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不同治疗方法对中青年残根残冠患者咀嚼功能及舒适度的影响*

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摘要 目的:对比不同治疗方法对中青年残根残冠患者咀嚼功能及舒适度的影响。**方法:**2018年8月到2020年7月选择在本院进行前牙美容修复的中青年残根残冠患者82例,根据随机信封抽签原则将患者分为观察组40例与对照组42例。对照组给予牙冠延长术治疗,观察组给予纤维桩加全瓷冠修复治疗,记录与随访患者预后情况。**结果:**两组修复后3个月的舌向集中殆侧向殆与前伸殆最大应力值小于解剖殆($P<0.05$),解剖殆的正中殆少于侧向殆与前伸殆($P<0.05$),组间对比差异无统计学意义($P>0.05$)。观察组修复后3个月的咬合接触时间多于对照组($P<0.05$),左右侧殆力百分比、殆力中心距离少于对照组($P<0.05$)。观察组修复后3个月的成功率为97.5%,高于对照组的85.7%($P<0.05$)。观察组修复后3个月的外观效果与舒适水平评分均高于对照组($P<0.05$)。随访12个月,观察组的牙龈萎缩、感染、松动等并发症发生率为2.5%,低于对照组的19.0%($P<0.05$)。**结论:**相对于牙冠延长术,纤维桩加全瓷冠在前牙残根残冠修复中的应用能提高患者的咀嚼功能与舒适度,并不会影响光弹性状况,从而提高修复效果,减少随访并发症的发生。

关键词:牙冠延长术;纤维桩;全瓷冠;前牙;残根残冠;咀嚼功能;舒适度

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Effects of Different Treatment Methods on Masticatory Function and Comfort of Young and Middle-aged Patients with Residual Root and Crown*

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ABSTRACT Objective: To compare the effects of different treatment methods on masticatory function and comfort of young and middle-aged patients with residual roots and crowns. **Methods:** From August 2018 to July 2020, 82 cases of young and middle-aged patients with residual roots and crowns who were selected for cosmetic restoration of anterior teeth in this hospital were selected and were equally divided into observation group of 40 cases and control group of 42 cases accorded to the principle of random envelope drawing. The control group were given crown lengthening treatment, and the observation group were given fiber post plus all-ceramic crown restoration treatment. The prognosis of the patients were recorded and followed up. **Results:** The tongue concentration (lateral) and extension of the two groups of tongues were less than the anatomical occlusion ($P<0.05$) at 3 months after repair. The median of the anatomical occlusion were less than the lateral occlusion and the extension ($P<0.05$), there were no statistically significant difference compared between the groups ($P>0.05$). The occlusion contact time of the observation group at 3 months after repair were longer than that of the control group ($P<0.05$), and the percentage of force on the left and right sides and the distance between the center of force in the observation group were less than those of the control group ($P<0.05$). The success rates of the observation group at 3 months after repair were 97.5 %, which were higher than 85.7 % of the control group ($P<0.05$). The appearance effect and comfort level scores of the observation group at 3 months after repair were higher than those of the control group ($P<0.05$). Followed-up for 12 months, the incidence of gingival recession, infection, loosening and other complications in the observation group were 2.5 %, lower than 19.0 % in the control group ($P<0.05$). **Conclusion:** Compares with crown lengthening surgery, fiber post plus full The application of porcelain crowns in the restoration of residual roots and crowns of anterior teeth can improve the patient's masticatory function and comfort without affecting the photoelasticity, thereby improving the effect of repair and reducing the occurrence of follow-up complications.

Key words: Crown lengthening; Fiber post; All-ceramic crown; Anterior teeth; Residual roots and crowns; Chewing function

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前言

残根残冠是指牙齿由于外力、龋坏导致的牙根冠缺损,前牙残根残冠在临床上较多见。由于前牙受损可造成牙体的不完整,严重影响美观,且会引发根尖周炎,为此对前牙残根残冠外形及功能的修复具有重要意义^[1,2]。牙冠延长术是通过手术的方法,降低龈缘位置,暴露健康的牙齿结构,使临床牙冠加长,防止生物学宽度异常情况的出现^[3,4]。牙冠延长术使牙齿冠根比例增加,降低牙体组织的抗牙颌能力,易在远期产生牙体折断现象^[5]。桩核当前在残根修复中应用较多见,桩为核提供固位力,核为冠提供固位形,其弹性模量与牙本质相近,可促进恢复牙冠形态,进而恢复患者的咀嚼功能与美观功能^[6,7]。金属是最早被用作桩核的材料,具有易加工性、良好物理机械性能等特点,但易造成应力集中,且有导致根折的可能性^[8];同时,长期使用可游离出部分金属离子,该离子多具有细胞毒性、且导致龈缘的染色,特别是对剩余牙体组织的保护作用差^[9]。纤维桩具有低弹性模量性、较少导致根折、操作简便、生物相容性好等优点,特别是可塑纤维桩全瓷冠具有良好的美观作用和透光性,当前应用较多^[10,11]。本文具体探讨了不同治疗方法对中青年残根残

