrasive stones and discs can be used. Interproximal areas can be treated with interdental strips or oscillating systems with diamond-coated inserts. Normally, dentists also use rotary instruments. Suitable types of carbide finishers have a clear advantage over fine-grit diamond burs in this step: They work selectively, meaning they "differentiate" between soft composite and hard enamel and to help conserve natural tooth structure.

In contrast, carbide finishers perform a cutting, rather than grinding, action, i.e. they remove material in the form

复合树脂充填后需要复杂的过程进行抛光。去除多余的树脂并修整后, 还需大约4步才能得到闪亮的抛光表面。目前出现了一种更为经济的方法, 使用钨钢修整钻针和一个高度闪亮的硅树脂抛光器。

复合树脂修形及抛光过程, 还没有一种标准程序。修整及抛光复合树脂表面可改善其美观效果并使其能抵御口腔环境中微生物的定植。

可以使用手术刀、刮治器、磨石或砂盘去除过多的树脂。邻面能用邻面砂条或含有金刚砂颗粒的震荡系统。通常, 牙科医生也使用旋转器械。在这一步骤中, 合适的钨钢钻针比细粒度的金刚砂钻针有明显的优势, 那就是安全。因为它们能区别软的树脂和硬的釉质, 从而保护自然牙体组织。

相反, 钨钢钻针的切割作用强于磨损作用, 比如说, 可对牙体组织进行片状切除。坚硬金属刃的作用主要由材料的可塑性形变以及工作刃和树脂表面间的剪切力产生⁽²⁾。这样一来, 有相当数量工作刃(20, 30或40)的钨钢钻针, 比金刚砂钻针抛光的表面更为光滑。令人吃惊的是, 用这种方法抛光后的光洁度好于使用氧化铝抛光者, 而后者常被认为是树脂抛光的标准工具。⁽⁵⁾

合适及不合适的抛光钻

然而, 并不是所有的钨钢抛光钻都同样适用。工作端不圆钝,



Fig. 2 The defect was restored with an aesthetic composite in an incremental technique. For excess removal and contouring, a 10-bladed carbide finishing bur (SE8-10) was used to selectively remove the composite and conserve the enamel

图2 使用美容复合树脂分层充填的缺损, 使用10刃的钨钢抛光钻(SE8-10)选择性地磨除复合树脂, 且保护牙釉质

of chips. Hardened metal blades act by means of plastic deformation of the substrate and deformation-associated shear forces occurring between blades and surface.⁽²⁾ As a result, carbide finishers with a sufficient number of blades (20, 30 or 40) produce smoother surfaces than diamond finishers. Surprisingly, the roughness values may even be better than those obtained by the use of aluminum-oxide-coated polishing discs, which are frequently regarded as the standard tools for composite polishing.⁽⁵⁾

Suitable and Unsuitable Finishers

However, not all carbide finishers are equally suitable. Working parts with non-rounded angles may damage composite and, in particular, enamel surfaces.⁽⁷⁾ This applies to burs with non-rounded flat ends and burs with pointed cutting tips alike. Ideally, carbide finishers with non-cutting tips and rounded transitions between tip and cutting blades should be used to help protect soft tissues when finishing transitional areas between filling material and tooth structure close to the gingival margin.

The Safe End* system is a good example of finishing burs designed to meet these requirements (Case Report, Figs. 1,

就会损伤复合树脂, 甚至部分釉质表面⁽⁷⁾。非圆钝的扁平末端及点状切割端的钻针会引起这样的损伤。理想的情况是: 当抛光动作邻近牙龈的填充材料和牙体组织时, 应使用无切割端或尖端与切割刃间圆钝的钨钢抛光钻, 以保护软组织。

Safe End*系统钻针能够很好地满足以上要求(病例报告, 图1,2,3,4)。这些钻针是特别为修整及抛光牙色塑料充填表面而设计的。使用10刃钻针去除多余的树脂及修整外形, 然后用20刃钻针磨平树脂表面, 准备抛光。两种钻针的工作刃均可有效磨除复合树脂材料, 并可最大限度地保护釉质表层。

适合牙体解剖的器械长度

Ron Goldstein, 牙科美容修复的先锋, 针对Safe End提出了“按治疗所需”原则选择器械长度。简单地说, 就是有多种钻针, 以适应不同的牙齿类型及治疗区长度。如, SE6、SE8及SE9等长钻针, 可用于上颌前牙的宽大表面; 而SE3及SE4等短钻针, 则适用于近牙龈或后牙的凹凸轮廓。纤细的钻针, 适用于复合树脂及釉质相接处。该系列钻针的其他优点包括使用寿命长, 以及由于钻针的直刃设计, 易于在消毒前进行清洗。

