

Preferable interradicular implant sites for orthodontic miniscrews

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Introduction: The interradicular space is the most common location for the placement of orthodontic miniscrews. However, as far as bone support is concerned, only little investigation has been performed on this topic so far. Therefore, the aim of this study was to evaluate the interradicular bone dimensions and as a consequence to find favourable interradicular implant sites for orthodontic miniscrews.

Material and Methods: Randomized selected axial CT images of 24 maxillae and 21 mandibles were examined. Every interradicular space was measured horizontally at a depth of 3, 4, 5 and 6mm apical from the cemento enamel junction by an accuracy of measurement of 0.1mm.

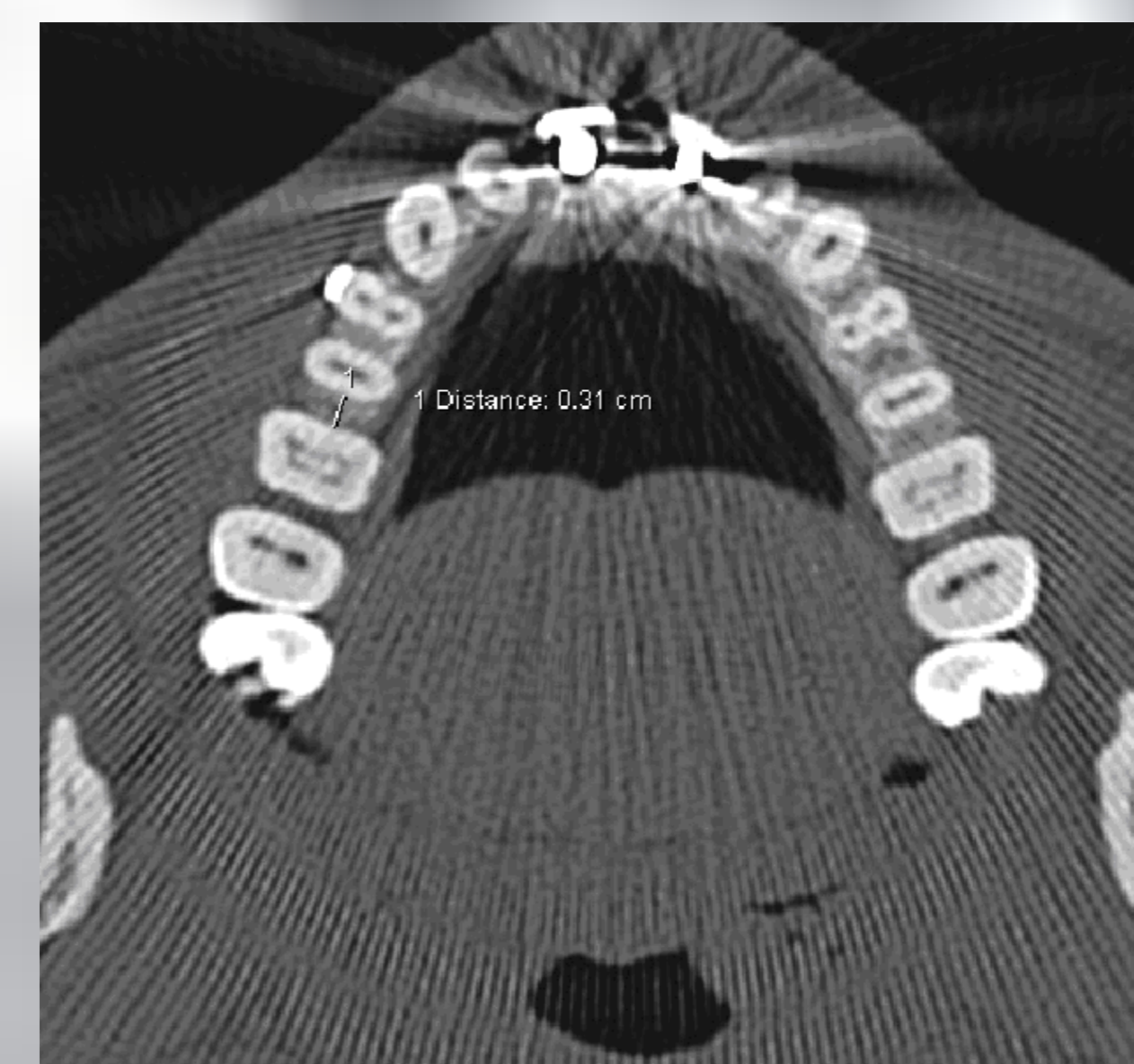


Table 1: Measurement of interradicular distance

Results: The highest amount of bone was found between the first molar and the second premolar in the upper jaw (average 2.65mm +/- 0.71), as well as between the first and second molar in the lower jaw (average 3.19mm +/- 0.72). In general, the interradicular distance increased significantly from coronal towards apical and the posterior teeth showed more interradicular distance than the anterior ones. Gender dependency has exclusively been detected in the area between the first molar and the second premolar in the upper jaw.

