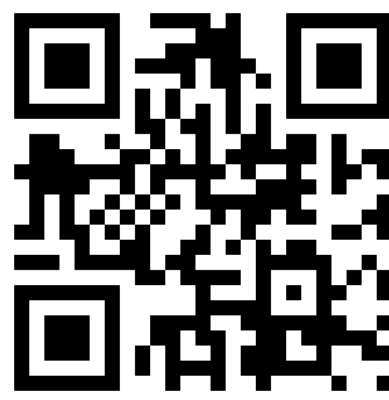# Early wound healing after implantation supported by oral hygiene

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Objectives:

Healing after implant surgery is the main hygiene goal and can prevent periimplant mucositis (Salvi et al., 2015). Therefore, (i) flexible versus fixed toothbrush necks for plaque control and (ii) oral care gel versus dentifrice for gingivitis control were used immediately after surgery for 14 days. Preceding testing demonstrated superior plaque control by flexible neck toothbrushes and a virus barrier and antixerostomia MOA of the gel.

Material and Methods:

The three-arm clinical randomized study was ethically approved (UW/H-EK192/2022) and the 63 subjects executed 2/daily oral hygiene:

Group A: Sensodyne-Bodyguard with flexible neck (Fig.1 A), OROFAN® Gel contains ChitoClear and 3 other bio-polymers, executes at mucosal cells a virus barrier for up to 16h (Fig. 1 C).

Group B: Sensodyne-Bodyguard with flexible neck (Fig.1 A), ProEnamel extra fresh (Fig.1 D).

Group C: Sensodyne Multicare Expert toothbrush (Fig.1 B), ProEnamel extra fresh (Fig.1 D).

The plaque assessment at day 0, day 7 and day 14 was presented as **clinPPI (pre- versus postbrushing)** and the gingivitis severity assessment **GPM/T** as **BOP of gingivitis teeth** and 6-point pocket measurement was summarized. Objective early wound healing was documented in code 0-3 around the implant gap on day 7 and day 14.

Results:

Group A reduced the BOP+ number of gingivitis teeth significantly from 19.76 to 12.52, **Group B** from 19.95 to 16.90, and **Group C** from 21.0 to 21.38 (Fig.4). Parallel to gingivitis reduction, the mucositis codes around implant wound decreased from Code 3-0 to 0.39-A, 0.26-B, 0.40-C to day14 (Fig. 5).

Planimetrical plaque assessment (clinPPI) revealed optimal plaque control with no statistical differences (Fig. 6, Tab. 1). Gentle toothbrushing with manual flexible neck toothbrushes and OROFAN® Gel with prolonged bioavailability contributed to the rapid decrease of the BOP number of gingivitis teeth by 40 %.

Subjects with higher periodontal probing depths exhibited significant impaired wound healing seven days post surgery (Tab. 2, Fig. 7).

Conclusions:

Soft toothbrushes with flexible necks and OROFAN® oral care gel contribute to optimal plaque control, reduction of inflammation and early wound healing within 14 days.