为达到最佳的控制效果, 10刃钻针应在电动手机上使用高转速(最大转速40,000转/分钟)进行操作。为了避免过度产热及产生沟纹, 推荐使用最大水量冷却并间断点磨。使用20刃钻针时, 最大转速应设为20,000转/分钟, 也需足够冷却水冷



Fig. 3 A 20-bladed carbide bur (SE8-20) created a smooth surface ready for polishing. This shows the non-cutting tip, which helps to avoid grooves and protect soft tissues when finishing areas close to the gingival margin

图3 20刃的钨钢抛光钻(SE8-20)为抛光预备出光滑的表面。这张图显示无切割尖, 这样可以避免产生沟纹, 并在修整近牙龈处时保护软组织

2, 3, 4). The burs were developed specially for the trimming and finishing of tooth-colored plastic filling materials. The 10-bladed version is used for excess removal and contouring, and the 20-bladed version subsequently produces smooth surfaces ready for polishing. The blades of both versions remove composite material effectively, but also selectively, ensuring maximum conservation of the highly valuable enamel layer.

Instrument Length Adapted to Anatomy

Ron Goldstein, a pioneer of aesthetic restorative dentistry, described the principle of "procedure specific" instrument lengths, which is utilized for Safe End. It simply means that a variety of burs are available, specially adapted to the type of tooth and the length of the area to be treated. The long burs SE6, SE8, and SE9, for example, are indicated for use on large surfaces of maxillary anterior teeth, while the short burs SE3 and SE4 are best suited for the emergence profile at the gingival margin and for posterior teeth. The slender shape of the burs is ideal for treatment of transitions from composite to enamel surfaces. Additional advantages include long service life and that the burs are easy to clean prior to disinfection, thanks to the straight blade design.

The 10-bladed burs should rotate at high speeds (maximum 40,000rpm) and to ensure optimal tactile control, an electric handpiece should be used. To avoid excessive heat generation and prevent grooves, it is advisable to apply almost no pressure and to work intermittently and with maximum water cooling. The 20-bladed burs should be used at a maximum 20,000rpm, and also with abundant spray cooling. For final finishing work, low speeds and reduced cooling are sufficient. The result is checked when the tooth has dried.

却。最后，需要低速少冷却水抛光，吹干牙面检查效果。

抛光变得容易

可用于抛光复合树脂表面的抛光系统种类繁多，令人眼花缭乱，包括抛光盘、含金刚砂或钨钢的硅树脂抛光器、表层包被氧化铝的瓷抛光器、含金刚砂的抛光刷和毡盘等。另外，还有与抛光杯、硅树脂抛光器或旋转的钨钢钻针配合使用的抛光膏，可帮助创造出高度光洁的抛光效果⁽⁶⁾。大多数系统都能制作出光滑、闪亮的表面。

哪种系统能产生最好的效果，有赖于所使用的检测方法或者说各个研究的赞助商⁽¹⁻¹³⁾。然而，快速、系统、简单的产品有很大的优势，使用者可通过尽可能少的步骤产生极好的抛光效果。所以在这个系统中，20刃的钨钢抛光钻已修整出光滑的表面，方便进一步的抛光(病例报告，图3)，非常理想。含金刚砂的单步硅树脂抛光器很容易产生高度闪光的外表。

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Fig. 4 Depending on the filling location and length of the treatment area, a variety of instrument lengths are available. The short burs SE3 and SE4 are best suited for interproximal spaces or transitional areas at the gingival margin
图4 依照充填体位置及治疗区域长度的不同，需要相应不同长度的器械。短的SE3和SE4短钻针适合抛光邻面或龈缘的过渡区



Fig. 7 The cup-shaped polisher is best suited for large surfaces or transitions between filling and tooth in cuspal areas
图7 杯状抛光器最适用于大面积充填体或牙尖处的牙齿充填体相接区

Polishing Made Easy

There is a confusing variety of polishing systems for composite surfaces, such as abrasive-coated polishing discs, diamond or silicon-carbide-impregnated silicone polishers, ceramic polishers with embedded aluminum oxide, diamond-impregnated polishing brushes and felt discs, and many more. Additionally, polishing pastes designed to be used with polishing cups, silicone polishers or even rotary carbide burs, and to produce the ultimate high-shine polish, are available.⁽⁶⁾ Most of these systems create smooth, shiny surfaces.

The question as to which shows the best results depends on the test method used—or the sponsor of the respective study.⁽¹⁻¹³⁾ However, it is advantageous to have a quick, systematic and uncomplicated product, allowing the user to achieve an excellent polish in as few steps as possible. So it is ideal that the system's 20-bladed carbide finishing burs already leave a very smooth surface virtually ready for polishing (Case Report, Fig. 3). Diamond-impregnated single-step silicone polishers will then easily create a high shine. These reusable instruments differ from multi-step polishers in that the amount of material removed can be varied simply by applying more or less pressure. This eliminates the need to change instruments and polishing consumes much less time.

