



Will Anterior Border of Ramus Have Impacts on The Depth of Mucosal Tunnel and Peri-implant Health for Second Molar Reconstruction? A Pilot Cohort Study

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Introduction

Mucosal tunnel (MT), defined as the distance from implant shoulder to mucosal margin, could be a modifier to the development of peri-implant mucositis¹. Previous study had identified multiple factors potentially associated with the depth of MT². However, for implant replacement in lower second molar region, the effect of anterior ramus on MT was seldom discussed. The aim of this study was to evaluate the impact of anterior border of ramus on the depth of MT and peri-implant health around bone-level implants.

Methods

Patients with controlled stage III to IV periodontitis and implant reconstruction in lower second molar region were included, and all participants followed strict supportive strategy under maintenance care. Clinical and radiographic data around the included implants, including the depth of MT, probing depth (PD) and marginal bone level (MBL) were measured at mesial, buccal, lingual and distal aspect from uncovering surgery (T0) to at least 3 months after loading (T2) (Figure 1). Besides, the angulation of anterior border of ramus (AR°) was measured between the implant platform and a line tangent to the anterior ramus from the most distal point of implant shoulder (Figure 2). Threshold value of 3 mm was used to distinguish deep (≥3 mm) and shallow (<3 mm) MT group. The correlation between AR°, all parameters and deep MT were investigated.

Figure 1. The schematic illustration of study design and measuring items at different time points (T0, T1, T2).

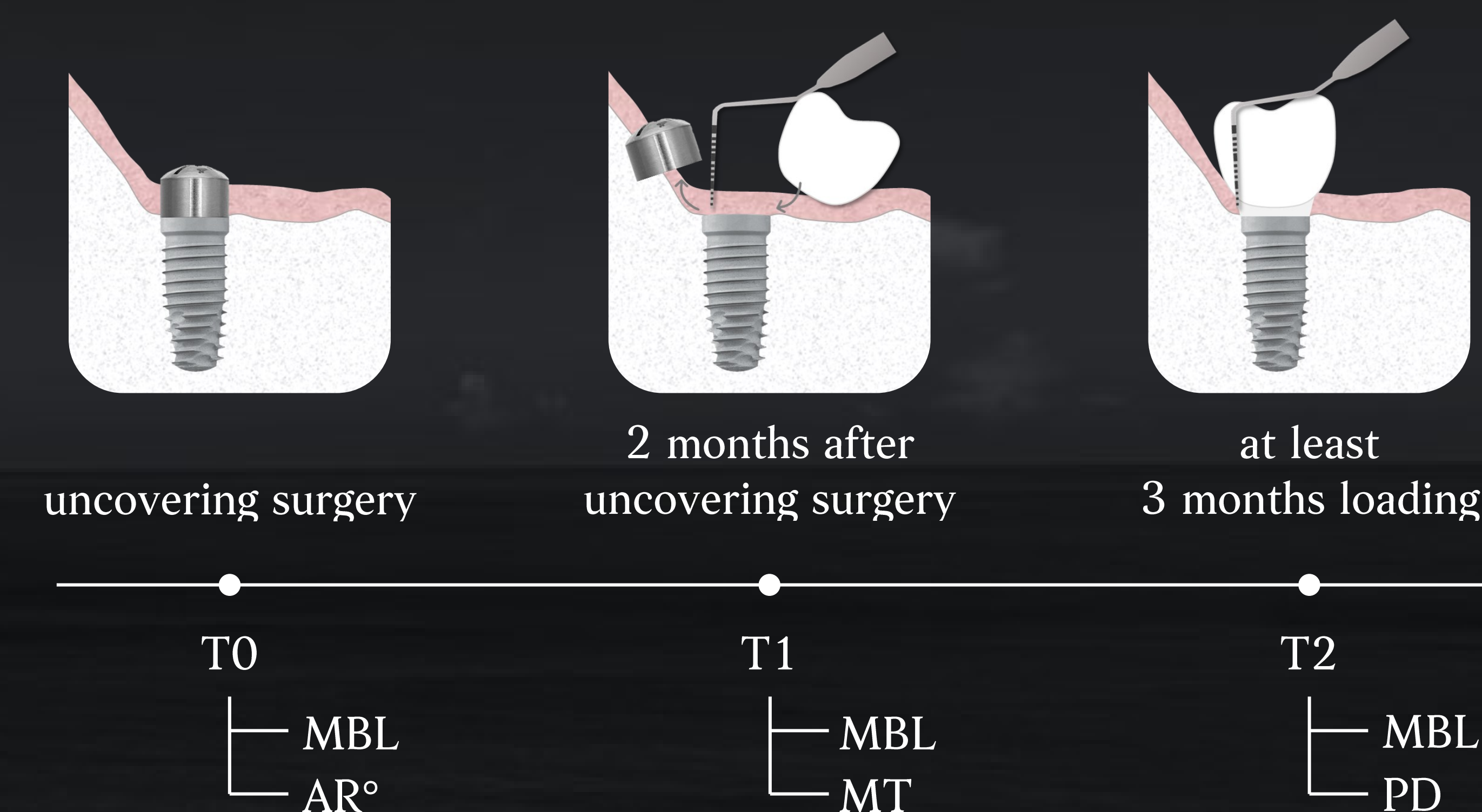
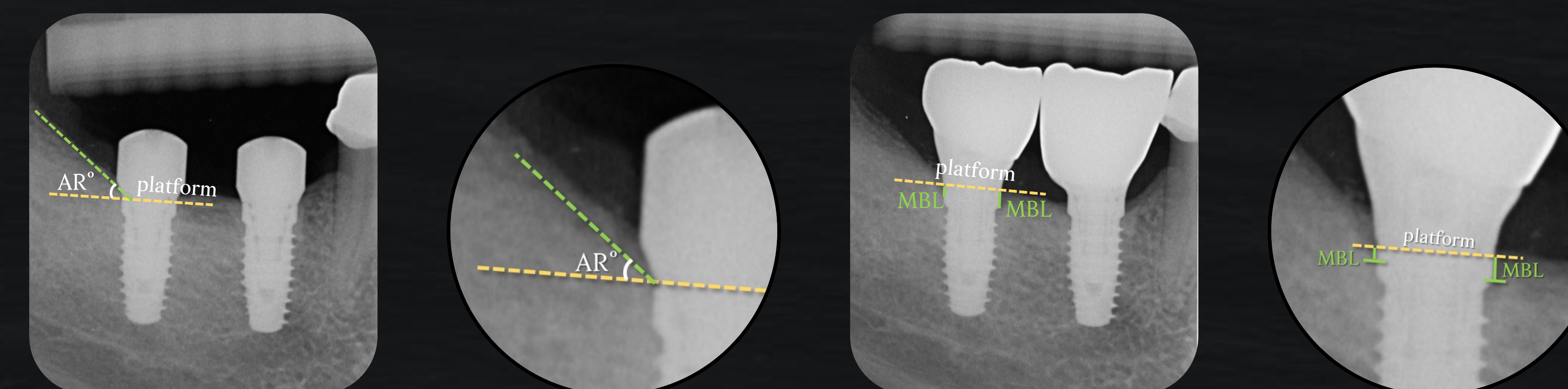