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Fig. 1: Tested oral hygiene products: MTB **A**: Sensodyne- Bodyguard with flexible neck; **B**: Sensodyne- Multicare Expert; **C**: oral care gel OROFAN® Gel; **D**: dentifrice ProEnamel extra fresh.
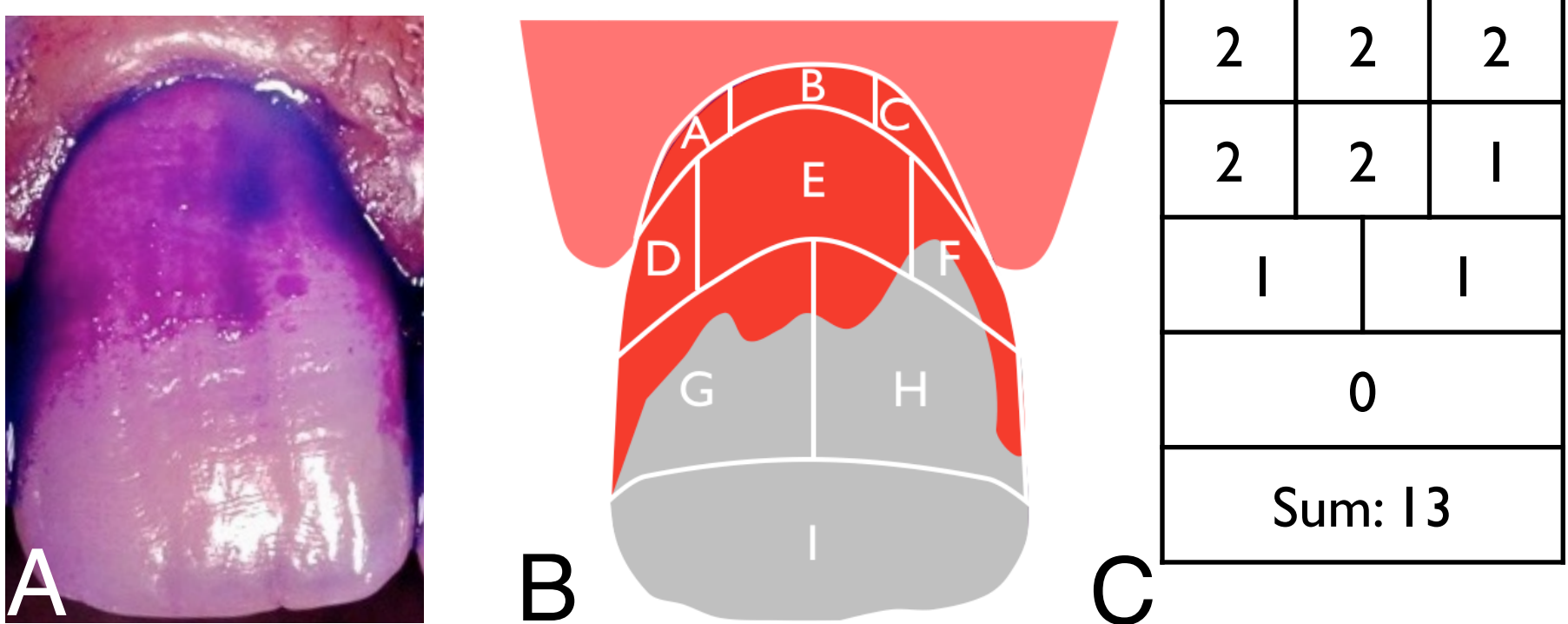

Fig. 2: Planimetrical fields at human teeth (A), clinical brushing outcome (B), Planimetrical Plaque Index PPI Scores (C) 0= no plaque, 1= plaque <50%, 2= plaque >50% per field (Lang et al., 2011).
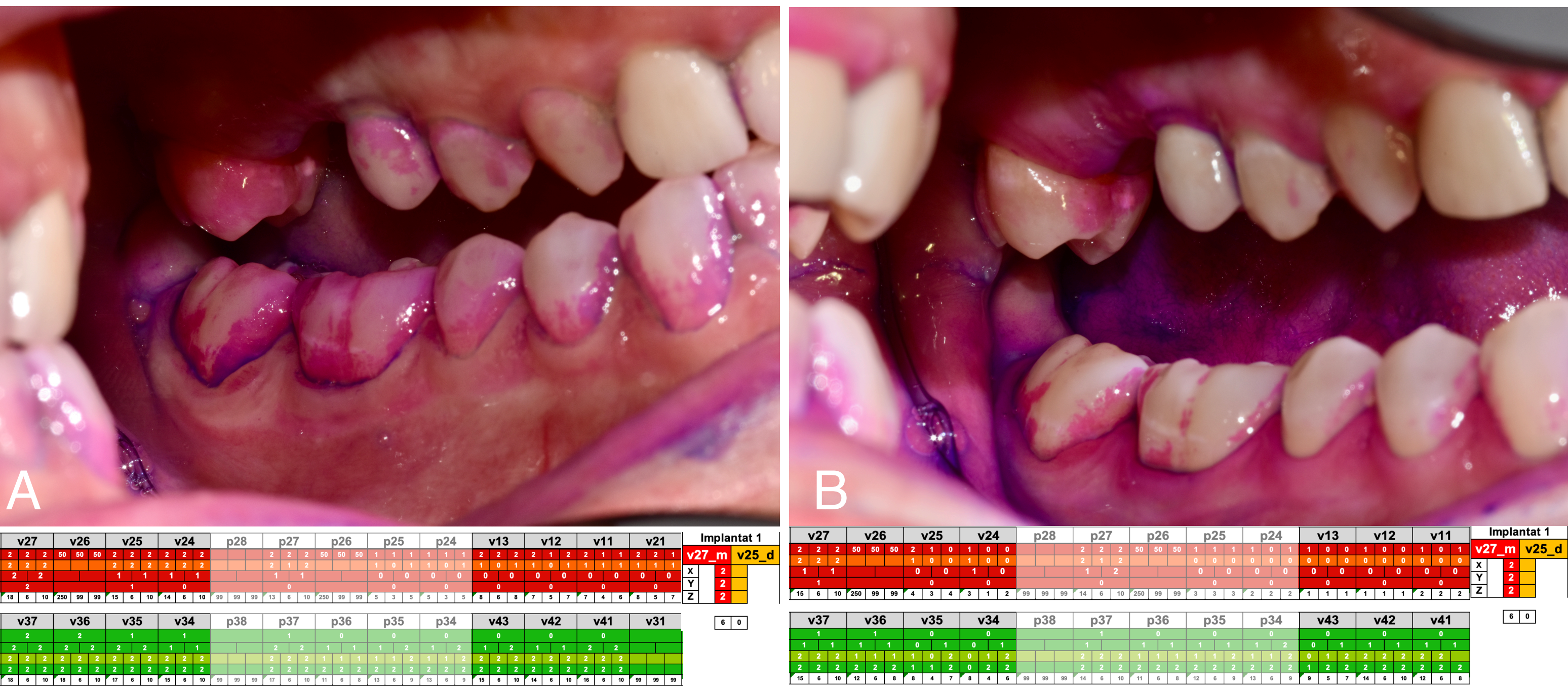