Position	N	Min.	Max.	Avg.	σ	
Maxilla 1-1	3mm	22	1	4	2.10	.79
	4mm	22	7	4.4	2.25	.82
	5mm	22	6	4.3	2.32	.81
	6mm	22	6	4.5	2.46	.80
Maxilla 1-2	3mm	40	1	4	1.57	.62
	4mm	40	7	3.1	1.57	.60
	5mm	40	7	4.1	1.57	.60
	6mm	40	7	4.5	1.68	.70
Maxilla 2-3	3mm	30	1	3	1.70	.53
	4mm	30	9	2.8	1.78	.53
	5mm	30	10	2.8	1.87	.57
	6mm	30	12	3.0	1.95	.62
Maxilla 3-4	3mm	31	1	3	1.90	.49
	4mm	31	7	2.7	1.90	.47
	5mm	31	10	2.9	1.97	.43
	6mm	31	9	3.1	2.05	.52
Maxilla 4-5	3mm	41	1	4	2.10	.60
	4mm	41	8	3.9	2.18	.65
	5mm	41	12	4.1	2.32	.60
	6mm	41	11	4.4	2.37	.70
Maxilla 5-6	3mm	41	1	4	2.38	.56
	4mm	41	13	3.8	2.45	.63
	5mm	41	9	3.8	2.53	.68
	6mm	41	10	4.0	2.68	.71
Maxilla 6-7	3mm	38	1	3	2.12	.43
	4mm	38	13	3.3	2.22	.48
	5mm	38	15	3.5	2.24	.49
	6mm	38	14	4.0	2.30	.61
Mandible 1-1	3mm	21	1	2	1.21	.27
	4mm	21	9	2.0	1.26	.34
	5mm	21	9	2.1	1.34	.34
	6mm	21	9	2.4	1.37	.41
Mandible 1-2	3mm	42	1	2	1.29	.43
	4mm	42	6	2.1	1.29	.39
	5mm	42	6	2.2	1.26	.39
	6mm	42	7	2.4	1.37	.41
Mandible 2-3	3mm	41	1	2	1.54	.46
	4mm	41	6	2.6	1.61	.48
	5mm	41	7	2.4	1.61	.46
	6mm	41	8	2.4	1.66	.49
Mandible 3-4	3mm	38	1	4	2.15	.46
	4mm	38	12	3.3	2.12	.42
	5mm	38	12	3.1	2.25	.46
	6mm	38	15	3.4	2.34	.50
Mandible 4-5	3mm	35	1	4	2.59	.59
	4mm	35	16	4.3	2.73	.64
	5mm	35	17	4.5	2.89	.70
	6mm	35	17	4.7	3.05	.75
Mandible 5-6	3mm	35	2	4	2.80	.49
	4mm	35	14	3.8	2.82	.52
	5mm	35	17	4.4	2.98	.61
	6mm	35	20	4.1	3.09	.54
Mandible 6-7	3mm	30	2	5	3.02	.57
	4mm	30	17	4.9	3.09	.63
	5mm	30	17	4.9	3.15	.66
	6mm	30	18	5.0	3.19	.72

Accuracy of measurement	N	Minimum mm	Maximum mm	Average mm	σ mm
Intraexaminer reliability	244	.0	.6	.159	.122

