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纳米复合树脂和光固化复合树脂材料用于前牙美容修复的对比研究

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摘要 目的:分析与比较纳米复合树脂和光固化复合树脂材料用于前牙美容修复的效果。**方法:**选取2013年9月至2016年10月于我院进行前牙美容修复的患者62例(115颗牙),平均分为甲组和乙组。甲组予以纳米复合树脂修复治疗,乙组则予以光固化复合树脂修复治疗。分析比较两组患者的治疗成功率、修复优良率、患者满意度、自觉疼痛程度、敏感发生率、并发症的发生情况及牙周相关指标。**结果:**甲组的治疗成功率(93.55%)显著高于乙组(70.97%),修复效果等级显著优于乙组,修复效果优良率(96.77%)也显著优于乙组(67.74%)。甲组的牙龈指数、龈沟出血指数、菌斑指数和牙松动度均显著低于乙组。两组患者的VAS评分均随着时间延长降低,在修复后1周、1个月、3个月时,甲组患者的VAS评分均显著低于乙组。甲组的患者满意度高于乙组,并发症总发生率显著低于乙组($P<0.05$)。**结论:**纳米复合树脂对前牙美容修复较光固化复合树脂有更好效果,且患者牙齿敏感发生率低、自觉疼痛程度小、并发症少,患者牙周相关较好,患者满意率高。

关键词:美容修复;前牙缺损;纳米复合树脂;光固化复合树脂;治疗效果

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A Comparative Study on the Nano-composite Resin and Light-cured Composite Resin in the Cosmetic Repair of Anterior Teeth

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ABSTRACT Objective: To analyze and compare the effect of nano-composite resin and light-cured composite resin materials on the cosmetic repair of anterior teeth. **Methods:** From September 2013 to October 2016, 62 patients (115 teeth) treated with anterior teeth cosmetic repair in our hospital were selected and divided into group A and group B. Group A was treated by nanocomposite resin, and group B was treated by light-cured composite resin. The treatment success rate, excellent and good rate of repair, periodontal indexes, and patient's satisfaction, incidence of tooth hypersensitivity, spontaneous pain score and complications were analyzed and compared between the two groups. **Results:** The success rate of treatment in group A (93.55%) was significantly higher than that of group B (70.97%) ($P<0.05$), and the repair grade was significantly better than that of the group B ($P<0.05$), and the excellent and good rate of repair (96.77%) was significantly higher than that of group B (67.74%) ($P<0.05$). The gingival index, sulcus bleeding index, plaque index and tooth mobility degree were significantly lower in group A than those of the group B ($P<0.05$). The VAS scores of both groups decreased with time. At 1 week, 1 month and 3 months after repair, the VAS scores of group A were all significantly lower those of group B ($P<0.05$). Patients' satisfaction of group A was higher than that of the B group ($P<0.05$), the overall incidence of complications was significantly lower than that of the group B ($P<0.05$). **Conclusion:** Compared with the light-cured composite resin, the nanocomposite resin was better for the repair of anterior teeth, with excellent indexes of the abutment, low degree of conscious pain, low incidence of tooth sensitivity, fewer complications and high satisfaction.

Key words: Cosmetic repair; Anterior tooth defect; Nanocomposite resin; Light-cured composite resin; Treatment effect

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前言

牙体缺损是指各种牙体组织不同质地、生理解剖外形的损坏或异常,其发病率占牙体疾病的24%-53%^[1,2]。正常的牙体形态、咬合及邻接关系的破坏,对咀嚼、咬合、发音、面容、牙髓、牙周组织乃至全身健康都会产生不良影响^[3,4]。随着口腔医学的

发展和人们生活水平的提高,现如今人们对口腔健康和美观愈加重视,不论是治疗牙体缺损还是预防性的口腔美容修复,都得到了充分的应用和发展,也提高了美容修复效果的要求^[5,7]。牙体缺损的美容修复可以满足患者的生物学要求和美学规律,从而改善患者的口腔功能和外貌^[8]。光固化复合树脂适应症广泛,能够尽量保持牙体组织的完整,操作简单,创伤小,美观自然,价格较为经济,对前牙美容修复也具有显著效果^[9,10]。纳米树脂是一种新型材料,直接粘接美学修复技术磨牙少或者不磨牙^[11],因其经济、即刻修复等优点,具有很好的应用前景

