·论著·

两种热塑牙胶充填技术与冷侧压法根管充填效果的比较

叶 晖,曹志中,周中华,汪大林
(第二军医大学长海医院口腔科,上海 200433)

[摘要] **目的**:比较2种热塑牙胶充填技术(Ultrafil 3D和ObturaⅡ)与冷牙胶侧方加压法充填根管的效果。**方法**:收集完整上颌前牙60颗,随机分成3组,每组20颗,常规制备根管,分别用Ultrafil 3D、ObturaⅡ和冷牙胶侧方加压法进行根管充填,并记录充填时间。3 d后,每组随机选10颗牙,染色后测量微渗漏长度;每组另10颗牙以扫描电镜测量根管壁与牙胶间微缝隙宽度。**结果**:充填时间以冷牙胶侧方加压法最长,ObturaⅡ次之,Ultrafil 3D最短;冷侧压法与其余两组热塑牙胶注射加压法之间存在显著差异($P<0.01$);微渗漏及微缝隙在冷牙胶侧方加压法与两组热塑牙胶注射加压法之间也存在显著差异($P<0.05$),而两组热塑牙胶注射加压法间却无明显差别。**结论**:在离体实验条件下,热塑牙胶注射加压与冷牙胶侧方加压充填相比,具有较好的根管壁适应性和密合度,且充填速度较快。

[关键词] 根管充填;Ultrafil 3D;ObturaⅡ;热塑牙胶充填法;冷牙胶侧方加压法;微渗漏;微缝隙

[中图分类号] R 781.33 **[文献标识码]** A **[文章编号]** 0258-879X(2006)05-0489-04

Two thermoplasticized gutta-percha filling techniques and cold lateral condensation: a comparison of root filling results

YE Hui, CAO Zhi-zhong, ZHOU Zhong-hua, WANG Da-lin (Department of Stomatology, Changhai Hospital, Second Military Medical University, Shanghai 200433, China)

[ABSTRACT] **Objective**: To compare the root filling results of 2 thermoplasticized gutta-percha filling techniques (Ultrafil 3D and ObturaⅡ) with cold lateral condensation of gutta-percha. **Methods**: Sixty freshly extracted maxillary mandibular single-rooted teeth were instrumented and randomly divided into 3 groups: Ultrafil 3D, ObturaⅡ and cold lateral condensation groups. The root canal was routinely prepared and the obturation time was recorded. Three days later, 10 teeth of each group were randomly stained and the micro effusion length was subsequently measured. The micro-chink between filling materials and the wall of root canal were measured with scanning electron microscope in the other 10 teeth of each group. The data were analyzed using unpaired Student's *t*-test. **Results**: The longest obturation time was in cold lateral condensation group, then ObturaⅡ and Ultrafil 3D group in order, with significant difference found between the cold lateral condensation group and the latter 2 groups ($P<0.01$). The lengths of micro effusion and micro-chink in lateral condensation group were significantly larger than those in the other 2 groups ($P<0.05$); however, there was no significant difference between the 2 injection thermoplasticized gutta-percha technique groups. **Conclusion**: Under *in vitro* condition, the 2 injection thermoplasticized gutta-percha techniques have better adaptation to the canal wall, better root filling results, and less obturation time compared with cold lateral condensation.

[KEY WORDS] root canal obturation; Ultrafil 3D; ObturaⅡ; thermoplasticized gutta-percha; cold lateral condensation of gutta-percha; micro effusion; micro chink

[Acad J Sec Mil Med Univ, 2006, 27(5): 489-492]

