the stripped teeth is essential for a good long-term prognosis, since scratches and furrows remaining on the enamel surface facilitate plaque accumulation and possibly caries development [11-13]. A number of researches have focused not only on the orthodontic aspects but also on the cariogenic and periodontal implications associated with this procedure since it has been shown that changes in enamel integrity may be considered as a predisposing factor for caries and periodontal disease [11,12]. After grinding, the tooth surface seems to become rougher, with a significantly greater plaque accumulation capacity [3,12,14,]. Although the results of a recent systematic review [15] were inconclusive regarding enamel roughness after interdental stripping *in vitro*, the meta-analysis of the *in vivo* results did not find that interdental enamel reduction was a predisposing factor for caries development.

Proximal enamel reduction entails a wide array of mechanical, automatic, rotating, or translatory devices. Recently, oscillating mechanisms have been introduced, claiming a smooth enamel topography following stripping. The aim of this *in vitro* study was to quantitatively assess the changes in enamel roughness after interproximal stripping with oscillating diamond strips. The null hypothesis was that stripping does not increase the amplitude, hybrid, and functional roughness parameters of the enamel.

Methods

Sample preparation

Sixteen premolars devoid of caries, enamel cracks, fluorosis, or abrasion under stereomicroscopic inspection (M80, Leica, Wetzlar, Germany) at ×10 magnification were used in the study. The teeth had been extracted for orthodontic reasons, cleaned, and stored in distilled water with 0.5% sodium azide at 8°C.

In order to simulate intraoral stripping conditions, four teeth were embedded up to their cervical region in an addition-type polyvinylsiloxane putty impression material (Aquasil Putty, Dentsply/Detrey, Konstanz, Germany), creating thus an arch with three interproximal contact areas. Four equal setups were used (n teeth = 16, n contact points = 12, n sites measured = 24). Before embedding, the roughness parameters of the proximal untreated surfaces were measured and served as reference.

Grinding was performed according to the manufacturer's instructions under water cooling by one operator (SB). The three interproximal areas per setup were ground on both sides (mesial/distal) using the Ortho-Strips system (Intensiv Dental SA, Montagnola, Switzerland) employing two-sided flexible diamond-coated strips of three different grit sizes (40 μm for contouring, 25 μm for finishing, and 15 μm for polishing). New devices were used for each stripping session. The strips used were attached to a micromotor (Eva Intra Lux Prophy head 61 LRG KaVo, Biberach, Germany, 7,500 rpm) operated for 20 s per grit size. Under these conditions, a 0.25-mm interproximal enamel reduction was achieved as checked by a steel ligature. The roughness parameters of the stripped areas were measured again under the same conditions.

Roughness parameter measurements

Roughness analysis was performed by optical interferometric profilometry. A 3D optical profiler was used (Wyko NT 1100, Veeco, Santa Barbara, CA, USA) under the following conditions: vertical scanning mode, Mirau lens, ×20.3 magnification (231.1 × 303.8 μm^2 analysis area), tilt correction, 5-μm Gaussian high-pass filter, and 0.2 μm (x, y) and 0.1 nm (z) resolution. Three measurements were performed per specimen and averaged representing surface roughness before and after stripping at the same region per tooth. The roughness parameters tested were the following:

a) The amplitude parameters Sa (the absolute profile deviation versus the average over a 3D surface) and Sz (the ten-point height over the complete 3D surface representing the average difference between the five highest peaks and five lowest valleys)
b) The hybrid parameter Sdr (the developed interfacial area ratio, expressed as the percentage of additional surface area contributed by the texture as compared to an ideal plane of the same size)
c) The functional parameters Sci (the core fluid retention index, a measure of the volume the surface would support from 5% to 80% of the bearing ratio) and Svi (valley retention index, the volume the surface would support at the valley zone, 80% to 100% of the bearing ratio)

The differences (Δ: after-before stripping) of the individual roughness parameters were calculated per tooth and region [16].

Statistical analysis

The results of ΔSa, ΔSz, ΔSdr, ΔSci, and ΔSvi were statistically analyzed by one-sample Mann-Whitney rank sum test [17] at a 95% confidence level (a = 0.05).

Results

Representative 3D profilometric images of interproximal enamel margins before stripping are illustrated in Figure 1a,b. At the beginning, the enamel surface is smooth with no specific features, apart from the appearance of a prismatic structure in some domains (Figure 1b). After stripping (Figure 2a,b), the same regions presented a rough texture with polishing grooves produced from the grinding direction of the strips.

The results of the differences in the surface roughness parameters (Δ: paired values of the same region after-before stripping) and the results of the statistical analysis