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[12,13]。本研究比较了两种材料美容修复前牙的效果,以期为在临床工作中选择合适的美容修复材料提供参考。

1 资料与方法

1.1 研究对象

研究对象选自 2013 年 9 月 -2016 年 10 月期间我科收治的前牙体缺损患者,共 62 例,115 颗牙。纳入标准:(1)经临床检查确诊为前牙牙体缺损,符合第 7 版《口腔修复学》中相关诊断

标准;(2)符合树脂材料前牙美学修复的适应证;(3)全身情况可耐受,知情同意本研究,可配合治疗。排除标准:(1)咬合关系异常(如反合、深覆合),患牙缺损部位承受巨大咬合力,患牙局部无法隔湿操作;(2)合并血液系统疾病、严重心、脑、肺、肾功能不全。将 62 例患者进行分组,按照随机数字表法,平均分为甲组和乙组各 31 例。甲组和乙组患者的基本临床资料比较差异均无统计学意义($P>0.05$),具有可比性,见表 1。

表 1 两组患者的基本临床资料对比($n, \bar{x} \pm s$)

Table 1 Comparison of the basic and clinical data between two groups ($n, \bar{x} \pm s$)

Groups	Number of teeth	Age(Year)	Course of disease(Year)	Gender		Type			
				Male	Female	Caries	Fluorosis	Wedge defect	Traumatic defect
Group A($n_1=31$)	60	43.3 $\pm$ 8.9	0.9 $\pm$ 0.3	17	14	32	8	11	9
Group B($n_2=31$)	55	42.7 $\pm$ 7.8	0.9 $\pm$ 0.2	19	12	35	7	8	5

1.2 治疗方法

充分清洁牙齿,在自然光下比色并用相机记录,上橡皮障进行隔湿。去除原填充物,龋坏组织,预备洞缘斜面,对粘接面进行少量的调磨和粗化。若患者缺损近髓,则用氢氧化钙护髓,避免刺激牙髓。接着酸蚀 30 秒,用大量流水彻底冲洗去除酸蚀剂,冲洗完毕后进行干燥,均匀、全面地涂布粘接剂,避免洞角处存留过多粘接剂,可用无水气枪轻吹均匀,固化 10 秒。

甲组使用纳米树脂(生产厂家:3M 公司,型号:Filtek Z350)修复:在硅橡胶导板的支撑下,使用相对应的树脂堆塑舌侧釉质层、舌侧釉牙本质界、牙本质层、唇侧釉牙本质界、唇侧牙釉质层及切端,逐层堆塑逐层充分固化,固化 20 秒。

乙组使用光固化复合树脂(生产厂家:3M 公司,型号:Filtek Z100)修复:关闭手术灯。将树脂铺平洞底,按照三角堆积方式充填直至合面,分层充填复合树脂,每层光固化 20-40 秒。

充填修复完毕后,调整咬合,用精细车针修整形态,用抛光碟抛光条及抛光膏由粗到细依次抛光。去除橡皮障,拍术后照。

1.3 评价指标

对患者进行随访 3 个月,在治疗后第 1 周、1 个月、3 个月时进行复查及拍照。

1.3.1 治疗效果 治疗成功:修复后牙齿外形、色泽自然,无变色、脱落、磨损,未出现继发性龋坏、牙敏感、牙周炎、牙髓炎等。再将修复效果分为三个等级^[14]:差:患者不满意,自觉疼痛评分 >6 分或出现龋齿、修复体脱落、牙周炎等。良:患者较为满意,无炎症反应,自觉疼痛评分 3-5 分,咬合功能良好。优:满意,自