完善的根管充填是根管治疗成功的重要环节,而不完善的根管充填最终可导致根管治疗的失败。有资料表明,根管治疗失败的原因约60%是根管充填不完善所致,如:超充、欠充、未能有效充填侧支根管和各种不规则区等[1]。而事实上几乎所有根管都具有一定的弯曲度[2],因而要求根管制备都达到理想状态是不现实的。这就要求我们从根管充填材料和充填方法方面加以改进,以适应各种不规则根管,达到完善的充填。冷牙胶侧方加压法是目前临床最常用并且很有效的根管充填方法,但由于冷牙胶的变形能力有限,充填效果受根管预备后的形态和锥度的影响较大[3]。而热塑牙胶具有较好的流动性,可以闭塞根管内部各种反常的管腔[4]。本研究采用高温型ObturaⅡ系统和低温型Ultrafil 3D系统,对离体牙进行热塑牙胶根管充填,通过染色法观察微渗漏,电子显微镜测量微间隙,以常规的冷牙胶侧方加压充填技术作为对照,评估这两种热塑牙胶充填方法的实际充填效果。

[作者简介] 叶 晖,硕士,讲师、主治医师.

1 材料和方法

1.1 *实验牙齿* 门诊新鲜拔除的人完整上颌前牙60颗，刮净牙石和牙周膜纤维，放入生理盐水中备用。

1.2 *实验材料和仪器设备* CORTISOMOL糊剂(法国碧兰公司)；牙胶尖(美国登士柏公司)；Firm-Set牙胶(Coltene/Whaledent)；Obtura 180℃古塔胶颗粒(美国Obtura Sparten公司)；1%亚甲蓝溶液(江苏济川制药有限公司)；AVON高级指甲油(广州雅芳有限公司)；车针、拔髓针、扩大针、根管锉(日本MANI)；单面金钢砂片(日本松风株式会社)；其他常规试剂：5%盐酸，75%、80%、90%、95%、100%乙醇，二甲苯溶液，水杨酸甲酯。ObturaⅡ高温热塑牙胶注射根充系统，包括温控器、手提式充填枪和架、充填针、防热罩、180℃古塔胶颗粒、凝结器、简捷垂直加压器(尺寸1～5号，美国Obtura Spartan公司)；Ultrafil 3D三维注射式热牙胶根充系统，包括注射枪、便携式加热器和装有含牙胶套管的材料盒(瑞士Coltene/Whaledent集团)；扫描电子显微镜(日立S-520，日本)。

1.3 *根管制备和根管充填* 将60颗牙随机分成3组，即冷牙胶侧方加压组、低温热塑牙胶(Ultrafil 3D)组和高温热塑牙胶(ObturaⅡ)组，每组20颗牙。常规法清理根管至60号，冲洗、干燥根管。根管充填前均先使用15#根管锉使根管壁涂1层CORTISOMOL根管糊剂。冷牙胶侧方加压组采用常规冷侧压充填法严密充填，Ultrafil 3D组和ObturaⅡ组均按操作指南进行。记录充填所花费的时间，并拍X线片检查根充情况，确认根充完善后，冠部以磷酸锌水门汀充填，根充剂充分凝固后分别放入0.9%生理盐水潮湿棉球杯中72 h。

1.4 *微渗漏试验* 每组随机取出10颗牙，于根尖孔1 mm以上涂2层指甲油，干燥后直立放入1%亚甲蓝溶液中至牙齿颈部，5 d后取出，用自来水反复冲洗干净，吹干后，将实验牙浸入5%盐酸中7 d(每天更换盐酸溶液)，取出后流水冲洗，放入75%、80%、90%、95%、100%乙醇中梯度脱水各12 h，二甲苯溶液透明处理4 d，然后放入水杨酸甲酯中保存，制成永久性透明牙[5]。双盲下用游标卡尺测量色素渗入根管的长度(精确至0.02 mm)。

1.5 *微缝隙检测* 每组剩余的10颗牙，均从距根尖1 mm和5 mm处用单面金钢砂片横向片切牙根，使砂片光滑面所对牙根面确定为扫描电镜观察面，使每颗牙两个光滑断面向上，并且颊舌径方向为纵向置于标本台上，干燥，真空喷涂金膜，用扫描电子显微镜在镜面下的3点、6点、9点、12点处观察，测量根充材料与根管壁间的微缝隙并记录。

