

Evaluation of the effect of implants placed in areas of discrepancy between implant platform and adjacent tooth cemento-enamel junction: A retrospective study

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Background

Dental implants is one of the preferred treatment options for missing teeth. However, a significant portion of implants could develop peri-implant complications. Meta-analyses suggests a prevalence of peri-implant mucositis and peri-implantitis to be at least 20% and 30%, respectively. These peri-implantitis issues may become significant when considering implants placed at a discrepancy between platform height and cemento-enamel junction (CEJ) of the adjacent teeth.

The specific aim of this study was to evaluate the effect on interproximal bone height due to a large (> 3mm) vertical discrepancy between implant platform and the CEJ of adjacent teeth on peri-implant parameters.

Methods

This retrospective radiographic study was approved by Harvard Medical School (IRB20-0189). Based on sample size calculation, the minimum sample size was 80 implants per group.

For each included implant, radiographs taken at the time of prosthetic loading and no less than 2 years post loading were examined. Radiographs evaluated were either two bite-wings or two peri-apical films taken at the same angle at loading and 2 or more years later. ImageJ software was used to standardize and measure the first bone-to-implant contact (fBIC) on the mesial and distal sides of implants.

The groups were defined as shallow or deep, based on relation of platform to adjacent CEJ. All implants compared had at least one adjacent tooth;

Group 1: Shallow placement: implant platform is ≤ 3 mm from adjacent tooth CEJ.