觉疼痛评分 <2 分,无敏感、炎症反应,咬合功能良好。修复效果优良率=(优+良)/总人数 $\times 100\%$ 。

1.3.2 牙周相关指标 评定患者的牙龈指数(GI)、龈沟出血指数(SBI)、菌斑指数(PLI)、牙松动度(MD)。GI 与 PLI 分值均为 0-3 分,SBI 分值为 0-5 分,MD 分为 I 度 -III 度,记为 0-2 分,四项指标均为分数越高表示相关指数越差。

1.3.3 自觉疼痛程度评分 采用视觉模拟评分法(VAS)评定患者的疼痛感受,总分 10 分,分数越高表示患者疼痛程度越高。

1.3.4 治疗后牙齿敏感发生率 调查并记录患者在随访期间的牙齿敏感发生情况,计算发生率。

1.3.5 患者满意度 调查患者对牙齿美容修复的满意度,分为三个等级:不满意、一般、满意。

1.3.6 并发症的发生情况 检查患者在治疗后是否出现修复体松动或脱落、龋齿、牙周炎、牙髓炎等,并计算发生率。

1.4 统计学分析

整理所有数据录入 SPSS 17.0 软件,计数资料用 Mann-Whitney U 检验及 χ^2 检验,计量资料用独立样本 t 检验,以 $P<0.05$ 为差异有统计学意义。

2 结果

2.1 两组治疗效果的比较

所有患者的修复手术均成功完成。治疗后,甲组的治疗成功率显著高于乙组,修复效果等级显著优于乙组,修复效果优良率也显著高于乙组($P<0.05$),见表 2。

表 2 两组治疗效果对比(n)

Table 2 Comparison of the clinical effect between two groups (n)

Groups	Treatment success rate	Repair effect			
		Bad	Good	Excellent	Excellent and good rate of repair
Group A($n_1=31$)	93.55%(29/31)*	1	12	18	96.77%*
Group B($n_2=31$)	70.97%(22/31)	10	11	10	67.74%

Notice: *Compared with group B, $P<0.05$.

2.2 两组牙周相关指标的比较

治疗后,甲组的牙龈指数、龈沟出血指数、菌斑指数和牙松

动度均显著低于乙组($P<0.05$),见表 3。

表 3 两组患者牙周相关指标的对比($\bar{x} \pm s$)Table 3 Comparison of the periodontal indexes between two groups($\bar{x} \pm s$)

Groups	GI	SBI	PLI	MD
Group A($n_1=31$)	0.355 $\pm$ 0.046*	0.418 $\pm$ 0.061*	0.967 $\pm$ 0.127*	0.271 $\pm$ 0.032*
Group B($n_2=31$)	0.712 $\pm$ 0.068	0.754 $\pm$ 0.079	1.198 $\pm$ 0.148	0.588 $\pm$ 0.046

Notice: *Compared with group B, $P<0.05$.

2.3 两组自觉疼痛程度评分比较

两组患者的 VAS 评分均随着时间延长降低,在修复后 1

周、1 个月、3 个月时,甲组患者的 VAS 评分均显著低于乙组,差异均有统计学意义($P<0.05$),见表 4。

表 4 两组患者 VAS 评分对比($\bar{x} \pm s$)Table 4 Comparison of the VAS score between two groups ($\bar{x} \pm s$)

Groups	1 week after	1 month after	3 months after
Group A($n_1=31$)	2.42 $\pm$ 0.79*	1.33 $\pm$ 0.45**	0.87 $\pm$ 0.35***
Group B($n_2=31$)	4.52 $\pm$ 0.88	2.36 $\pm$ 0.76°	1.28 $\pm$ 0.54°

Notice: *Compared with group B, $P<0.05$; ° compared with 1 week after in the same group, $P<0.05$; ° compared with 1 month after in the same group, $P<0.05$.

