

Effect of Drilling Speed on Stability of Short Implants with Different Diameters

Zhong Wang¹, Karen Li², Georgios E. Romanos¹

¹Department of Periodontics and Endodontics, Stony Brook University, Stony Brook, NY, USA

²College of Letters and Science at UCLA, Los Angeles, CA, USA

INTRODUCTION

Primary stability (PS) of implants can be defined as how well the mechanical engagement is between the implant and the surrounding bone at the time of implant placement.

OBJECTIVE

The purpose of this study was to evaluate PS of short implants in artificial soft bone with various drilling speeds and implant diameters

MATERIALS & METHODS

120 total implants (ImplantSwiss, Novodent, Yerdon-les-Bains, Switzerland) were placed in polyurethane soft bone at various drilling speeds of 50, 800, 1,500 and 2,000 RPM. Two different diameter short implants were evaluated (4.3 x 5mm and 4.8 x 5mm); 60 implants were placed for each implant diameter; 15 implants were placed per drilling speed (50, 800, 1,500 and 2,000 RPM).

The PS of each implant was evaluated using insertion torque (IT) values and RFA (Figure 1) to determine the implant stability quotient (ISQ) of the implants. Statistical analysis with repeated ANOVA (analysis of variance) was used to compare implant stability between implant diameter and drilling speeds.

STUDY DESIGN



Fig. 1A. Ostell device used to evaluate PS of implants via RFA (Resonance Frequency Analysis)

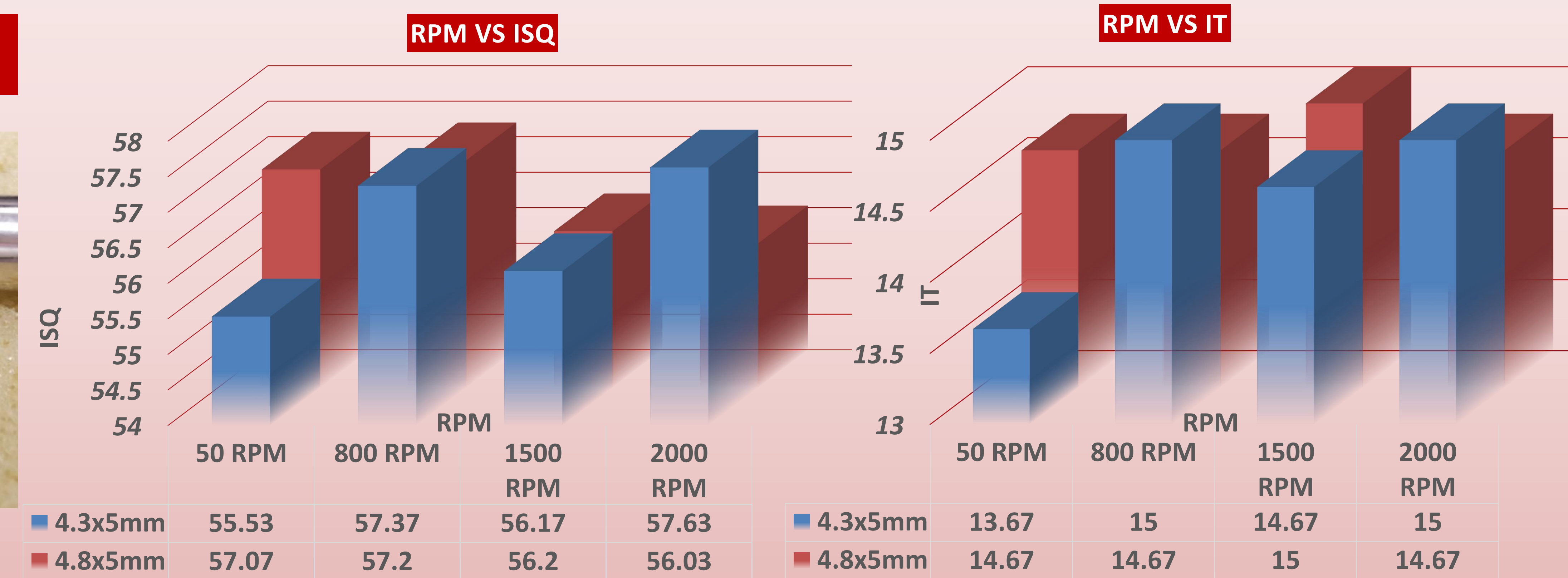


Fig. 1B. Short ImplantSwiss implants placement in Polyurethane soft bone resin block at bone level

RESULTS

All implants were mechanically stable. The mean insertion torque (IT) and ISQ for 4.3 x 5mm implants in soft bone using 50, 800, 1,500 and 2,000 rpm drilling speeds were 13.67, 15, 14.67, 15 (IT) and 55.53, 57.37, 56.17 and 57.63 (ISQ), respectively. Similarly, the mean IT and ISQ for 4.8 x 5mm implants in soft bone using 50, 800, 1,500 and 2,000 rpm drilling speeds were 14.67, 14.67, 15, 14.67 (IT) and 57.07, 57.20, 56.20, 56.03, (ISQ) respectively.

Statistically significant differences ($p < 0.001$) occurred only for ISQ in the 4.3 x 5mm implant group comparing between 50 and 800 rpm as well as 50 and 2000 rpm.



	4.3							
	1500rpm		2000rpm		50rpm		800rpm	
	Mean	Std	Mean	Std	Mean	Std	Mean	Std
IT	14.67	1.27	15	0	13.67	2.25	15	0
osstell	56.17	1.81	57.63	1.83	55.53	1.71	57.37	0.78
	4.8							
	1500rpm		2000rpm		50rpm		800rpm	
	Mean	Std	Mean	Std	Mean	Std	Mean	Std
IT	15	0	14.67	1.27	14.67	1.27	14.67	1.27
osstell	56.2	1.11	56.03	1.49	57.07	0.58	57.2	1.48

Comparing 4.3x5mm Mean Osstell ISQ values of different RPMs				
Observation #	RPM 1	RPM 2	Mean ISQ compare	Probt
1	50	800	55.53 vs. 57.37	<.0001
2	50	2000	55.53 vs. 57.63	<.0001

CONCLUSION

Within limitations of this study of a specific implant design, implant stability of short implants placed in soft artificial bone is not influenced significantly by different drilling speeds.