冠患者咀嚼效率及舒适度的影响,旨在明确不同治疗方法在治疗中的应用价值。

1 资料与方法

1.1 研究对象

选择于2018年8月到2020年7月在本院进行前牙美容修复的中青年残根残冠患者82例,医院伦理委员会已批准此次研究,所有患者已签署知情同意书。

纳入标准:单牙修复;厚度强度足够的残留龈上牙体高度 ≥ 2 mm;牙冠长度 $<$ 牙根长度;临床与修复资料完整;根尖周无暗影或者暗影有缩小趋势;均为上前牙的牙体缺损;术前经过完善的根管治疗;患者意识、语言表达清楚,配合能力尚可;前牙覆殆覆盖关系为正常;X线扫描结果显示根充完善;年龄20-60岁。

排除标准:颌面部软硬组织缺损者;临床资料缺项者;妊娠与哺乳期妇女;根管明显弯曲者;存在凝血功能障碍者。

根据随机信封抽签原则把患者分为观察组40例与对照组42例,两组的一般资料对比无差异($P>0.05$)。见表1。

表1 一般资料对比

Table 1 Comparison of general data

Groups	n	Site of disease (anterior teeth/lower anterior teeth)	Gender (male/female)	Age (years)	Body mass index (kg/m ²)	Dental position (central incisor/lateral incisor/canine)
The Observation group	40	22/18	16/24	34.58 $\pm$ 4.20	22.49 $\pm$ 1.42	18/12/10
The control group	42	22/20	18/24	34.51 $\pm$ 3.33	22.13 $\pm$ 1.92	21/11/10
T/ χ^2		0.057	0.069	0.056	0.433	0.226
P		0.811	0.793	0.964	0.666	0.893

1.2 治疗方法

对照组:给予牙冠延长术治疗,患者进行局部浸润麻醉,依据切除牙龈多少作内斜切口。完全暴露牙根断面后修整牙槽骨,保障留足生物学宽度和龈沟深度后,龈缘以上牙体组织 ≥ 4 mm。根面平整并去除根面残留的牙周膜纤维,修整龈瓣的位置、形态、厚度、部位,防止再附着,缝合牙槽嵴顶处。待牙周牙龈组织完全愈合后,行基牙充填修复并预备,全冠修复。

观察组:给予纤维桩加全瓷冠修复治疗, EverStick 高强度纤维包括桩核树脂、桩核成型塑料套、桩根内粘固剂、酸蚀剂,纤维桩全瓷冠由德国 Vita 公司提供。完成牙体预备后,选择上述纤维桩进行根管内试戴,其次对纤维桩与管壁进行清洁,消毒,粘接纤维桩,精修纤维桩树脂核,用比色板对比邻牙,进行牙釉质、牙本质比色。利用临时冠材料采用直接法制作临时冠,然后进行粘接全瓷冠的试戴,检查全瓷冠的咬合、邻接和边缘位置,完成全冠修复。

1.3 观察指标

1.3.1 咀嚼功能检查 在修复后3个月测量与记录患者的前牙咀嚼功能,检测指标包括咬合接触时间、左右侧颌力百分比、颌力中心距离,咬合接触时间为从下颌姿势位咬合的第一个接触点直到牙尖交错位最大咬合力所需要的时间;颌力中心距离

是咬合力力矩的平衡点;左右侧颌力百分比为左侧颌力占据的比例减去右侧颌力占据的比例。

1.3.2 光弹性检测 在修复后3个月检测患者的前牙光弹性,记录舌向集中颌、解剖颌的正中颌、侧向颌、前伸颌。

1.3.3 在修复后3个月进行判定修复成功标准 判断标准:患牙无自觉症状,根尖周无异常,牙体组织无折断、无继发龋坏,纤维桩核无松动、无脱落、无折断,患牙咀嚼功能无异常。