2.4 两组牙齿敏感发生率的比较

在修复后 1 周、1 个月、3 个月时,甲组患者的牙齿敏感发

生率均低于乙组,但是差异均无统计学意义($P>0.05$),见表 5。

表 5 两组患者牙齿敏感发生率对比[例(%)]

Table 5 Comparison of the incidence of tooth hypersensitivity between two groups [n(%)]

Groups	1 week after	1 month after	3 months after
Group A($n_1=31$)	2(6.45%)	1(3.23%)	1(3.23%)
Group B($n_2=31$)	3(9.68%)	2(6.45%)	2(6.45%)

2.5 两组患者满意度比较

甲组的患者满意度高于乙组,差异具有统计学意义($P<0.05$),见表 6。

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表 6 两组患者满意度对比 [n(%)]

Table 6 Comparison of the satisfaction degree between two groups [n(%)]

Groups	Dissatisfied	Ordinary	Satisfied
Group A($n_1=31$)	0	1(3.23%)	30(96.77%)*
Group B($n_2=31$)	3(9.68%)	4(12.90%)	24(77.42%)

Notice: *Compared with group B, $P<0.05$.

2.6 两组并发症发生情况比较

甲组的修复体松动、修复体脱落、龋齿、牙周炎、牙髓炎的发生率均低于乙组,但是差异均无统计学意义($P>0.05$);甲组的

并发症总发生率显著低于乙组,差异具有统计学意义($P<0.05$),见表 7。

表 7 两组并发症发生情况的对比[例(%)]

Table 7 Comparison of the incidence of complications between two groups [n(%)]

Groups	Repair body loosening	Repair body falling-off	Caries	Periodontitis	Pulpitis	Total incidence
Group A($n_1=60$)	4(6.67%)	2(3.33%)	2(3.33%)	3(5.00%)	2(3.33%)	11(18.33%)*
Group B($n_2=55$)	9(16.36%)	6(12.73%)	4(7.27%)	8(14.55%)	5(9.09%)	28(50.91%)

Notice: *Compared with group B, $P<0.05$.

3 讨论

牙体缺损成功修复的关键除了正确诊断和合理设计以外,在于精确的牙体制备、印模和修复体制作^[15,16]。在条件允许的情况下,首选充填治疗^[17-19]。生物材料植入修复是当前最为常见的

治疗方法,而如何选取合适的美容修复材料则是临床研究的重点和热点^[20,21]。

复合树脂是经自由基加成聚合反应而固化形成的材料,已广泛用于前牙修复,常用的有微填料复合树脂、微混合填料复合树脂、纳米颗粒型复合树脂及瓷化树脂等^[22]。3M 光固化复合

树脂的主要填料为压微米,直径为 1-10 μm ,虽然具有黏稠度适中的流动性,但因为随着时间延长会聚合收缩而出现微漏,导致继发龋,耐磨性也较差^[23,24]。光固化复合树脂的填料中有较大颗粒,在进行充填时,手术者可能无法看到微小缝隙,使得口腔中唾液、细菌等进入,可能引起一系列并发症,对牙髓有一定刺激,故中洞以上需要垫底^[25,26]。光固化灯一般只能充分固化 2-3 mm 厚的复合树脂,因此在洞深超过 2 mm 时需要分层充填,贴面面积大时需要分区固化^[27]。这就要求光源照射距离尽可能近,过远则会影响光固化的深度,因此需要增加固化时间。

3M 纳米树脂的颗粒均是纳米级别,流动度适中、均匀^[28],使得整个树脂表面光滑平整,也增强了树脂强度和操作手感,因而具有与牙釉质近似的耐磨耗性和极佳的抛光性^[29,30]。由于其填料直径仅为 0.005-0.01 μm ,故颗粒能够进入聚合链之间,而不会产生凝聚成团现象,显著减少微漏现象和对牙髓的刺激^[31]。相比于光固化复合树脂,纳米树脂克服了诸多缺陷,如化学不稳定性、修复体折裂、渗漏等。本研究比较了纳米复合树脂和光固化复合树脂材料用于前牙美容修复的效果,结果显示治疗后纳米复合树脂的治疗成功率、修复效果等级及修复效果优良率均显著优于光固化复合树脂治疗,而纳米复合树脂的患者牙龈指数、龈沟出血指数、菌斑指数和牙松动度均显著低于光固化复合树脂治疗的患者,这说明纳米树脂更能有效去除菌斑,减少牙龈炎症,减轻牙周组织损伤。此外,纳米复合树脂治疗的患者 VAS 评分均显著低于光固化复合树脂治疗的患者,患者满意度高于光固化复合树脂治疗的患者,说明纳米树脂让患者更耐受,舒适度更高,可能是因为纳米树脂材料的相容性更好,所以患者的认可度更高。纳米复合树脂的修复体松动、修复体脱落、龋齿、牙周炎、牙髓炎的发生率均低于光固化复合树脂治疗,虽然差异无统计学意义,但是纳米复合树脂的并发症总发生率显著低于光固化复合树脂治疗,提示纳米树脂对牙周、牙髓的刺激更小,安全性更高。但纳米树脂材料的费用高昂,也并非适用于所有患者。在实际的临床诊治工作中,我们更应该根据不同的年龄阶段、牙体特征及收入水平选择适合的树脂材料。