Fig. 3: clinPPI with plaque indicator (mira2Tone) with its evaluation prebrush (A) and postbrush (B) on all smooth surfaces, and the anterior/posterior fields (*Implantat 1*).
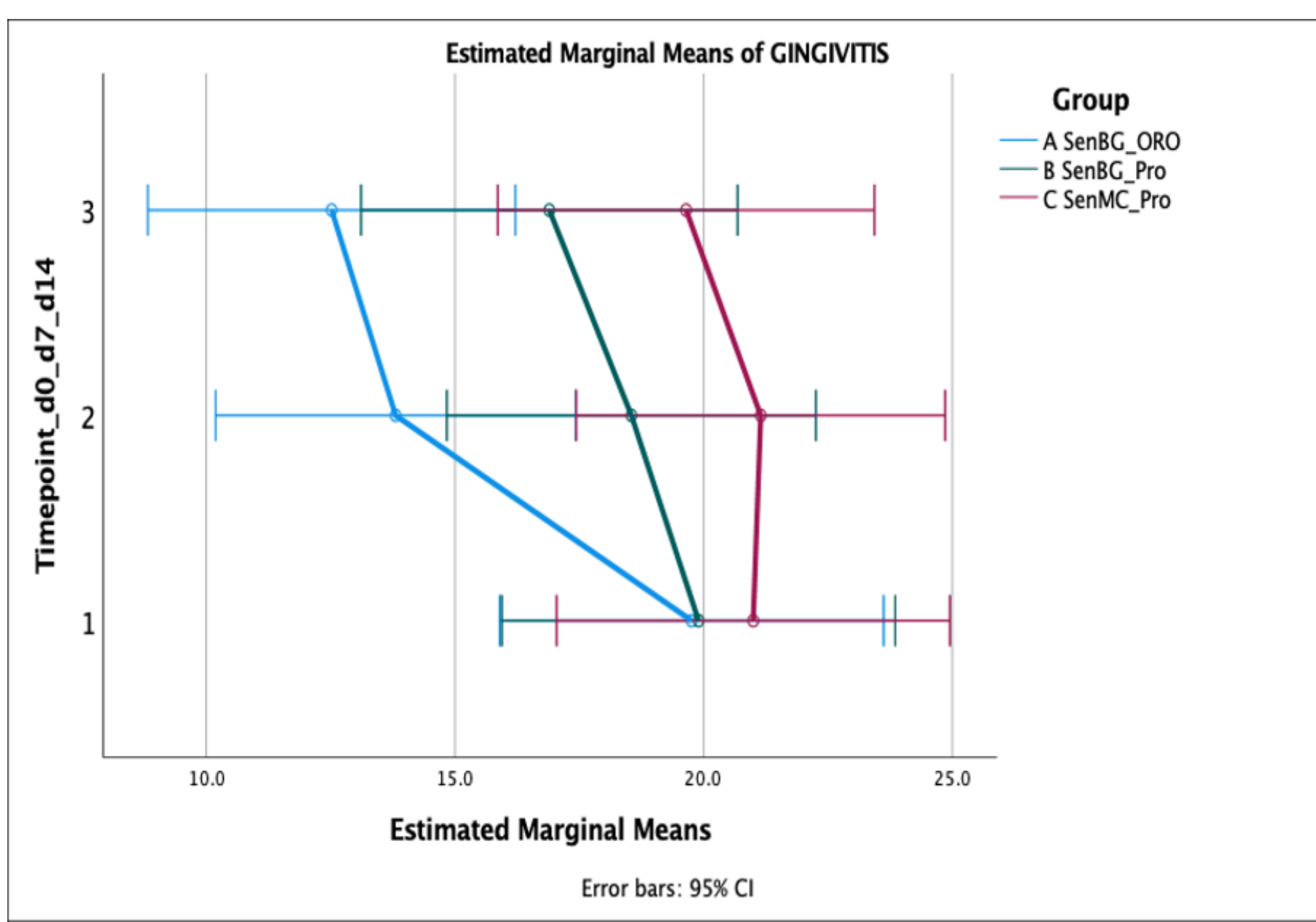
Fig. 4: Estimated mean values BOP + probing per subject on all groups: test group A (*SenBG_ORO*), test group B (*SenBG_Pro*) and control group C (*SenMC_Pro*) for the points day 0 (*1*), day 7 (*2*) and day 14 (*3*) with its error bars for 95% confidence interval.
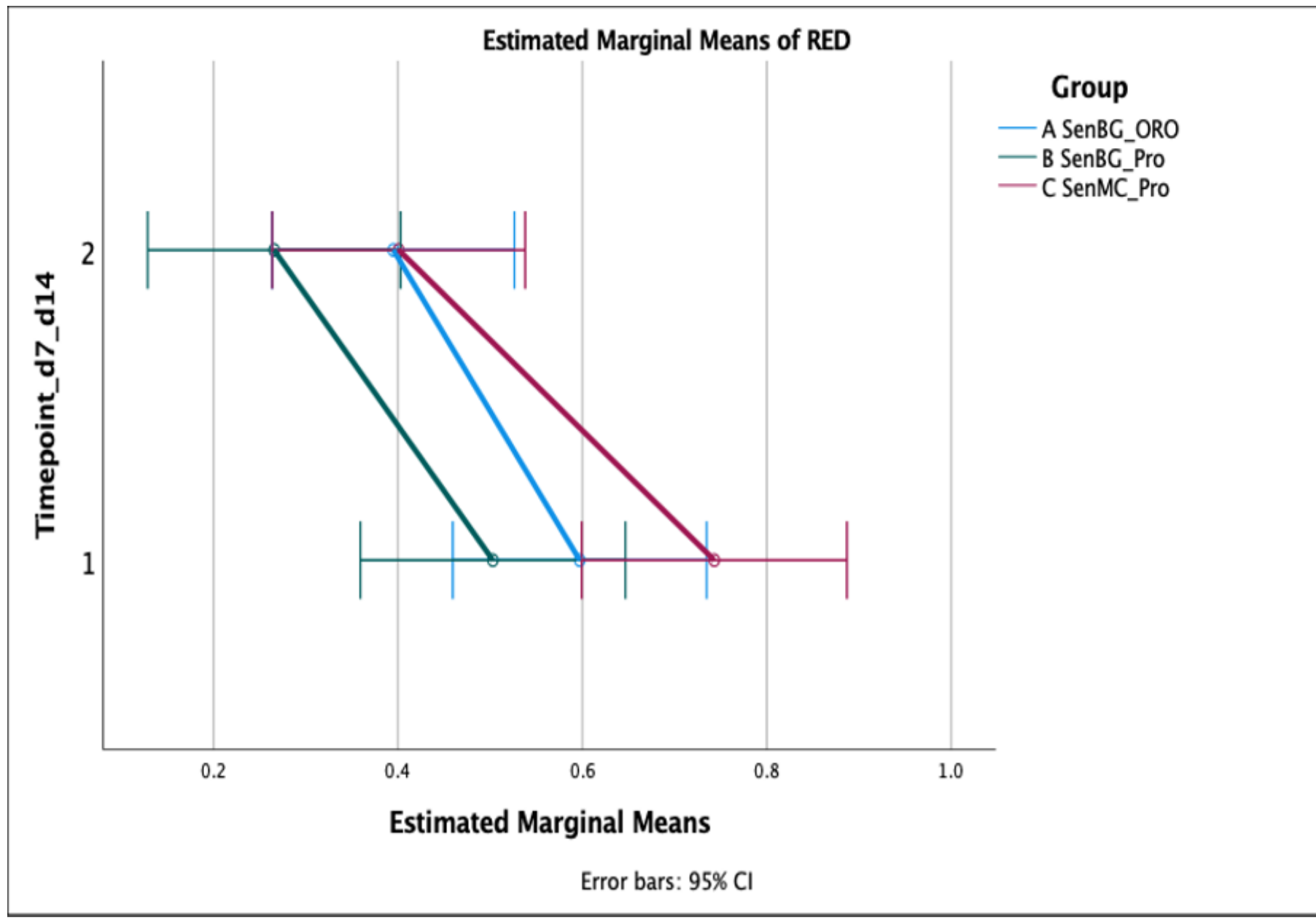
Fig. 5: Estimated Mean values of inflammation codes around implants at day 7 (*1*) and day 14 (*2*) in all groups: test group A (*A SenBG_ORO*), test