Figure 2. Radiographic measurement of AR° and MBL with paralleled taken standard peri-apical film.



Results

Sixteen patients with sixteen bone-level implants were included. The average MT depth in mesial and distal aspect were 2.953 ± 1.026 mm and 3.484 ± 1.302 mm respectively without significance ($p=0.120$), while deep MT were more inclined to be found at distal side than mesial side of the implants (75% vs 56.25%, $p=0.264$). After loading (T2), there was no significant difference in PD and MBL change around implants, and none of implants presented peri-implant disease. The average AR° was 27.15 ± 13.3 degree, and implants with deep MT in distal aspect had steeper mean AR° (30.25 ± 13.74 vs 17.85 ± 6.19) with borderline significant difference ($p=0.058$). Besides, the Spearman's correlations test showed a positive relationship between AR° and MT depth (Spearman's rho = 0.669, $p=0.005$), which indicated that increased angle of anterior border of ramus would be associated with deeper MT depth.

Table 1 Descriptive results of patient and implant characteristics.

Demographic data and implant characteristics	Mean $\pm$ SD
Age (years)	55.38 $\pm$ 9.03
Sex (n)	Male: 7 ; Female: 9
Stage of periodontitis (n, implant level)	III: 10 ; IV: 6
Grade of periodontitis (n, implant level)	B: 8 ; C: 8
Implant sites (n)	Lower left second molar: 7 Lower right second molar: 9
Previous guided bone regeneration (implant level)	Ridge preservation: 4 Vertical ridge augmentation (VRA): 2
Soft tissue phenotype modification therapy (implant level)	Free gingival graft: 13 Pouch roll technique: 2 Modified roll technique: 1
Clinical measurements at implant level	Mean $\pm$ SD (minimum ~ maximum)
MT (mm)	3.13 $\pm$ 0.98 (1.0~5.6)
MT classification	Shallow (MT<3mm): 8 Deep (MT $\geq$ 3mm): 8
AR°	27.15 $\pm$ 13.3 (13.3~63.7)

Table 2 The mean values of different parameters in distal or mesial aspect. (mean $\pm$ SD)

	Distal	Mesial	P value
(Mann-Whitney U test)			
MT depth	3.484 $\pm$ 1.302	2.953 $\pm$ 1.026	0.120
PD	2.641 $\pm$ 0.32	2.813 $\pm$ 0.873	0.739
MBL change (T2 – T0)	0.271 $\pm$ 0.305	0.439 $\pm$ 0.226	0.959
(Chi-Squared Tests)			
N=Deep MT ($\geq$ 3mm)	12 (75%)	9 (56.25%)	0.264

Table 3 The relationship between anterior ramus angle and other parameters at distal aspect (D). (Spearman's Correlations)

		Anterior ramus angle	MT (D)	PD (D)
MT (D)	Spearman's rho	0.669	—	—
	p-value	0.005**	—	—
PD (D)	Spearman's rho	0.162	-0.039	—
	p-value	0.548	0.885	—
MBL (D)	Spearman's rho	0.475	0.303	-0.193
	p-value	0.063	0.254	0.474
Note. All tests one-tailed, for positive correlation				
* p < .05, ** p < .01, *** p < .001, one-tailed				

Limitation

Small sample size and short-term follow-up period were main limitations of this study. Besides, different guided bone regeneration strategies and soft tissue phenotype modification therapy during uncovering surgery were used, which might also impact the clinical outcomes.

Conclusion

Based on the present study, the anatomy of anterior ramus was correlated with the depth of MT, and steeper anterior border of ramus might determine to deeper MT. Nevertheless, peri-implant health was not compromised by both AR° and the depth of MT under adequate maintenance care.

Reference

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