1.3.4 牙舒适度调查 在修复后3个月进行患者前牙舒适度的调查,包括外观效果、舒适水平等维度,各维度评分为0-10分,评分越高表明满意度越高。

1.3.5 并发症记录 修复后随访1年,记录患者出现牙龈萎缩、感染、松动等并发症发生情况。

1.4 统计方法

选择 SPSS20.00 软件进行数据分析,以均数 $\pm$ 标准差、率等表示计量数据与计数数据,对比方法为t检验与卡方 χ^2 分析,检验水准为 $\alpha=0.05$ 。

2 结果

2.1 光弹性结果对比

两组修复后3个月的舌向集中颌侧向颌与前伸颌最大应

力值小于解剖殆($P<0.05$),解剖殆的正中殆少于侧向殆与前伸殆($P<0.05$),组间对比差异无统计学意义($P>0.05$)。见表 2。

表 2 两组修复后 3 个月的不同部位最大应力值对比(mm,均数±标准差)

Table 2 Comparison of maximum stress values at different positions 3 months after repair between the two groups (mm, mean±standard deviation)

Groups	n	Anatomic occlusion			Lingual concentrated occlusion		
		Centric occlusio	Lateral occlusion	Protrusive occlusion	Centric occlusio	Lateral occlusion	Protrusive occlusion
The Observation group	40	0.95±0.21	1.48±0.34	1.55±0.14	1.07±0.15	1.08±0.14	1.06±0.21
The control group	42	0.98±0.15	1.50±0.22	1.56±0.25	1.02±0.12	1.00±0.14	1.02±0.25
t		0.184	0.153	0.078	0.253	0.315	0.219
P		0.714	0.763	0.844	0.644	0.513	0.613

2.2 咀嚼功能对比

05),左右侧殆力百分比、殆力中心距离少于对照组($P<0.05$)。

观察组修复后 3 个月的咬合接触时间多于对照组($P<0.05$)。见表 3。

表 3 两组修复后 3 个月的咀嚼功能对比(均数±标准差)

Table 3 Comparison of mastication function between the two groups three months after repair (mean ± standard deviation)

Groups	n	Occlusal contact time (s)	Left and right dental occlusio percentage	Occlusion center distance (mm)
The Observation group	40	1.19±0.14	12.93±2.45	1.54±0.14
The control group	42	0.85±0.15	17.34±1.59	2.11±0.21
t		7.111	9.194	8.111
P		0.013	0.001	0.004

2.3 修复成功率对比

85.7 %($P<0.05$)。见表 4。

观察组修复后 3 个月的成功率为 97.5 %，高于对照组的

表 4 两组修复成功率对比(n)

Table 4 Comparison of success rate of repair between the two groups (n)

Groups	n	Success	The success rate
The Observation group	40	39	97.5%
The control group	42	36	85.7%
χ^2			4.670
P			0.031

2.4 舒适度对比

对照组($P<0.05$)。见表 5。

观察组修复后 3 个月的外观效果与舒适水平评分都高于

表 5 两组修复后 3 个月的舒适度对比(分,均数±标准差)

Table 5 Comparison of comfort level 3 months after repair between the two groups (points, mean±standard deviation)

Groups	n	The appearance	Comfort level
The Observation group	40	8.67±0.33	8.46±0.14
The control group	42	7.07±0.24	6.98±0.72
t		12.843	11.444
P		0.000	0.000

2.5 随访并发症情况对比

随访 12 个月,观察组的牙龈萎缩、感染、松动等并发症发生率为 2.5 %,低于对照组的 19.0 %($P<0.05$)。见表 6。

残根残冠为临床常见口腔疾病类型,是一种牙齿受到外力、龋坏导致的牙根冠缺损,不仅影响牙齿美观度以及个体的发音功能,还可诱发根尖周炎的形成,影响牙齿咀嚼功能,并在一定程度上形成口腔癌^[12,13]。随着医学技术的发展,前牙残根残

3 讨论

表 6 两组随访并发症情况对比(n)

Table 6 Comparison of follow-up complications between the two groups (N)

Groups	n	Gingival recession	Infection	Loose	A combined
The Observation group	40	0	0	1	12.5%
The control group	42	3	2	3	8(19.0%)
χ^2					5.742
P					0.017

