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生物导向型预备技术在口腔修复中的应用

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［摘要］口腔修复中的牙体预备边缘一直是口腔医生关注的热点问题，不当的预备边缘可能导致龋病和牙周炎等疾病，最终导致修复失败。生物导向型预备技术的应用已证明可恢复良好的牙周软硬组织形态，有望替代传统牙体预备方法。从生物导向型预备技术在贴面、全冠、种植中的应用综合论述生物导向型预备技术在口腔修复中的应用。

［关键词］生物导向型预备技术；口腔修复；牙体预备
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Applications of Biologically Oriented Preparation Technique in Prosthodontics

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［**Abstract**］The preparation edge of the tooth in oral restoration has always been the hot concern for dentists, and the improper preparation edge may lead to such diseases as caries and periodontitis, and ultimately lead to the restoration failure. The application of biologically oriented preparation technique has been proven to restore good periodontal soft and hard tissue morphology, which is expected to replace the traditional dental preparation methods. This article aims to comprehensively discuss the application of biologically oriented preparation technique in veneers, full crown and implantation.

［**Key words**］Biologically oriented preparation technique; Prosthodontics; Tooth preparation

生物导向型预备技术(biologically oriented preparation technique，BOPT)由 Loi 在 2008 年首次提出[1]，通过临时修复体对牙龈塑形，获得满意的牙龈形态后再在永久修复体上复制穿龈部分的准确形态。BOPT 理念倡导牙体预备中并不形成明确的肩台，根据牙周参数在颈部区域勾勒牙冠，以利于更加自由的调整牙龈形态。与其他牙体预备技术相比，BOPT 技术在准备印模、临时牙冠重衬和创建牙冠轮廓直至最终修复的过程更简单、更快捷[1]。

BOPT 是传统水平精加工线的可靠替代方案。使用 BOPT 后，牙龈组织可根据修复体出现的形状进行建模，形成牙周保护组织，特别是形成新的牙周组织，在结构上等同于正常的牙周组织，

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以确保没有炎症的健康环境[2]。

现在 BOPT 已广泛应用于口腔各类修复方案中[3]，本文将从贴面、全冠、种植及总结 4 个方面综合论述 BOPT 的应用现状。

1　BOPT 在贴面中的应用

BOPT 技术代表了目前口腔修复领域牙体预备的新趋势。这种技术与陶瓷贴面一起使用，可将牙龈龈缘线的稳定性转移到陶瓷贴面上，从而稳定牙龈组织并避免不必要的牙龈退缩[4]。

研究发现[5]，进行正确的牙周分析后，在没有终点线的情况下进行牙体预备可纠正牙龈不对称，这有助于成功维持软组织稳定。作为常规治疗的替代方案，使用 BOPT 在前牙区应用陶瓷贴面有助于牙周组织的改建和改善牙龈对称性。在贴面中使用 BOPT，牙体制备不设置水平终点线，软组织能在正确的位置再生，进而达到良好的适应和稳定，甚至可以纠正软组织异常和不对称。与传统的制备技术相比，BOPT 在牙体预备过程中产生更大程度的牙龈增厚，无论患者呈现薄牙龈生物型还是厚牙龈生物型，都会降低由于血管形成增加而导致牙龈移位的风险。

2　BOPT 在全冠中的应用

有研究表明，固定义齿的留存率与冠修复材料无密切相关性[6]。固定义齿的牙龈边缘位置一直是口腔修复领域争论的热点[7-8]。牙龈修复位置不当会导致牙周病及龋病的发生[9]。Maniatopoulos 等[10] 的前瞻性研究表明，BOPT 形成良好的修复体周围结构，提高了牙龈边缘的稳定性，增加修复体周围的牙龈厚度。

固定义齿修复最常见的并发症之一是牙龈边缘的顶端迁移，这可能与牙龈边缘位置和牙体预备类型等因素有关。Serra-Pastor 等[11] 对 25 名患者使用 BOPT 制备前牙后行固定桥修复，在进行长达 6 a 的追踪评估后得出结论：使用 BOPT 制备的牙齿后行固定桥修复，基牙具有良好的牙周健康和牙龈边缘稳定性，且牙龈无退缩，固定桥留存率为 100%。

有学者[12] 使用BOPT 进行单个氧化锆冠修复前牙的牙周组织评估和患者满意度进行为期 6 a 的前瞻性临床研究，研究表明在前牙区用 BOPT 制备的牙齿在修复体周围特别在牙龈边缘的稳定性和牙龈厚度增加方面，表现出良好的牙周形态。用 BOPT 制备的单冠获得了优异的临床留存率，并且在 6 a 后获得较高的患者满意度。

3　BOPT 在种植修复中的应用

种植体的长期成功率部分取决于修复体和种植体颈部周围建立的软组织圈，这一结构可以提供有效的密封，防止细菌入侵后导致的种植体周围炎[13]。临床医生能够决定和调整种植体周围软组织的边缘水平，从而改变修复体冠颈缘，提供软组织的适应性形态，软组织以受控方式侵入龈沟，从而确保种植体周围组织的健康，提供种植体周围硬组织和软组织的稳定性[14-16]。

良好的种植体周围软组织可防止牙龈组织萎缩，并可作为防止食物嵌塞的机械屏障，这是植入物支撑修复体不可避免的常见问题[17]。BOPT 通过胶原纤维增强上皮组织附着和种植体周围黏膜密封，胶原纤维随着时间的推移保持牙龈组织的稳定和厚实，更加有效保护种植体周围骨组织[18-20]。

在种植体上粘结修复体与固定修复体粘结到天然牙齿的设计和美学原则一致[21]。BOPT 同样适用于粘结在种植体上的固定修复体[22-23]，确保种植体周围组织健康，预防牙周组织发生炎症[21]。Cabanes-Gumbau 等[24] 的研究表明，使用 BOPT 行种植修复，10 月后种植体周围软组织厚度显着增加[25]。种植体周围软组织的形态功能及骨质流失与使用的修复体类型有关，与传统的种植体相比，采用 BOPT 的种植体修复表现出更好的种植体周围软组织形态，种植体周围骨质流失也较少[26-27]。

4　小结

综上所述，BOPT 在贴面、全冠及种植修复后修复体周围都表现出良好的牙周组织形态，大大提高修复的成功率及患者满意度。使用 BOPT 预备的修复体其周围软组织表现出良好的形态，牙龈增厚，边缘组织稳定性增加，并发症的发生率较低。在需要更换旧修复体的情况下，BOPT 是一种很好的治疗选择，表现出良好的牙周组织形态、牙龈增厚和边缘稳定性增加[8]。许多研究已经证明使用该技术治疗的牙齿的牙周组织状况有所改善[2]。随着 BOPT 研究的深入，BOPT 的应

用范围越来越广阔[3]。BOPT 还可与全数字工作流程相结合，矫正和重塑牙龈形态[28]。

尽管 BOPT 有一定的局限性，对于牙龈厚度不足难以确保生物宽度有足够的空间行种植修复的临床病例，BOPT 并不适用。此外，该技术非常耗时，因为在第 2 阶段手术期间，临床医生必须调整临时基台，这需要丰富的临床经验，对新手医生是极大的挑战[29]。但 BOPT 在临床中应用广泛，促进牙周组织再生，恢复良好边缘形态，具有良好的应用前景，值得临床推广。

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