综上所述,与光固化复合树脂相比,纳米复合树脂用于前牙美容修复的效果更好,牙周相关指标优秀,患者的自觉疼痛程度小、牙齿敏感发生率低、并发症少,对于美容修复的满意度高,值得临床应用和进一步研究。

参考文献(References)

- [1] Cantekin K, Arslan D, Delikan E. Presence and distribution of dental enamel defects, recurrent aphthous lesions and dental caries in children with celiac disease [J]. Pakistan Journal of Medical Sciences, 2015, 31(3): 606-609
- [2] Jung R E, Herzog M, Wolleb K, et al. A randomized controlled clinical trial comparing small buccal dehiscence defects around dental implants treated with guided bone regeneration or left for spontaneous healing[J]. Clinical Oral Implants Research, 2017, 28(3): 348-354
- [3] Eimar H, Tamimi F, Retrouvey J M, et al. Craniofacial and Dental Defects in the Col1a1Jrt/+ Mouse Model of Osteogenesis Imperfecta[J]. Journal of Dental Research, 2016, 95(7): 761-768
- [4] Jo J H, Choi S W, Choi J W, et al. Effects of different rhBMP-2 release profiles in defect areas around dental implants on bone regeneration [J]. Biomedical Materials, 2015, 10(4): 045007
- [5] Baudry A, Alleaume-Butaux A, Dimitrova-Nakov S, et al. Essential Roles of Dopamine and Serotonin in Tooth Repair: Functional Interplay Between Odontogenic Stem Cells and Platelets [J]. Stem Cells, 2015, 33(8): 2586
- [6] Beatty H, Svec T. Quantifying Coronal Tooth Discoloration Caused by Biodentine and EndoSequence Root Repair Material [J]. Journal of Endodontics, 2015, 41(12): 2036-2039
- [7] Liviu F, Khammissa R A G, George T, et al. Apical External Root Resorption and Repair in Orthodontic Tooth Movement: Biological Events[J]. Biomed Research International, 2016, 2016(2): 1-7
- [8] R Mormile. Celiac disease and dental enamel defects: what is the link? [J]. International Journal of Colorectal Disease, 2016, 31 (5): 1073-1073
- [9] Mohammed R E, Abass S, Abubakr N H, et al. Comparing orthodontic bond failures of light-cured composite resin with chemical-cured composite resin: A 12-month clinical trial [J]. American Journal of Orthodontics & Dentofacial Orthopedics, 2016, 150(2): 290-294
- [10] Lv D, Liu K L, Yao Y, et al. Effect of thermal cycling on surface microstructure of different light-curing composite resins [J]. Nan fang yi ke da xue xue bao = Journal of Southern Medical University, 2015, 35 (4): 615-618
- [11] Khan A A, Siddiqui A Z, Mohsin S F, et al. Influence of mouth rinses on the surface hardness of dental resin nano-composite [J]. Pakistan Journal of Medical Sciences, 2015, 31(6): 1485
- [12] Dede D Ö, Şahin O, Koroglu A, et al. Effect of sealant agents on the color stability and surface roughness of nanohybrid composite resins [J]. Journal of Prosthetic Dentistry, 2016, 116(1): 119-128
- [13] Suhasini K, Madhusudhana K, Suneelkumar C, et al. Clinical performance of Class I nanohybrid composite restorations with resin-modified glass-ionomer liner and flowable composite liner: A randomized clinical trial [J]. Journal of Conservative Dentistry Jcd, 2016, 19(6): 510-515
- [14] 张志春. 两种复合树脂用于前牙美容修复的疗效对比 [J]. 中国医疗美容, 2015, 5(4): 94-96
Zhang Zhi-chun. Comparison of the curative effects of two kinds of composite resin on prosthetic cosmetic repair[J]. China Medical Cosmetology, 2015, 5(4): 94-96
- [15] Guttal S S, Desai J, Kudva A, et al. Rehabilitation of orbital defect with silicone orbital prosthesis retained by dental implants [J]. Indian Journal of Ophthalmology, 2016, 64(1): 93
- [16] Gao Z, Li Z, Ran Q, et al. Tissue engineered bone and dental implant in the repair of maxillary defect in two stages: a case report [J]. Zhonghua kou qiang yi xue za zhi = Zhonghua kouqiang yixue zazhi = Chinese journal of stomatology, 2015, 50(6): 383-384
- [17] Wei Z, Zheng Q, Tan X, et al. Comparison of Mineral Trioxide Aggregate and iRoot BP Plus Root Repair Material as Root-end Filling Materials in Endodontic Microsurgery: A Prospective Randomized Controlled Study[J]. J Endod, 2017, 43(1): 1-6
- [18] Özcan M. Surface conditioning protocol for the chairside repair of polymeric denture teeth.[J]. Journal of Adhesive Dentistry, 2015, 17 (1): 90
- [19] Neves V C M, Babb R, Chandrasekaran D, et al. Promotion of natural