冠的修复原则是应综合考虑美观度、咀嚼功能、舒适度,采用弹性模量接近牙组织、耐腐蚀、强度高的材料^[14,15]。牙冠延长术是将留有全冠修复体的牙冠延长,以免冠缘向龈沟深处延伸,确保修复体固位良好^[16]。其在临床操作中是在与牙周生物学宽度相符的前提下,将患者受损牙齿龈缘位置降低,暴露出健康牙组织,从而改善断根位于龈下症状^[17,18]。

桩核是由桩-核-冠及粘结剂组成的修复系统,桩核材料的选择是决定前牙残根残冠修复效果的重要因素^[19]。理想的桩核材料应具备透光性好、美观、操作简单、强度高、耐腐蚀、耐疲劳等特点^[20]。不过金属桩核由于其弹性模量远高于牙本质,且存在易腐蚀、美观性差、治疗周期长等缺点;特别是由于金属材料的机械特性与牙体组织差别大,也使得其对剩余牙体组织的保护作用差,因此开发各方面性能俱佳的桩核来取代金属桩核具有重要价值^[21,22]。本研究显示两组修复后3个月的舌向集中殆侧向殆与前伸殆最大应力值小于解剖殆,解剖殆的正中殆少于侧向殆与前伸殆,表明纤维桩加全瓷冠在前牙残根残冠修复中的应用并不会影响光弹性状况,而采用牙冠延长术治疗降低了牙槽骨的高度。EverStick高强度纤维桩由聚合物树脂基质包裹着碳纤维、石英纤维、玻璃纤维等组成^[23]。基纤维具有高强度的物理性能。特别是石英纤维桩,其为结晶态纯二氧化硅,患牙美观度佳,不会发生细胞毒性,具有耐酸耐碱,生物安全性和生物稳定性佳等特点^[24]。可塑纤维桩均与牙本质的弹性模量相近,可使应力沿根管壁均匀分布,避免应力集中。同时纤维桩可与树脂粘接剂发生化学性粘接,有效保障纤维桩的稳定性^[25,26]。

部分残根残冠患者若治疗不及时,将会导致牙龈因炎症影响出现退缩。因受到牙冠修复不良等因素影响,极可能导致牙冠过短,从而影响患者舒适度^[27]。牙冠延长术适用于多种原因导致的残根,在有效修复残根的同时,可保护牙周组织,也可改善过短的临床冠,增强修复体稳固性,改善牙齿美观度^[28]。当前桩核材料为修复前牙残根残冠的重要方法,可减缓牙槽骨的吸收速度,也可避免因过大的咬合力对牙周组织造成的损坏,有利于维持牙槽骨原有的高度^[29]。本研究显示观察组修复后3个月的成功率高于对照组;观察组修复后3个月的外观效果与舒适水平评分都高于对照组。从机制上分析,采用牙冠延长术,将会影响牙周组织的修复效果。而与此相反的是,可塑纤维桩的根内应力峰值最低,其应力分布最接近天然牙的情况,有利于保护剩余牙体组织。且在修复前牙时,将纤维桩钉的根外段向舌侧做适当的调整,可避免唇侧突出,也可保证根外段有足够长度,从而提高修复成功率,改善患者的舒适程度^[30]。

牙体力学相关观点表明,由不同硬度组成部分组成的一个系统,在负荷的影响下,首先破坏的是较弱部分,而较硬部分能

承受较大的力而不变形,且负荷产生的应力得以释放。准确定位殆平面前点是前牙残根残冠修复成功的前提条件之一,殆平面前点是牙体中能重复得到、可精确的唯一位置,因此在前牙残根残冠修复中需要构建水平咬合关系^[31,32]。本研究显示观察组修复后3个月的咬合接触时间多于对照组,左右侧殆力百分比、殆力中心距离少于对照组,表明纤维桩加全瓷冠在前牙残根残冠修复中的应用能提高患者的咀嚼效率。

