Objectives:
Individual toothbrushing is of cosmetic and preventive nature. The advantages of proper bio-physical brushing actions are plaque control, stain removal, saliva stimulation and contribution to satisfying fluoride bioavailability. The disadvantages are the risks of tooth wear and gum injuries. Manual and powered toothbrushing is associated with low wear and gum injuries. However, less is known concerning abrasion risk of high pressure jetting devices. Therefore, the aim (i) to standardize the in-vitro pig gum test, (ii) to evaluate the gingival injury potential of Sonicare 2 N 10 sec. and Waterpik WP 560/High Pressure mode (Water Pik, NL) and (iii) to compare the pig gingival lesions due to these jetting devices with earlier Pig Gum Test results of manual and powered toothbrushing.

Material and Methods:
The two test devices were applied according to manufacturer’s recommendations at 24 fresh intertandental gingival areas of porcine jaws around premolars and molars, buccally and lingually, max. 48 hours after slaughtering. The tips of AirFloss and Waterpik were applied strictly to interdental spaces between premolars and molars in 90° angle to the tooth axis for 3 seconds (Waterpik) or 5 seconds (AirFloss) per interdental space by a calibrated clinical researcher. Gingival injuries were revealed with Paro Plak 2-tone (ESRO, Thalwil, CH) before brushing (for exclusion of any pre-mortem gum lesion due to chewing) and after testing (intraepithelial abrasion - red staining; transepithelial abrasion- blue staining). These superficial and deeper abrasion areas were digitized, planimetrical assessment and area expression as absolute values and percentages per field of application. Finally, the samples were histopathologically controlled (HE staining). Statistics included t-Test and Mann-Whitney-Test.

Results:
The null hypothesis of normal distribution of variable percentages of injured area per gingival area after jetting was accepted (Kolmogorov-Smirnov-Test, p >0.100). The working hypothesis of unequal means of the tested devices cannot be accepted for jetting devices (t-Test: AirFloss (n=13): M=9.22, SD=6.55; Waterpik (n=11): M=5.92, SD=4.02; t=1.454, df=122, p=0.160). [Mann-Whitney-Test: AirFloss (n=13): Median=8.66, IQR=7.95, Waterpik (n=11): Median=4.54, IQR=4.37, Z=1.362, p=0.173]. However, the working hypothesis of unequal means of the comparisons with earlier tested manual and powered toothbrushes concerning combinations of device/force/ brushing time can be accepted for 4 of 19 comparisons. In descriptive terms statistics, "Oral B 2 N 10 sec." "ORMED 4 - 5 N 30 sec." and "Sonicare 3.5 - 5 N 30 sec." score substantially higher than "Waterpik 100 PSI 3 sec." in the target variable injured area (\%). Additionally, "AirFloss X PSI 5 sec." scores higher than Sonicare 2 N 10 sec. All means of injured areas due to jetting or brushing range from 5.2 % to 14.9 % (total range of injured area for all devices 1.3 % - 30.9 %). The individual susceptibility of gingival tissues with strictly excluded pre-mortem lesions was different in planimetrical areas buccally and lingually and around premolars and molars.

Conclusions:
In-vitro Pig Gum Tests of oral hygiene jetting devices are recommended for gingival injury risk assessment. AirFloss Pro and WaterPik exhibit the same low injury potential, different from area to area.