Table 2: Statistic overview

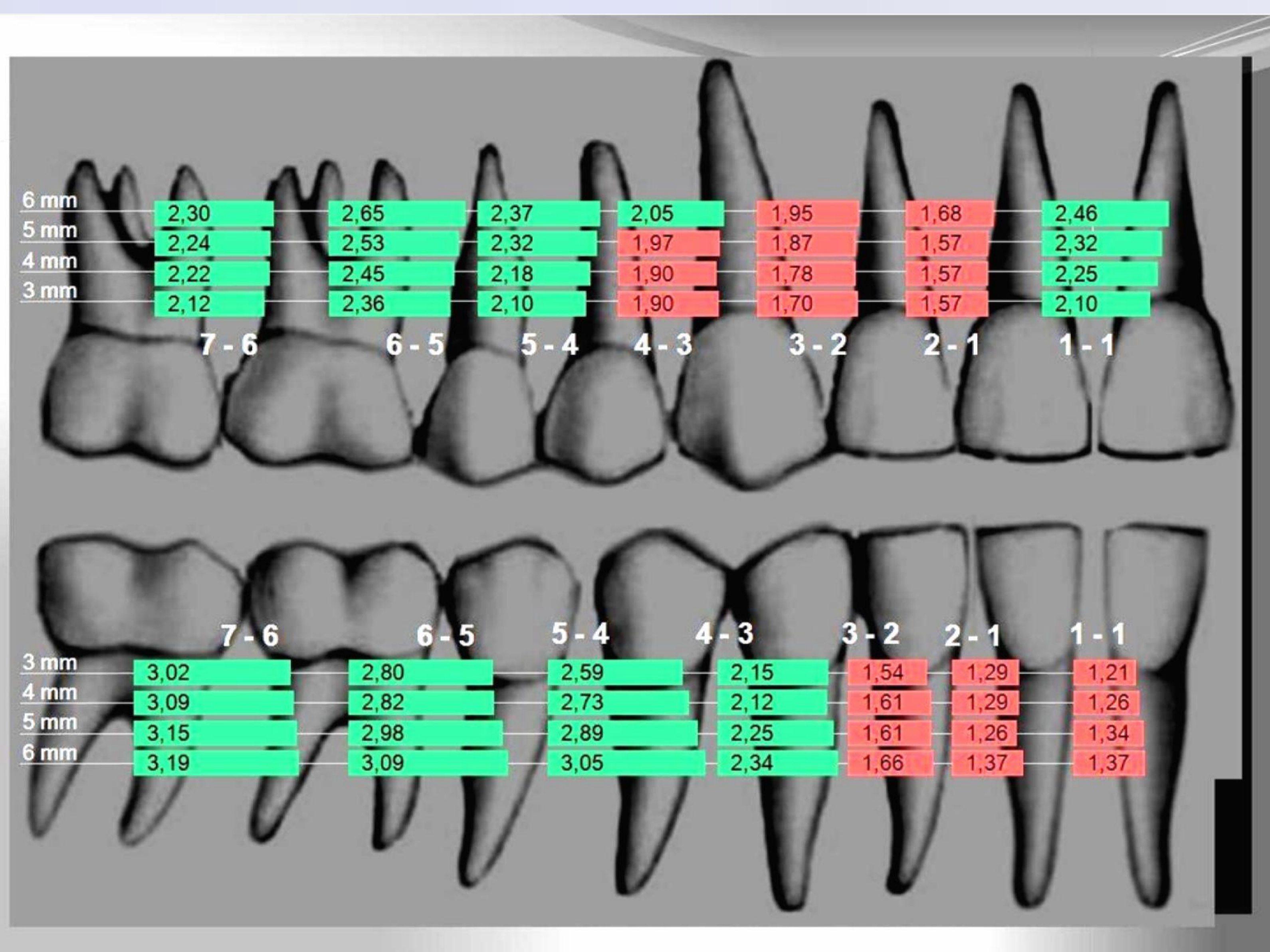
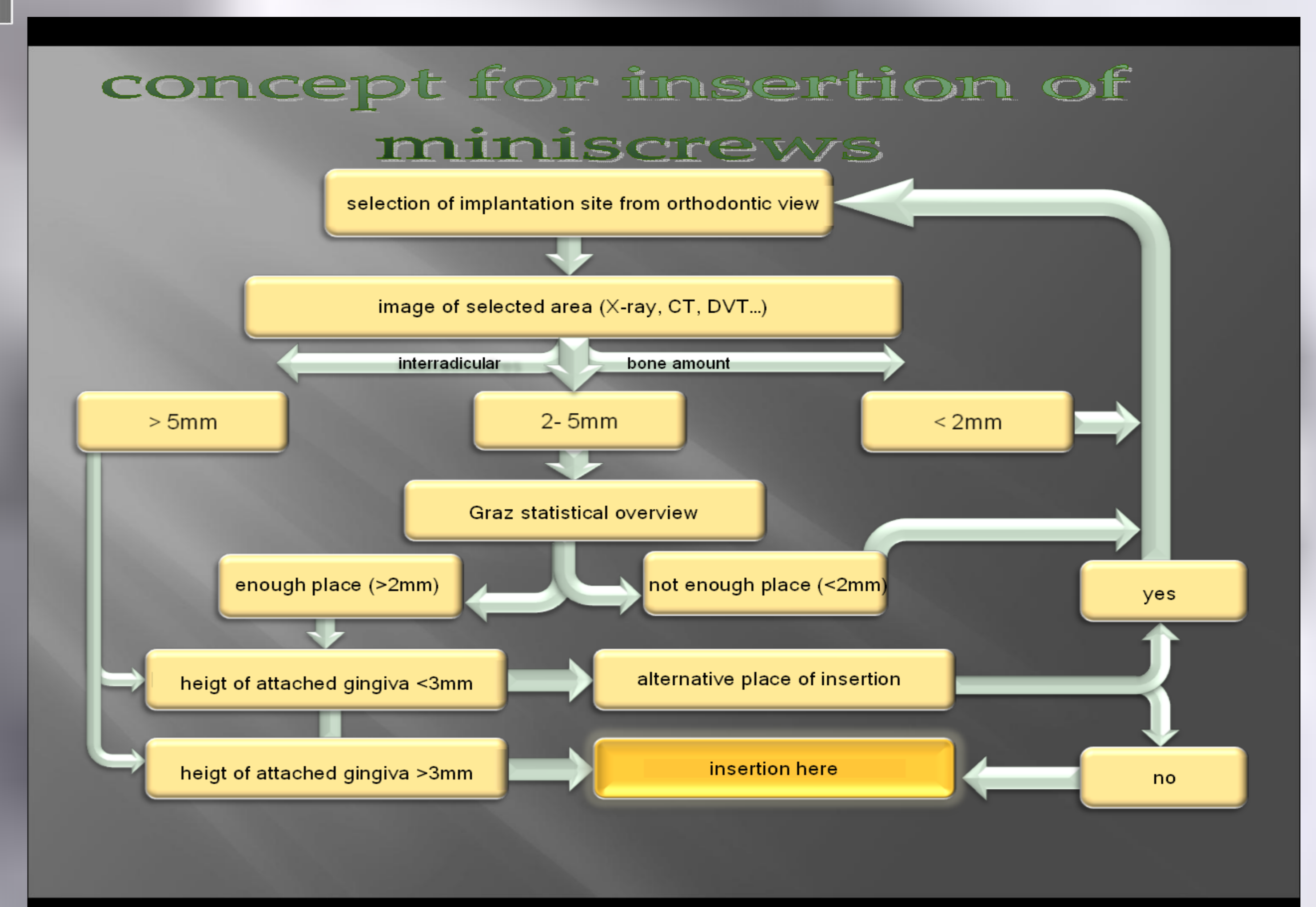