1.6 *统计学处理* 采用非配对资料 t 检验。

2 结 果

2.1 *根管充填的时间* 完成每个根管充填的时间，以冷牙胶侧压组较长(112～190 s)，ObturaⅡ组(18～40 s)和Ultrafil 3D组(9～27 s)较短。冷牙胶侧压法与2组热塑牙胶注射加压法之间存在显著差异($P<0.01$)。结果见表1。

表1 三种根管充填法根管充填时间、微渗漏长度和牙胶与根管壁间的缝隙比较

Tab 1 Comparison of obturation time, micro effusion and micro chink between 3 groups

($\bar{x}\pm s$)

Group	Obturation time (t/s, n=20)	Micro effusion (l/mm, n=10)	Micro chink (d/μm, n=10)
Lateral condensation	147.1 ±23.186	4.428±0.985	5.8 ±1.798
Ultrafil 3D	25.7 ±5.723**	1.536±0.581*	3.2 ±0.978*
Obtura Ⅱ	16.35±4.923**	1.267±0.704*	3.38±0.901*a

*$P<0.05$, **$P<0.01$ vs lateral condensation group; a: Fissure appeared in one teeth after obturation

2.2 *微渗漏试验* 色素自根尖孔渗入根管的长度，以冷牙胶侧压组最长(2.68～5.60 mm)，ObturaⅡ组(0.62～2.38 mm)和Ultrafil 3D组较短(0.42～2.26 mm)。冷牙胶侧压法与与两组热塑牙胶注射加压法之间也存在显著差异。结果见表1。

2.3 *牙胶与根管壁间的密合度* 从X线片上可见，ObturaⅡ组15颗牙、Ultrafil 3D组12颗牙有牙胶进入侧支根管，冷牙胶侧压组只有一颗牙的牙胶进入侧支根管(图1)。扫描电镜观察(图2)：ObturaⅡ组和Ultrafil 3D组牙胶与根管壁间呈均质状紧密相连；而冷牙胶侧压组牙胶与根管壁间呈疏松状接触，缝隙明显。结果见表1。

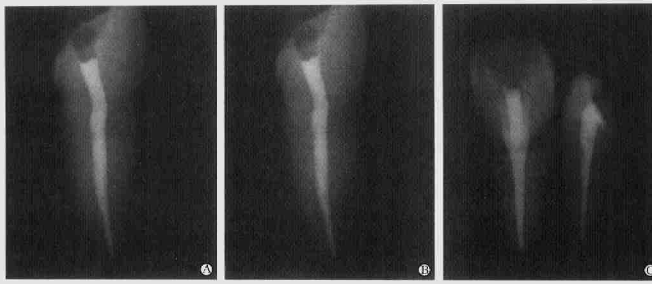

图1　ObturaⅡ组(A)、Ultrafil 3D组(B)和冷牙胶侧压组(C)牙胶与根管壁间的密合度X线片观察

Fig 1　X-ray images of fitness between filling materials and wall of root canal in ObturaⅡ group(A), Ultrafil 3D group(B) and lateral condensation group(C)

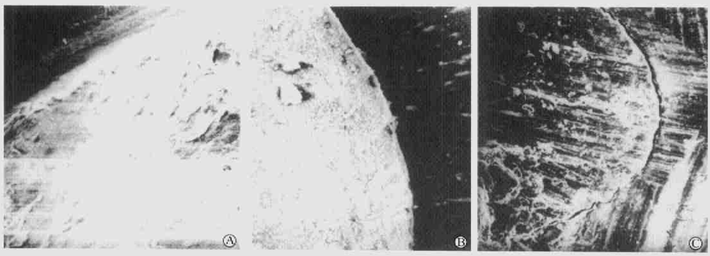

图2　ObturaⅡ组(A)、Ultrafil 3D组(B)和冷牙胶侧压组(C)牙胶与根管壁间的密合度电镜观察

Fig 2　Electron microscope observations of fitness between filling materials and wall of root canal in ObturaⅡ group(A), Ultrafil 3D group(B) and lateral condensation group(C)