The manufacturer has recently launched the Jazz polishing system (Figs. 5, 7 through 9) available for composites or ceramics / metals, as 1-, 2- or 3-step systems, and in reusable or single-patient-use versions. These single-step polishers are suitable for all tooth-colored direct restorative materials. Their special room-temperature manufacturing process, in which very fine diamond particles are embedded in a flexible rubber matrix, makes them particularly heat-

这些可重复利用的器械不同于多步抛光器，其磨除材料的量可随施力大小的改变而改变。这样，就不需更换器械，从而节省了抛光时间。

最近，制造商推出了Jazz抛光系统(图5、7-9)，可用于复合树脂或瓷/金属的抛光，有1步、2步及3步的系统，重复利用或一次性使用套系。这些单步抛光器适用于所有牙色直接充填材料的抛光。它们采用特殊的室温制作工艺，这样，细小的金刚砂颗粒包埋在弹性橡皮材料中，使其具有耐热、不褪色、耐用等特点。

成功抛光

制造商推荐在8,000 ~ 15,000转/分钟的反角手机(蓝色环标记)上使用Jazz Supreme单步复合树脂抛光器。只有正确用力，才能得到真正的高度抛光的表面。接触的压力影响着暴露的金刚砂颗粒数，所以，如果仅仅压力小，就不会磨除



Fig. 5 For final polishing, a single-step silicone polisher (Jazz Supreme) was used. The instrument removes no additional material if light pressure is applied. A perfect high-shine polish is achieved with a "tender stroke" to remove fine debris produced during polishing

图5 使用单步硅树脂抛光器(Jazz Supreme)进行最后一步抛光。该器械不会磨除光固化后多余的材料。抛光过程中轻柔地去除细小碎片，可获得高度闪亮的抛光表面



Fig. 8 The knife-edge Jazz Supreme polisher can be used for fissures, lingual surfaces, or transitional areas in interproximal spaces. The small flame shape is optimal for finishing and polishing of pits and fissures

图8 刃状的Jazz Supreme抛光器适用于窝沟、舌侧或邻间隙区。小的焰状钻针适合于修整及抛光窝沟处

resistant, colorfast, and durable.

Success without Pressure

The manufacturer recommends using Jazz Supreme single-step composite polishers in a blue-ring contra-angle at approximately 8,000-15,000rpm. A true high-shine polish will be achieved only if the correct pressure is applied. The contact pressure influences the number of diamond particles exposed, which means that almost no enamel will be removed if only light pressure is used. The diamond grains are subject to microscopic fracturing when under load, so that new cutting edges are produced again and again, making them self-sharpening and allow contouring, finishing, and polishing with only one instrument.

The action of these polishers should be tested on a cured composite sample prior to use to determine the correct pressure. The debris produced during polishing is best removed by giving the surface a "tender stroke" with Jazz Supreme. This final step creates the excellent high-shine polish desired. Polishing pastes are not needed in this technique.

Conclusion

Selecting a proper finishing and polishing system for composite fillings may easily become a guessing game for dentists. With the described approach, after pretreatment of the filling surface with special carbide finishers (in 2 steps), only one additional step is required for polishing: The use of a diamond-impregnated composite polisher at the correct pressure quickly creates a natural high-shine polish without polishing pastes and instrument changing.

釉质。施力后，金刚砂产生微裂，所以可以不断产生新的切割边缘，相当于钻针自身磨锐，可用一个器械完成修形、修整、抛光。

这些抛光器在使用前均需固化的复合树脂表面进行操作，以确定合适的压力。抛光过程中产生的碎屑最好能用Jazz Supreme轻柔擦拭表面移除。经过这最后一步，就可得到期望的闪亮抛光效果。该技术无需使用抛光膏。

结论

对于牙科医生来说，选择合适的修整和抛光系统是个很疑惑的问题。通过上述方法，用特殊的钨钢钻针预处理充填体表面(2步完成)，之后仅仅需要一步抛光：使用含金刚砂的复合树脂抛光器，以正确的压力抛光出闪亮的表面，无需抛光膏，无需更换器械。



Fig. 6 The restoration matches the adjacent tooth in shape, color, and surface quality

图6 充填体的形态、颜色及表面特性均与邻牙相匹配



Fig. 9 Jazz Supreme composite polishers come in kits with autoclavable aluminum block containing 4 instrument shapes and in refills containing 3 pcs of each shape

图9 Jazz Supreme复合树脂抛光器放置在耐高温高压的铝盒中，包含有4种器械形状及3套替换装