- tooth repair by small molecule GSK3 antagonists [J]. Scientific Reports, 2017, 9(7): 39654
- [20] 樊东力, 张一鸣. 生物医用材料和组织工程技术在组织修复中的应用及进展[J]. 第三军医大学学报, 2015, 37(19): 1909-1913
Fan Dong-li, Zhang Yi-ming. Application and progress of biomaterial and tissue engineering in tissue repair [J]. Journal of third military medical university, 2015, 37(19): 1909-1913
- [21] Li S H, Dai X W, Zhang W L, et al. Alveolar bone defect repair using autologous bone marrow mesenchymal stem cells combined with platelet-rich fibrin [J]. Chinese Journal of Tissue Engineering Research, 2016, 20(1): 3-7
- [22] Ástvaldsdóttir Á, Dagerhamn J, Van Dijken J W, et al. Longevity of posterior resin composite restorations in adults - A systematic review [J]. Journal of Dentistry, 2015, 43(8): 934
- [23] Ahn J, Jung K H, Son S A, et al. Effect of additional etching and ethanol-wet bonding on the dentin bond strength of one-step self-etch adhesives[J]. Restorative Dentistry & Endodontics, 2015, 40(1): 68-74
- [24] Tiwari A, Shyagali T, Kohli S, et al. Effect of Dental Chair Light on Enamel Bonding of Orthodontic Brackets Using Light Cure Based Adhesive System: An In-Vitro Study [J]. Acta Informatica Medica, 2016, 24(5): 237
- [25] Lima A C, Rached-Junior F J, Faria N S, et al. Influence of Sealer and Light-Curing Units on Push-Out Bond Strength Of Composite Resin to Weakened Roots[J]. Brazilian Dental Journal, 2016, 27(4): 430-435
- [26] Sidhu S K, Ikeda T, Omata Y, et al. Change of color and translucency by light curing in resin composites [J]. Operative Dentistry, 2015, 31(5): 598-603
- [27] Thakur Veerandar Singh, Jaya Prakash Patil, RVS Chakradhar Raju, et al. Comparison of Effect of C-Factor on Bond Strength to Human Dentin Using Different Composite Resin Materials [J]. Journal of Clinical & Diagnostic Research, 2015, 9(8): ZC88
- [28] Dede D Ö, Şahin O, Koroglu A, et al. Effect of sealant agents on the color stability and surface roughness of nanohybrid composite resins [J]. Journal of Prosthetic Dentistry, 2016, 116(1): 119-128
- [29] Pereira A G, Raposo L, Teixeira D, et al. Influence of Battery Level of a Cordless LED Unit on the Properties of a Nanofilled Composite Resin[J]. Operative Dentistry, 2016, 41(4): 409-416
- [30] Öztürk-Bozkurt F, Toz T, Kara-Tuncer A, et al. Clinical Evaluation of Silorane and Nano-hybrid Resin Composite Restorations in Class II Cavities up to 3 Years[J]. Operative Dentistry, 2016, 41(6): 599
- [31] Perez M M, Hita-Iglesias C, Ghinea R, et al. Optical properties of supra-nano spherical filled resin composites compared to nanofilled, nano-hybrid and micro-hybrid composites [J]. Dental Materials Journal, 2016, 35(3): 353-359