3　讨　论

冷牙胶侧方加压技术是一种经典的改进充填方法，主要是通过侧方加压使根管内的充填牙胶发生一定的形态变化，获得更好的密合度，完成对根管的封闭。然而冷牙胶的形变能力和侧方加压的强度都很有限。牙胶尖之间始终不能形成一个整体，各主副牙胶尖之间将存在有一定的间隙，这种牙胶尖之间的间隙同样也可出现在牙胶尖与根管的接触面，即便是制备形态很好的根管也是如此。根尖1/3的充填密合度常取决于主牙胶尖与根尖座匹配程度。因此这种技术出现较多的微渗漏是在所难免的。

热牙胶充填技术是通过充填时对牙胶加热，改变牙胶的物理性能，使其呈半流动性，获得根管充填所需的可塑性和充盈性。充填于根管内的牙胶冷却后能形成一个紧密的整体，牙胶对根管壁的黏壁效果明显改善，并能达到良好的密闭，减少了在充填牙胶与根管壁之间发生空隙的可能性。同样由于其流动性加大，在有一定压力的情况下，达到对侧副根管进行充填的可能性。

本试验所选用的60颗牙均为上颌前牙，因上颌前牙多为单根牙，根管粗大，变异少，这样可增加实验结果的可比性。实验中，X线观察，ObturaⅡ组和Ultrafil 3D组的牙胶均质性更好，而且两组的微渗漏和微缝隙都小于冷牙胶侧方加压法，而两组之间则无明显差别，且与电镜微缝隙测量结果一致，这一结果与国内外的研究[1,4~9]结果相似。

热塑牙胶注射充填法采用专门的仪器，将牙胶自动加热软化，然后迅速注入到根管内，加快了充填的速度，完成一个根管充填仅需数秒至数十秒，这与国内外报道的数秒至十几秒钟基本相似[10,11]，而侧压法则需2.9～3.2 min，较国内外报道的3.7～5.6 min[1]稍快，可能与离体牙操作更方便有关。热塑牙胶注射法明显提高了临床工作效率。

根管充填是根管治疗术的最后一步,根管充填质量的好坏直接关系到根管治疗的成败。严密的三维充填,可以有效地消灭死腔,杜绝来自根尖及冠方的各种微渗漏,阻止外界细菌和污染物的渗入,防止再感染,从而创造一个有利于根尖愈合的良好环境。热塑牙胶由于具有良好的流动性和黏附性,在一定压力下可将软化的牙胶和糊剂压入侧支根管和根管不规则区,适合于各种不规则根管、侧支根管、副根管等特殊根管,而且充填迅速,值得临床推广应用。

[参考文献]

[1] Ingle JI, Bakland LK. Endodontics[M]. 4th ed. USA: Williams Wilkins, 1994: 1-34.

[2] West JD, Roane JB. Cleaning and shaping the root canal system[M]//Cohen S, Burns RC. Pathways of the pulp. 7th ed. St louis USA: Mosby, 1998:203.

[3] Brayton SM, Davis SR, Goldman M. Gutta-percha root canal fillings[J]. Oral Surg, 1973, 35: 226-231.

[4] Malin J. Injectable standard gutta-percha as a method of filling the root canal system[J]. J Endod, 1986, 12:354-361.

[5] Goldbery F, Patrical L, De silvil A. Apical sealing ability of a new glassionomer root canal sealer[J]. J Endod, 1995, 21: 498-500.

[6] Al-Dewani N, Hayes SJ, Dummer PM. Comparison of laterally condensed and low-temperature thermoplasticized gutta-percha root filling[J]. J Endod, 2000, 26: 733-738.

[7] 尹仕海,何国华.热牙胶胶注射法根管充填的临床评价[J].华西口腔医学杂志,1992,10:185-187.

[8] 王 青,熊世江.热牙胶注射根管充填封闭性的研究[J].华西口腔医学杂志,1996,31:192-195.

[9] Tani-Ishii N, Teranaka T. Clinical and radiographic evaluation fo root canal obturation with Obtura Ⅱ[J]. J Endod, 2003, 29: 739-742.

