Objectives: Microinvasive endodontic treatment is based on hard tissue conservation and different carious access cavities: occlusal caries lesion 15° (posterior teeth), mesial caries lesion 30° (posterior teeth) and cervical carious or wear lesion 45° (posterior and front teeth). Caries free teeth with no wear will be accessed in 0° angulation (not shown here). Therefore, the aim was (i) to create an Artificial Oral Cavity (AOC) for clinical simulation of these three access cavities, (ii) to assess the biomechanics of blinded instrumentation and (iii) to measure the volumetric loss of simulated dentin caused by four different preparation systems.

Material and Methods: Simulated s-shaped root canals with medium degree of obliteration in acrylic polymer bodies with canal entrance angles 15°, 30° and 45° were wet shaped with NaOCl (3%), at body temperature in randomized blinded sequences (n = 7) according to manufacturers’ instructions. Type of instruments: 1. Conventional geometry, not heat treated, up to size 35/.04 (TruNatomy, DentsplySirona) 2. Conventional geometry, heat-treated, spark-eroded up to size 36/.03 (TruNatomy, DentsplySirona) 3. Off-centered geometry, heat treated, up to size 35/.04 (XP-Endo Shaper, SwissEndo) 4. Off-centered geometry, heat-treated, up to size 30/.04 XP-Endo Shaper, SwissEndo) Vectorization (AutoCAD) of the whole root canal was performed before and after preparation, summarized in apical, middle and coronal thirds. Volumetric shaping and dentin loss was recorded before and after preparation, (posterior and front teeth). Caries free teeth with no wear will be accessed in 0° angulation (not shown here). Therefore, the aim was (i) to create an Artificial Oral Cavity (AOC) for clinical simulation of these three access cavities, (ii) to assess the biomechanics of blinded instrumentation and (iii) to measure the volumetric loss of simulated dentin caused by four different preparation systems.

Results: Total volume loss at 15° access was significantly lowest with TruNatomy and XP-Endo. At 30°, total loss remained low and increased with F360 and Hyflex. At 45° the group differences remained: TruNatomy (6.5 mm³) and XP-Endo (6.4 mm³) versus F380 (8.3 mm³) and Hyflex (8.4 mm³). This difference was highly significant.

Conclusions: Conventional instruments achieve optimal shape of apical third of root canal via enteral entrance angles only with high loss of simulated dentin along coronal and middle thirds. In contrast, off-centered instrument geometry contributes to dentin protection and supports the concept of minimally invasive endodontics for lifelong tooth preservation.

Sponsored by DentisPflege, Berlin, Germany. All authors declared no potential conflicts of interest with respect to the research, authorship and publication of this interactive talk.