group B (*B SenBG_Pro*) and control group C (*C SenMC_Pro*) with error bar. The wound healing is coded with code 0 = no redness, code 1 = redness, code 2 = redness and swelling and code 3 = extensive redness and swelling extending into the vestibulum. All implant gaps have 6 measure points.
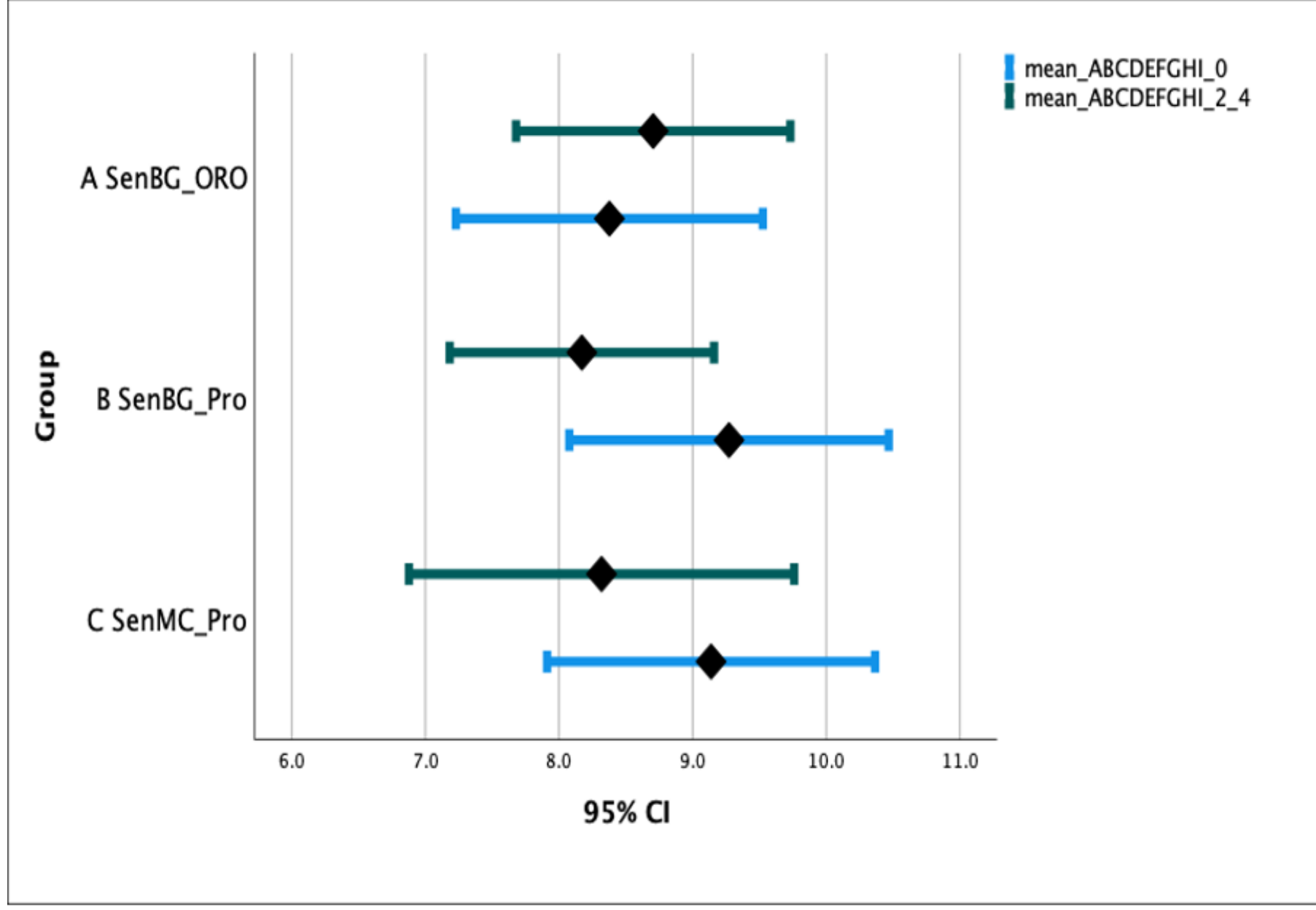