[10] 尹仕海.热牙胶注射根管充填法的研究[J].华西口腔医学杂志,1989,7: 5-9.

[11] Ritchie GM, Anderson DM. Apical extrusion of thermoplasticized gutta-percha used as a root canal filling[J]. J Endod, 1988, 14:128-132.

[收稿日期] 2005-10-25 [修回日期] 2006-03-30
[本文编辑] 曹 静

Antifungal activities and action mechanisms of compounds from *Tribulus terrestris* L.

Zhang JD, Xu Z, Cao YB, Chen HS, Yan L, An MM, Gao, PH, Wang Y, Jia XM, Jiang YY(Department of Pharmacology, College of Pharmacy, Second Military Medical University, Shanghai 200438, China)

[ABSTRACT] Antifungal activity of natural products is being studied widely. Saponins are known to be antifungal and antibacterial. We used bioassay-guided fractionation to have isolated eight steroid saponins from *Tribulus terrestris* L., which were identified as hecogenin-3-O-beta-*D*-glucopyranosyl (1→4)-beta-*D*-galactopyranoside (TTS-8), tigogenin-3-O-beta-*D*-glucopyranosyl (1→4)-beta-*D*-galactopyranoside (TTS-9), hecogenin-3-O-beta-*D*-glucopyranosyl (1→2)-beta-*D*-glucopyranosyl (1→4)-beta-*D*-galactopyranoside (TTS-10), hecogenin-3-O-beta-*D*-xylopyranosyl (1→3)-beta-*D*-glucopyranosyl (1→4)-beta-*D*-galactopyranoside (TTS-11), tigogenin-3-O-beta-*D*-xylopyranosyl (1→2)-[beta-*D*-xylopyranosyl (1→3)]-beta-*D*-glucopyranosyl (1→4)-[alpha-*L*-rhamnopyranosyl (1→2)]-beta-*D*-galactopyranoside (TTS-12), 3-O-[beta-*D*-xylopyranosyl (1→2)-[beta-*D*-xylopyranosyl (1→3)]-beta-*D*-glucopyranosyl (1→4)-[alpha-L-rhamnopyranosyl (1→2)]-beta-*D*-galactopyranosyl]-26-O-beta-*D*-glucopyranosyl-22-methoxy-(3beta, 5alpha, 25R)-furostan-3, 26-diol (TTS-13), hecogenin-3-O-beta-*D*-glucopyranosyl (1→2)-[beta-*D*-xylopyranosyl (1→3)]-beta-*D*-glucopyranosyl (1→4)-beta-*D*-galactopyranoside (TTS-14), tigogenin-3-O-beta-*D*-glucopyranosyl (1→2)-[beta-*D*-xylopyranosyl (1→3)]-beta-*D*-glucopyranosyl (1→4)-beta-*D*-galactopyranoside (TTS-15). The in vitro antifungal activities of the eight saponins against five yeasts, *Candida albicans*, *Candida glabrata*, *Candida parapsilosis*, *Candida tropicalis* and *Cryptococcus neoformans* were studied using microbroth dilution assay. *In vivo* activity of TTS-12 in a *Candida albicans* vaginal infection model was studied in particular. The results showed that TTS-12 and TTS-15 were very effective against several pathogenic candidal species and *Cryptococcus neoformans in vitro*. It is noteworthy that TTS-12 and TTS-15 were very active against *Candida albicans* (MIC_{80} = 10 and 2.3 microg/ml) and *Cryptococcus neoformans* (MIC_{80} = 1.7 and 6.7 microg/ml). Phase contrast microscopy showed that TTS-12 inhibited hyphal formation, an important virulence factor of *Candida albicans*, and transmission electron microscopy showed that TTS-12 destroyed the cell membrane of *Candida albicans*. In conclusion, TTS-12 has significant *in vitro* and *in vivo* antifungal activity, weakening the virulence of *Candida albicans* and killing fungi through destroying the cell membrane.

[J Ethnopharmacol, 2006, 103: 76-84]