(上接第 6148 页)

- [23] Koon C M, Woo K S, Leung P C, et al. Salviae Miltiorrhizae Radix and Puerariae Lobatae Radix herbal formula mediates anti-atherosclerosis by modulating key atherogenic events both in vascular smooth muscle cells and endothelial cells [J]. Journal of Ethnopharmacology, 2011, 138(1): 175-183
- [24] Hu P, Luo G A, Zhao Z, et al. Quality assessment of radix salviae miltiorrhizae [J]. Chemical & Pharmaceutical Bulletin, 2005, 53(5): 481-486
- [25] Matkowski A, Zielińska S, Oszmiański J, et al. Antioxidant activity of extracts from leaves and roots of Salvia miltiorrhiza Bunge, S. przewalskii Maxim. and S. verticillata L.[J]. Bioresource Technology, 2008, 99(16): 7892-7896
- [26] 孙宁霞, 冯爱敏. 丹参川芎嗪注射液辅助治疗对慢性阻塞性肺疾病患者肺功能及免疫功能的影响 [J]. 中国药物经济学, 2015, (8): 60-62
Sun Ning-xia, Feng Ai-min. Effects of Salviae Miltiorrhizae and Ligustrazine Hydrochloride Injection on pulmonary function and immune function in patients with chronic obstructive pulmonary disease [J]. China Journal of Pharmaceutical Economics, 2015, (8): 60-62
- [27] 刘文钊, 肖辉亮, 周徐州. 丹参川芎嗪注射液辅助治疗缺血性脑卒中的临床研究[J]. 中国生化药物杂志, 2014, 34(02): 120-121
Liu Wen-kai, Xiao Hui-liang, Zhou Xu-zhou, et al. Clinical study of Salviae Miltiorrhizae and Ligustrazine Hydrochloride Injection aided identification and treatment of ischemic stroke[J]. Chinese Journal of Biochemical Pharmaceutics, 2014, 34(02): 120-121
- [28] Wang Q, Tang Z, Zhang W. Brain microdialysate, CSF and plasma pharmacokinetics of ligustrazine hydrochloride in rats after intranasal and intravenous administration[J]. Biopharmaceutics & Drug Disposition, 2013, 34(7): 417
- [29] Fan X, Wang W, Chen Y. Therapeutic effect of combination of salvia and ligustrazine on bleomycin-induced pulmonary fibrosis [J]. European Respiratory Journal, 2011, 38(Suppl 55): 661
- [30] 郑玉兰, 付文荣, 曹锋生. 丹参川芎嗪对慢性阻塞性肺疾病急性加重合并呼吸衰竭患者肺功能及炎症因子的影响 [J]. 中国老年学, 2015, (24): 7109-7111
Zheng Yu-lan, Fu Wen-rong, Cao Feng-sheng. Effects of Salviae Miltiorrhizae and Ligustrazine Hydrochloride Injection on pulmonary function and inflammatory factors for patients with acute exacerbation of chronic obstructive pulmonary disease and respiratory failure [J]. Chinese Journal of Gerontology, 2015, (24): 7109-7111