Table 3: Average interradicular bone amount (> 2mm, < 2mm)

Conclusions: Although there are individual variations in the interradicular distance, a number of preferable locations for the placement of miniscrews were detected. In combination with a correct surgical technique, the risk of root damage can be minimized and the survival rate can be increased. The reflection of the physiological relations between dental roots might also be used for further implantological research.

Table 4: Graz Concept for Insertion of Miniscrews



Literature: Poggio P.M. et al., "Safe zones": a guide for Miniscrew Positioning in the maxillary and mandibular arch, Angle Orthod 2006;76:191-197; Chen et al., Root contact of orthodontic miniscrews increases failure rate, Clin Oral Implants Res 2007 (10); Deguchi T. et al., The use of small titanium screws for orthodontic anchorage, J Dent Res 2003 (377-381); Schnelle MA et al., A radiographic evaluation of the availability of bone for placement of miniscrews, Angle Orthod 2004 (06); Lindhe J. et al., Clinical Periodontology and Implant Dentistry 4th edition, Blackwell Munksgaard, 2003/2005; Kuroda S. et al., Root proximity is a major factor for screw failure in orthodontic anchorage, Am J Orthod and Dentof Orthop 2007 (04); Deguchi T. et al., Quantitative evaluation of the cortical bone thickness with computed tomographic scanning for orthodontic implants, Am J Orthod Dentofac Orthop 2006 (10); Wiechmann D. et al., Success rate of mini- and micro-implants used for orthodontic anchorage: a prospective study, Clin Oral Implants Res 2007 (263-267)