Fig. 6: Mean plaque values of clinPPI fields/tooth day 0 (*mean_ABCDEFGHI_0*) and day 7 postbrush + day 14 postbrush (*mean_ABCDEFGHI_2_4*). It is shown for all fields at both sides (palatal/lingual and vestibular) for test group A (*SenBG_ORO*), test group B (*SenBG_Pro*) and control group C (*SenMC_Pro*).

surface	groups	Mean postbrush	Mean delta	Mean prebrush	Brushing efficacy (%)
ALL	A SenBG_ORO	6,4546	-1,4236	7,8782	18,0701
	B SenBG_Pro	6,2672	-1,5993	7,8665	20,3305
	C SenMC_Pro	6,2822	-1,5071	7,7893	19,3483
VES	A SenBG_ORO	6,3298	-1,9152	8,245	23,2286
	B SenBG_Pro	5,8308	-2,0277	7,8585	25,8026
	C SenMC_Pro	6,1730	-1,8738	8,0468	23,2862
PAL	A SenBG_ORO	6,5705	-1,1977	7,7682	15,4180
	B SenBG_Pro	6,6861	-1,1590	7,8451	14,7735
	C SenMC_Pro	6,3978	-1,1458	7,5436	15,1890

Tab. 1: Mean plaque accumulation for all groups in the whole mouth (*ALL*), all surfaces on vestibular side (*VES*), and on lingual/palatinal side (*PAL*) and its brushing efficiency in percent.

perio_123	Group	Mean	Std. Deviation	N
PERIO low	A SenBG_ORO	1.0393	0.02710	3
	B SenBG_Pro	1.0440	0.02563	10
	C SenMC_Pro	1.0324	0.02463	7
	Total	1.0393	0.02468	20
PERIO medium	A SenBG_ORO	1.1080	0.02181	6
	B SenBG_Pro	1.1034	0.02142	8
	C SenMC_Pro	1.1026	0.01541	6
	Total	1.1045	0.01904	20
PERIO high	A SenBG_ORO	1.2191	0.10432	12
	B SenBG_Pro	1.2096	0.02531	3
	C SenMC_Pro	1.2586	0.16291	7
	Total	1.2303	0.11723	22