全冠修复主要用于修复临床残根残冠患者,能够修复缺损牙齿的功能、形态、美观度,也可覆盖整个牙冠表面。在前牙残根残冠的修复中,桩核材料可加强牙齿的抗力形和固位形,但牙折或龋坏后长期未修复,在后期易引起根折^[33]。金属桩使得应力直接传导至桩与根部牙本质的交界处而无吸收,常导致无法修复的牙体折裂。此外金属桩具有不透明的特征,金属离子在口腔环境中易被游离出来,影响修复效果^[34]。本研究随访12个月,观察组的牙龈萎缩、感染、松动等并发症发生率低于对照组。从机制上分析,可塑纤维桩由石英纤维和树脂基质构成,具有良好的机械性能、生物兼容性,可使牙体组织得到保存,从而提高远期修复效果^[35]。本研究也存在一定的缺陷,随访时间点比较短,未反映3-5年的变化趋势,收集的病例数较少,对机制的分析还不够明确,将在下一步进行深入分析。

总之,相对于牙冠延长术,纤维桩加全瓷冠在前牙残根残冠修复中的应用,能提高患者的咀嚼功能与舒适度,并不会影响光弹性状况,从而提高修复效果,减少随访并发症的发生。

参考文献(References)

- [1] Araya E I, Claudino R F, Piovesan E J, et al. Trigeminal Neuralgia: Basic and Clinical Aspects [J]. *Curr Neuroparmacol*, 2020, 18(2): 109-119
- [2] Baghizadeh Fini M, Olyae P, Homayouni A. The Effect of Low-Level Laser Therapy on the Acceleration of Orthodontic Tooth Movement [J]. *J Lasers Med Sci*, 2020, 11(2): 204-211
- [3] Berthaume M A, Lazzari V, Guy F. The landscape of tooth shape: Over 20-years of dental topography in primates [J]. *Evol Anthropol*, 2020, 29(5): 245-262
- [4] Bhattacharyya S, Das D P, Bhattacharyya A, et al. Clinical guideline and treatment planning decisions of single-tooth implants versus preserving natural teeth with nonsurgical endodontic therapy [J]. *J Family Med Prim Care*, 2020, 9(6): 2654-2658
- [5] 黄蔓萍, 张涌, 刘付奇川. 牙髓血运重建术治疗年轻恒牙牙髓坏死的临床效果[J]. *实用临床医学*, 2020, 21(2): 62-63, 83
- [6] Shimada Y, Yoshiyama M, Tagami J, et al. Evaluation of dental caries, tooth crack, and age-related changes in tooth structure using optical coherence tomography[J]. *Jpn Dent Sci Rev*, 2020, 56(1): 109-118