Group 2: Deep placement: The implant platform is > 3 mm from adjacent tooth CEJ

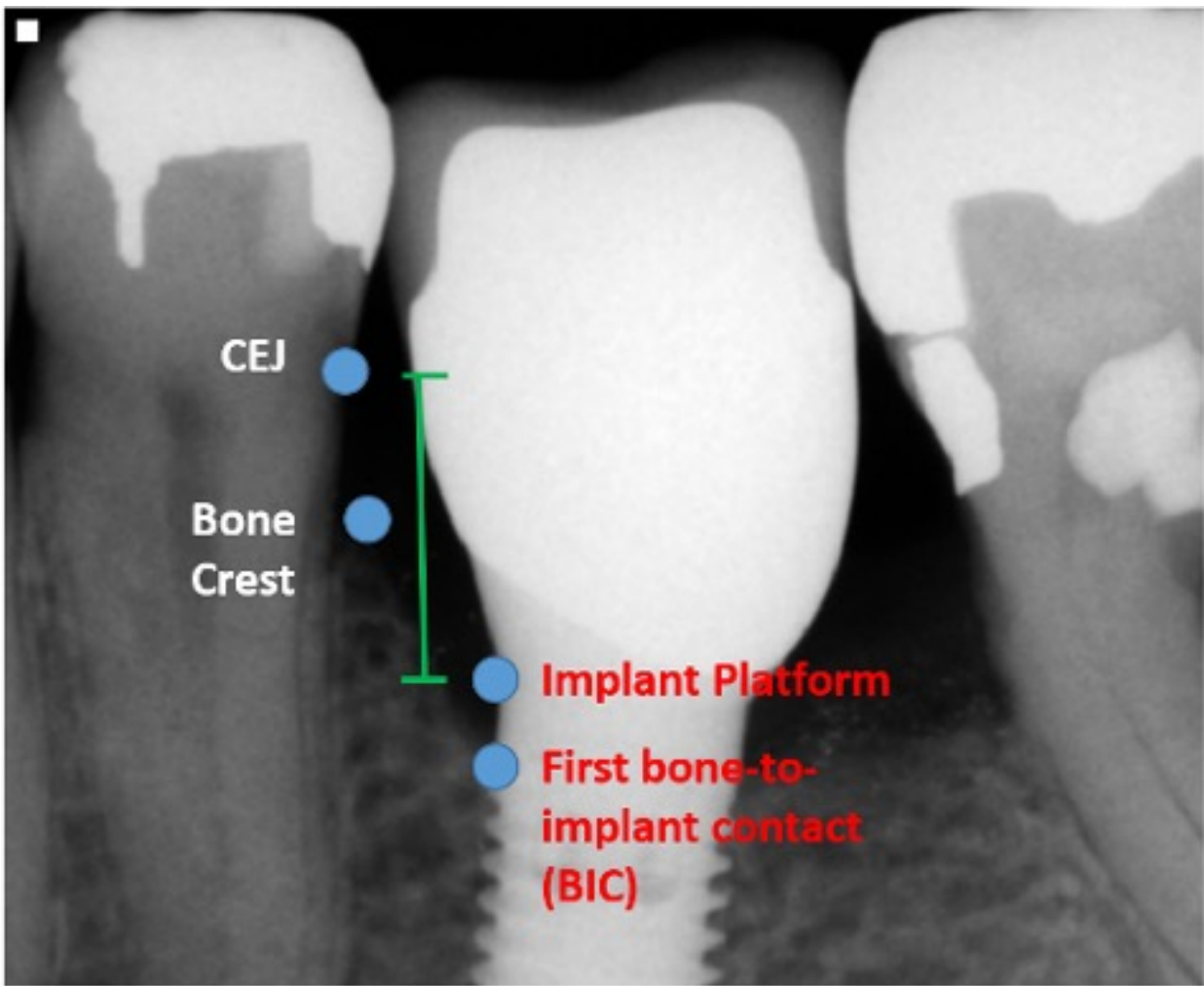


Figure 1: Illustration of the distance between implant platform and adjacent tooth CEJ.

Results

In this study, 86 implants were included in the deep group while 81 implants were included in the shallow group. There were no statistical differences in the length of the implant between the two groups while the shallow group implants had wider diameters (4.266 ± 0.619 v.s. 4.549 ± 0.459 , $p=0.001$) (**Table 1**).

TABLE 1: BASELINE CLINICAL MEASUREMENTS: COMPARISON BETWEEN GROUPS

Variable	Deep		Shallow		p-value*
	N	Mean $\pm$ SD	N	Mean $\pm$ SD	
Age	86	69.593 $\pm$ 8.516	81	68.519 $\pm$ 11.524	0.496
Implant diameter	86	4.266 $\pm$ 0.619	81	4.549 $\pm$ 0.459	0.001
Implant length	86	10.128 $\pm$ 1.672	81	10.074 $\pm$ 1.649	0.834

*t-test for unpaired observations.
Bold values represent significant
($P<0.05$) values

The average fBIC changes between baseline and follow-up were 0.671 ± 1.027 mm and 0.277 ± 0.726 mm for the deep and shallow groups respectively, and this was statistically significant ($p= 0.005$), indicating a greater loss of bone for the implants placed at a larger discrepancy between the implant platform and adjacent tooth CEJ (**Table 2**).

TABLE 2: COMPARISON BETWEEN GROUPS: CLINICAL OUTCOMES

Variable	Deep		Shallow		p-value*
	N	Mean $\pm$ SD	N	Mean $\pm$ SD	
Δ mesial BIC	75	0.662 $\pm$ 1.121	55	0.200 $\pm$ 0.745	0.006
Δ distal BIC	53	0.727 $\pm$ 1.019	54	0.319 $\pm$ 0.740	0.019
Δ average BIC	86	0.671 $\pm$ 1.027	81	0.277 $\pm$ 0.726	0.005

*t-test for unpaired observations
Bold values represent significant ($P<0.05$) values