Tab. 2: To different periodontal situations, subjects of all groups were ranked on mean periodontal probing depth code in ascending order. This order was divided into thirds. The composition of the subgroups (*PERIO low, PERIO medium and PERIO high*) whose mean periodontal probing depth code can be seen left. The periodontal probing depth is coded with code 1 = <3.5mm, code 2 = 3.5- 5.5mm, code 3 = >5.5mm. All teeth have 6 measure points.
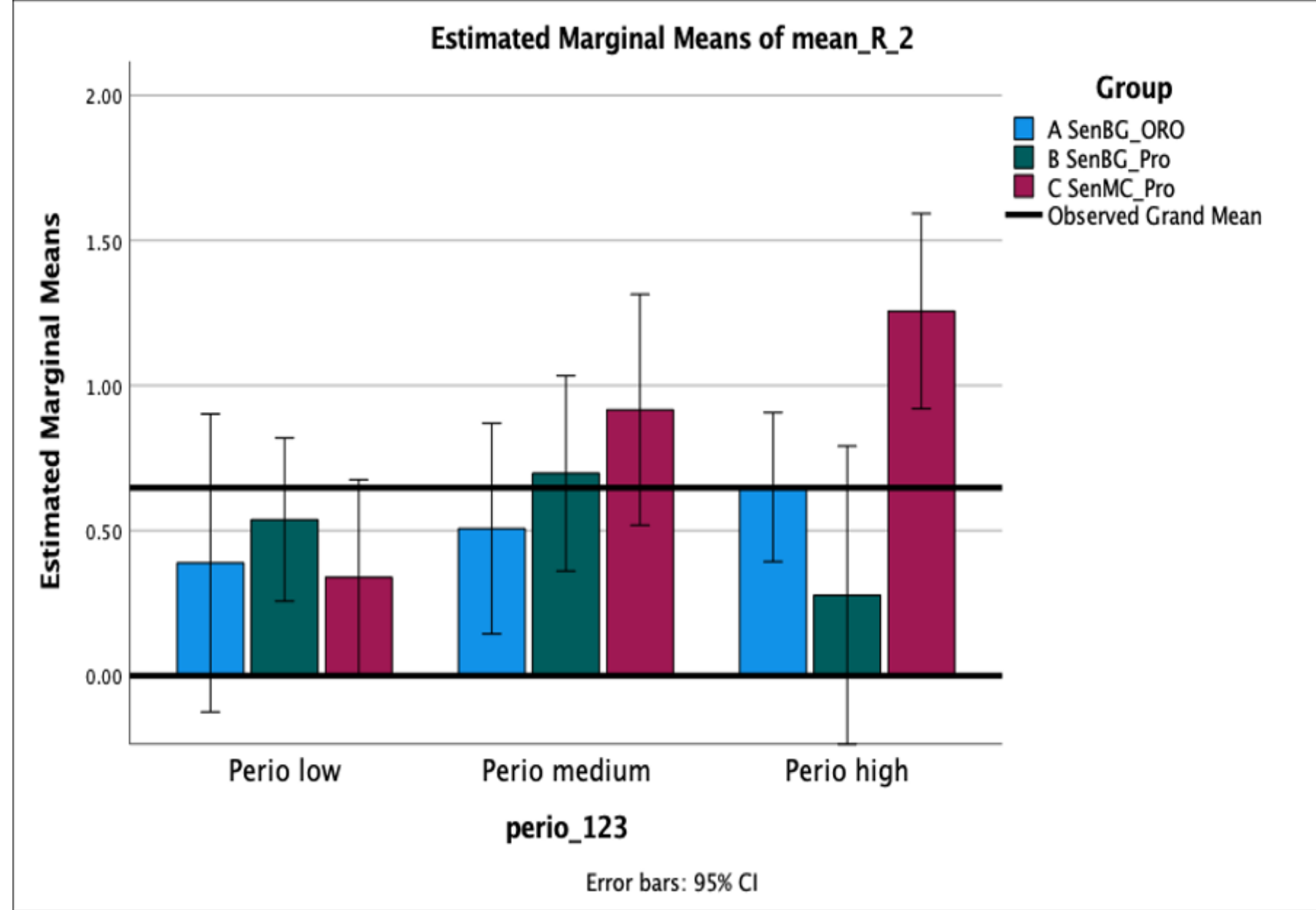
Fig. 7: Estimated mean values of early wound healing inflammation codes at day 7 in three periodontal subgroups (*PERIO low, PERIO medium, PERIO high*) for all three testgroups, with its error bar for 95% confidence interval. The black line shows the observed wound healing inflammation grand mean over all subjects. (coding see Fig. 5).

References:

SALVI, Giovanni E.; RAMSEIER, Christoph A. Efficacy of patient-administered mechanical and/or chemical plaque control protocols in the management of peri-implant mucositis. A systematic review. Journal of clinical periodontology, 2015, 42. Jg., S. S187-S201.

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