- [7] Stiffler C A, Jakes J E, North J D, et al. Crystal misorientation correlates with hardness in tooth enamels [J]. *Acta Biomater*, 2021, 120(9): 124-134
- [8] Tavelli L, McGuire M K, Zucchelli G, et al. Biologics-based regenerative technologies for periodontal soft tissue engineering [J]. *J Periodontol*, 2020, 91(2): 147-154
- [9] Tobiasch E, Yu T, Klein O D. Molecular and cellular mechanisms of tooth development, homeostasis and repair [J]. *Int J Mol Sci*, 2020, 147(2): 99-108
- [10] Pisciotta A, Bertoni L, Vallarola A, et al. Neural crest derived stem cells from dental pulp and tooth-associated stem cells for peripheral nerve regeneration[J]. *Neural Regen Res*, 2020, 15(3): 373-381
- [11] Sayed M E, Jurado C A, Tsujimoto A. Factors Affecting Clinical Decision-Making and Treatment Planning Strategies for Tooth Retention or Extraction: An Exploratory Review [J]. *J Periodontol*, 2020, 23(12): 1629-1638
- [12] Zhou L. Anti-Biofouling Coatings on the Tooth Surface and Hydroxyapatite [J]. *Clin Cosmet Investig Dent*, 2020, 15 (10): 8963-8982
- [13] Araya E I, Claudino R F, Piovesan E J, et al. Trigeminal Neuralgia: Basic and Clinical Aspects [J]. *Curr Neuropharmacol*, 2020, 18(2): 109-119
- [14] De Souza I P R, Ragucci G M, Elnayef B, et al. Immediate implant placement in molar extraction sockets: a systematic review and meta-analysis[J]. *Prog Orthod*, 2020, 6(1): 40-44
- [15] 向舒畅, 罗特, 张华. 数字化双定位导板引导下的前牙美学冠延长病例报告 1 例[J]. *临床口腔医学杂志*, 2021, 37(1): 50-52
- [16] Fouda A a H. The impact of the alveolar bone sites on early implant failure: a systematic review with meta-analysis [J]. *J Korean Assoc Oral Maxillofac Surg*, 2020, 46(3): 162-173
- [17] Hoogeveen R C, Hol M L F, Pieters B R, et al. An overview of radiological manifestations of acquired dental developmental disturbances in paediatric head and neck cancer survivors [J]. *Dentomaxillofac Radiol*, 2020, 49(3): 20190275
- [18] Petronis Ž, Zigmantavičius J, Gervickas A. Various wound closure ways after impacted lower wisdom teeth removal: A review [J]. *Stomatologija*, 2020, 22(4): 107-115
- [19] Keerthana P, Diddige R, Chitra P. Performance comparison of vibration devices on orthodontic tooth movement-A systematic review and meta-analysis [J]. *J Oral Biol Craniofac Res*, 2020, 10(4): 814-823
- [20] Kitani-Morii F, Noto Y I. Recent Advances in *Drosophila* Models of Charcot-Marie-Tooth Disease[J]. *Int J Mol Sci*, 2020, 21(19): 778-793
- [21] Li Q L, Takahashi K, Kiso H, et al. Development of tooth regenerative medicine strategies by controlling the number of teeth using targeted molecular therapy[J]. *Int J Nanomedicine*, 2020, 40(9): 21-24
- [22] Pedano M S, Li X, Yoshihara K, et al. Cytotoxicity and Bioactivity of Dental Pulp-Capping Agents towards Human Tooth-Pulp Cells: A Systematic Review of In-Vitro Studies and Meta-Analysis of Randomized and Controlled Clinical Trials [J]. *Materials (Basel)*, 2020, 13(12): 114-119
- [23] 李高中, 方萍, 龚恒丽, 等. 氧化锆全瓷修复与金属烤瓷修复在前牙牙冠延长术后冠修复中的应用效果比较[J]. *现代生物医学进展*, 2020, 20(1): 106-109, 143
- [24] Rodd H D, Graham A, Tajmehr N, et al. Molar incisor hypomineralisation: current knowledge and practice [J]. *Int Dent J*, 2020, 9(12): 556-559
- [25] Tabancis M, Ratzmann A, Doberschütz P, et al. Multiloop edgewise archwire technique and denture frame analysis: a systematic review [J]. *Head Face Med*, 2020, 16(1): 32-37
- [26] Vale F, Kini S, Somayaji K, et al. Anomalies and Clinical Significance of Mylohyoid Nerve: A Review [J]. *Materials (Basel)*, 2020, 12(6): 429-436
- [27] 李卫芳. 微创牙冠延长术联合纳米树脂修复龈下楔状缺损的临床效果[J]. *河南医学研究*, 2021, 30(7): 1226-1228
- [28] Borse S, Chaware S H. Tooth shade analysis and selection in prosthodontics: A systematic review and meta-analysis[J]. *J Neurochem*, 2020, 20(2): 131-140
- [29] Carvalho R M, Zucchelli G, Tavelli L. Autogenous soft tissue grafting for periodontal and peri-implant plastic surgical reconstruction[J]. *Clin Exp Dent Res*, 2020, 91(1): 9-16
- [30] Gan L, Liu Y, Cui D X, et al. New insight into dental epithelial stem cells: Identification, regulation, and function in tooth homeostasis and repair[J]. *World J Stem Cells*, 2020, 12(11): 1327-1340
- [31] Najeeb S, Al-Quraini A a A, Almusallam H a A, et al. Effect of laser treatment on outcomes of tooth replantation - A systematic review[J]. *Am J Med Genet A*, 2020, 15(3): 169-176
- [32] Moss K R, Höke A. Targeting the programmed axon degeneration pathway as a potential therapeutic for Charcot-Marie-Tooth disease [J]. *Brain Res*, 2020, 1727(12): 146539-146544
- [33] Huang D, Ren J, Li R, et al. Tooth Regeneration: Insights from Tooth Development and Spatial-Temporal Control of Bioactive Drug Release[J]. *Molecules*, 2020, 16(1): 41-55
- [34] Martin P B, Hicks A N, Holbrook S E, et al. Overlapping spectrums: The clinicogenetic commonalities between Charcot-Marie-Tooth and other neurodegenerative diseases [J]. *J Periodontol*, 2020, 1727(10): 146532
- [35] Schlueter N, Amaechi B T, Bartlett D, et al. Terminology of Erosive Tooth Wear: Consensus Report of a Workshop Organized by the ORCA and the Cariology Research Group of the IADR[J]. *Caries Res*, 2020, 54(1): 2-6