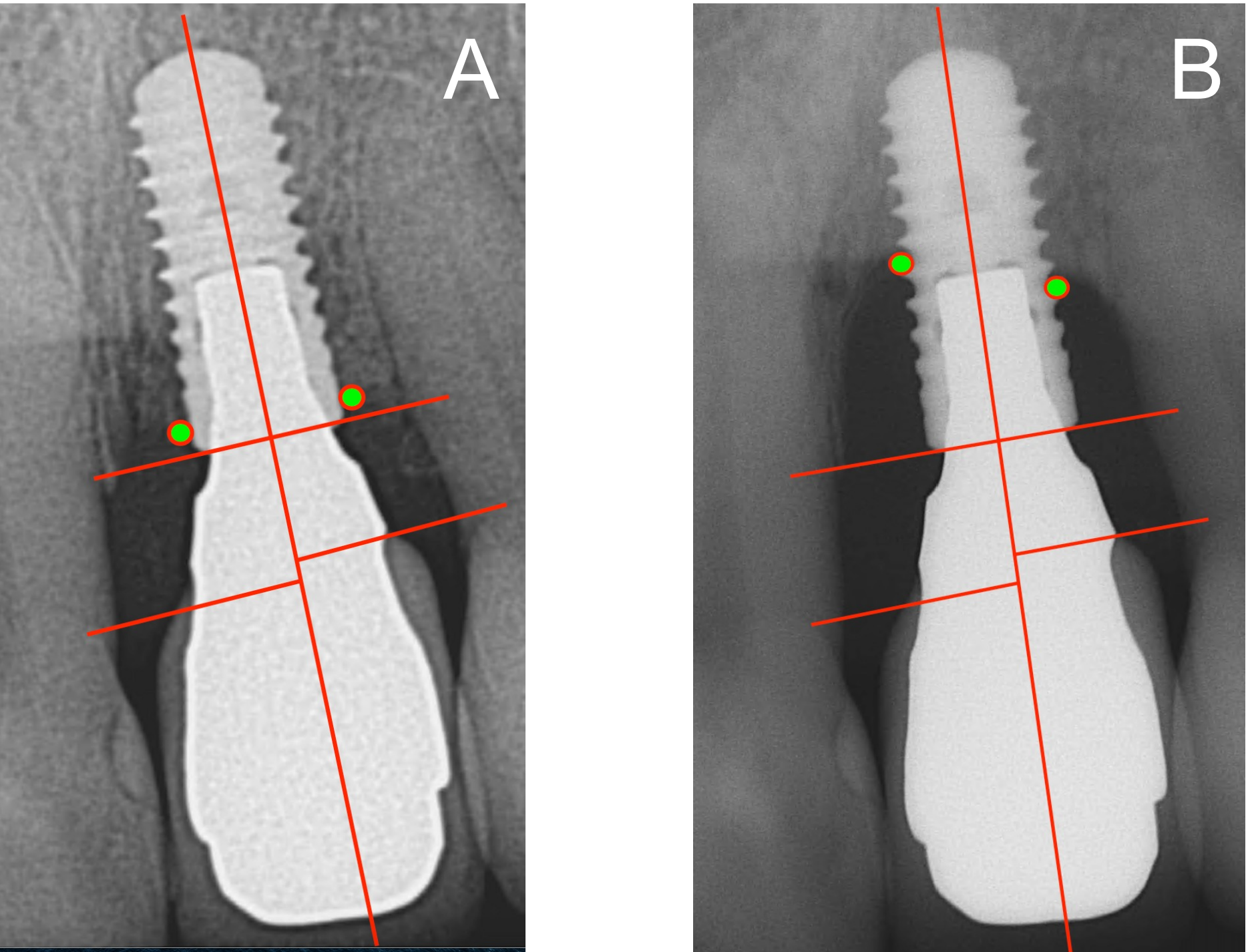
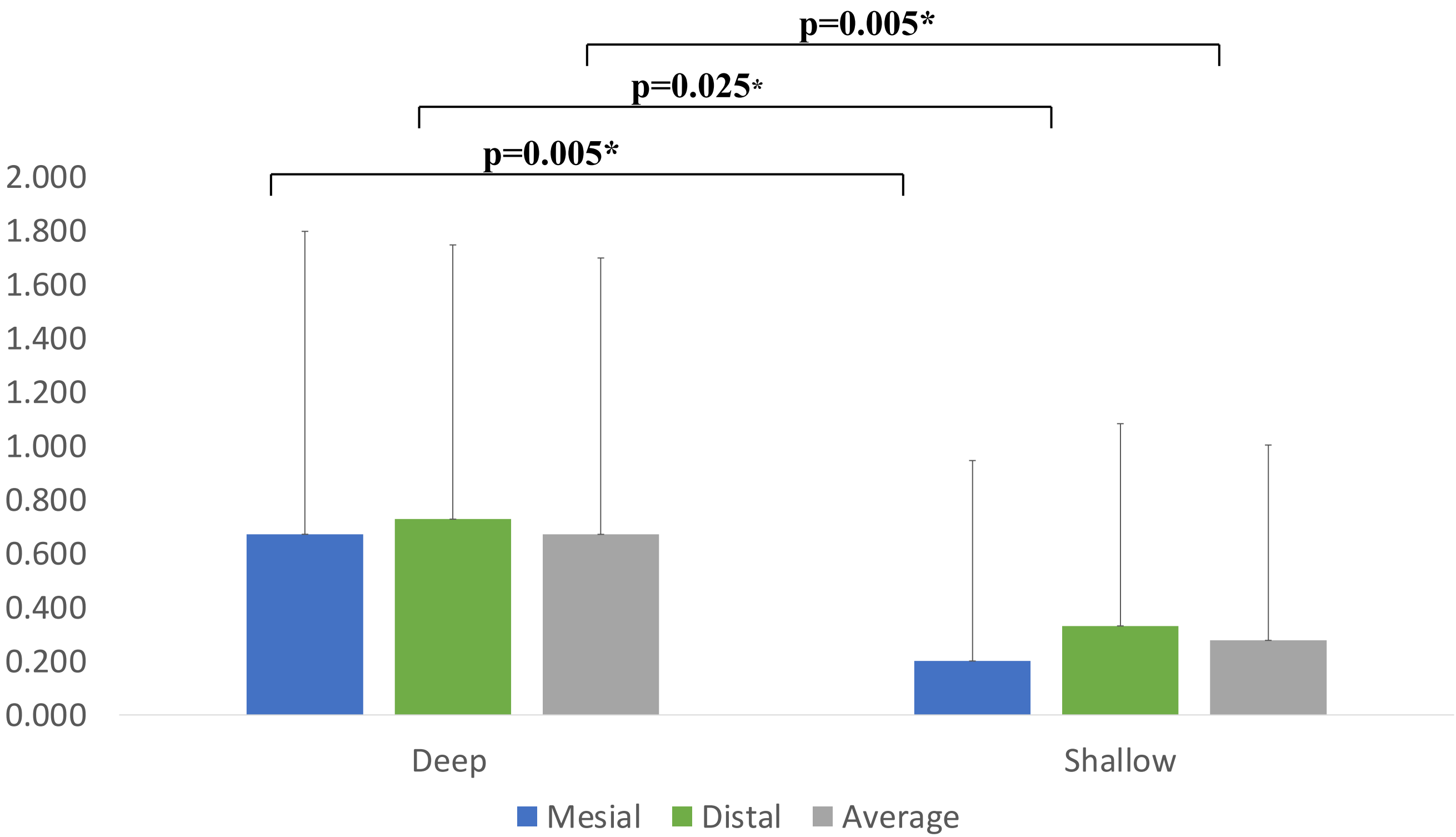


Figure 2: At loading (A) and at 2 year-post-loading (B), the most coronal line represents CEJ of adjacent teeth, apical lines represent implant platform, dots represent first bone to implant contact.

Figure 3: Represents change in first BIC when comparing deep vs. shallow implants.

Blue: Changes in BIC on the mesial sides of implants
Green: Changes in BIC on the distal sides of implants
Grey: Average BIC changes

Changes in mesial side and distal side of the implant fBIC were significantly greater for implants in the deep placement group. The average changes in fBIC were also significantly greater for the deep group.

*represent significant ($p < 0.05$) values

Conclusion

The results from the present study showed that the implants being placed with > 3 mm of discrepancy between the implant platform and adjacent teeth CEJs have more radiographic bone loss. Deep implant placement may result in higher occurrence of radiographic evidence of bone loss.

References

