p-6 Influence of spreader and cone taper on the sealing effect of root canal with gutta-percha

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Ⅰ. Objectives

The purpose of this study was to evaluate the influence of spreader and cone taper on the sealing effect of root canal with gutta-percha.

Ⅱ. Materials and Methods

Sixty simulated root canals in clear resin blocks were used. Working lengths were established 0.5 mm short of the apical foramen. Coronal two-thirds of the canal were instrumented with rotary Ni-Ti ProTaper and apical one-third was instrumented with 0.06 taper #30 ProFile.

Prepared sixty resin blocks were randomly divided into 4 groups of 15 blocks: a group using stainless steel finger spreader and 0.02 taper gutta-percha cone (SS/0.02) ; a group using nickel-titanium finger spreader and 0.02 taper gutta-percha cone (NiTi/0.02) ; a group using stainless steel finger spreader and 0.06 taper gutta-percha cone (SS/0.06) ; a group using nickel-titanium finger spreader and 0.06 taper gutta-percha cone (NiTi/0.06). All canals were obturated with laterally condensed gutta-percha and AH 26 sealer. Type A accessory cones were added to all teeth until the finger spreader no longer penetrated deeper than the coronal one-third of the canal. To measure obturation efficiency, the number of accessory cones required to obturate teeth in all groups was recorded.

After resin blocks were stored at 37℃ and 100% humidity for setting of the resin sealer, they were cross-sectioned with a microtome at 1.0, 3.0, and 5.0 mm levels from the apical foramen. The sections were immediately photographed under a stereomicroscope, and stored in a computer using a CCD camera and a commercial digitizing image program. The proportion of gutta-percha area to whole canal section were calculated at each level using Auto Cad 2000.

Statistical analysis for all data was performed by using two-way ANOVA and Duncan's multiple range test.

Ⅲ. Results

Sealing quality

At 1 mm level, the mean ratio of the area of gutta-percha was 86.67±3.24% for group SS/0.02, 91.86±2.87% for group NiTi/0.02, 94.33±2.43% for group SS/0.06, and 94.04±2.86% for group NiTi/0.06. NiTi groups showed significantly higher gutta-percha area ratio than SS groups, and 0.06 gutta-percha groups showed significantly higher gutta-percha area ratio than 0.02 gutta-percha groups ($p<0.05$).

At 3mm level, the mean ratio of the area of gutta-percha was 81.55±7.18% for group SS/0.02, 85.66±5.56% for group NiTi/0.02, 93.35±7.42% for group SS/0.06, and 95.54±1.57% for group NiTi/0.06. NiTi groups showed significantly higher gutta-percha area ratio than SS groups, and 0.06 gutta-percha groups showed significantly higher gutta-percha area ratio than 0.02 gutta-percha groups ($p<0.05$).

At 5 mm level, the mean ratio of the area of gutta-percha was 91.19±4.46% for group SS/0.02, 86.48±5.04% for group NiTi/0.02, 94.47±3.48% for group SS/0.06, and 94.75±2.39% for group NiTi/0.06. SS groups showed significantly higher gutta-percha area ratio than NiTi groups, and 0.06 gutta-percha groups showed significantly higher gutta-percha area ratio than 0.02 gutta-percha groups ($p<0.05$).

Sealing efficiency

0.06 taper cone groups required significantly less number of accessory cones than 0.02 taper gutta-percha groups ($p<0.05$). However there was no significant difference between SS and NiTi groups ($p>0.05$).

Ⅳ. Conclusions

It is concluded that, when root canal is prepared with 0.06 tapered instruments, uses of 0.06 taper gutta-percha cones and NiTi spreader are recommended to improve sealing quality (gutta-percha area ratio) and obturation efficiency.