

# The Impact of PDL Versus RBM Implant Surface Treatment on Implant Stability During Healing: A Preliminary Clinical Study

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## ABSTRACT

**Background:** Implant surface treatment showed through years and impact on speed of peri-implant bone healing which affects the proposed loading protocol for each implant surface

**Objectives:** To assess the changes in implant stability quotient for laser treated implants (PDL) in comparison to standard sandblasted implant surfaces (RBM)

**Materials and methods:** 10 patients with bilaterally symmetrical edentulous sites were enrolled in a split mouth study. For each patient a PDL implant is inserted on one side and an RBM implant is placed in the contralateral side following the manufacturer protocol. The implant stability quotient is measured using RFA technique (Osstell) at implant insertion then 2,4,6 and 8 weeks postoperatively.

**Results:** The mean ISQ values at time of insertion were  $68.4 \pm 5.2$  and  $53.8 \pm 3.3$  for RBM and PDL implants respectively. At week 2 both implants showed insignificant changes in the mean ISQ. At week 4, RBM implant showed significant decrease in ISQ values  $62.6 \pm 5.6$ , while PDL showed significant increase  $63.5 \pm 4.1$ . For both weeks 6, and 8 ISQ in both groups showed significant increase  $66.2 \pm 4.7$  and  $66.7 \pm 3.9$  for RBM and PDL at week 6 respectively and  $70.1 \pm 3.4$  and  $70.9 \pm 5.4$  at week 8 for RBM and PDL implants respectively

**Conclusions:** Conventional sandblasted implant surface show implant stability dip from week 2-6 while PDL implants show gradual increase in stability throughout the healing phase. Despite the significant difference in ISQ value at insertion time both implants reach similar ISQ value at week 8

## RESULTS

The mean ISQ values at time of insertion were  $68.4 \pm 5.2$  and  $53.8 \pm 3.3$  for RBM and PDL implants respectively. At week 2 both implants showed insignificant changes in the mean ISQ. At week 4, RBM implant showed significant decrease in ISQ values  $62.6 \pm 5.6$ , while PDL showed significant increase  $63.5 \pm 4.1$ . For both weeks 6, and 8 ISQ in both groups showed significant increase  $66.2 \pm 4.7$  and  $66.7 \pm 3.9$  for RBM and PDL at week 6 respectively and  $70.1 \pm 3.4$  and  $70.9 \pm 5.4$  at week 8 for RBM and PDL implants respectively

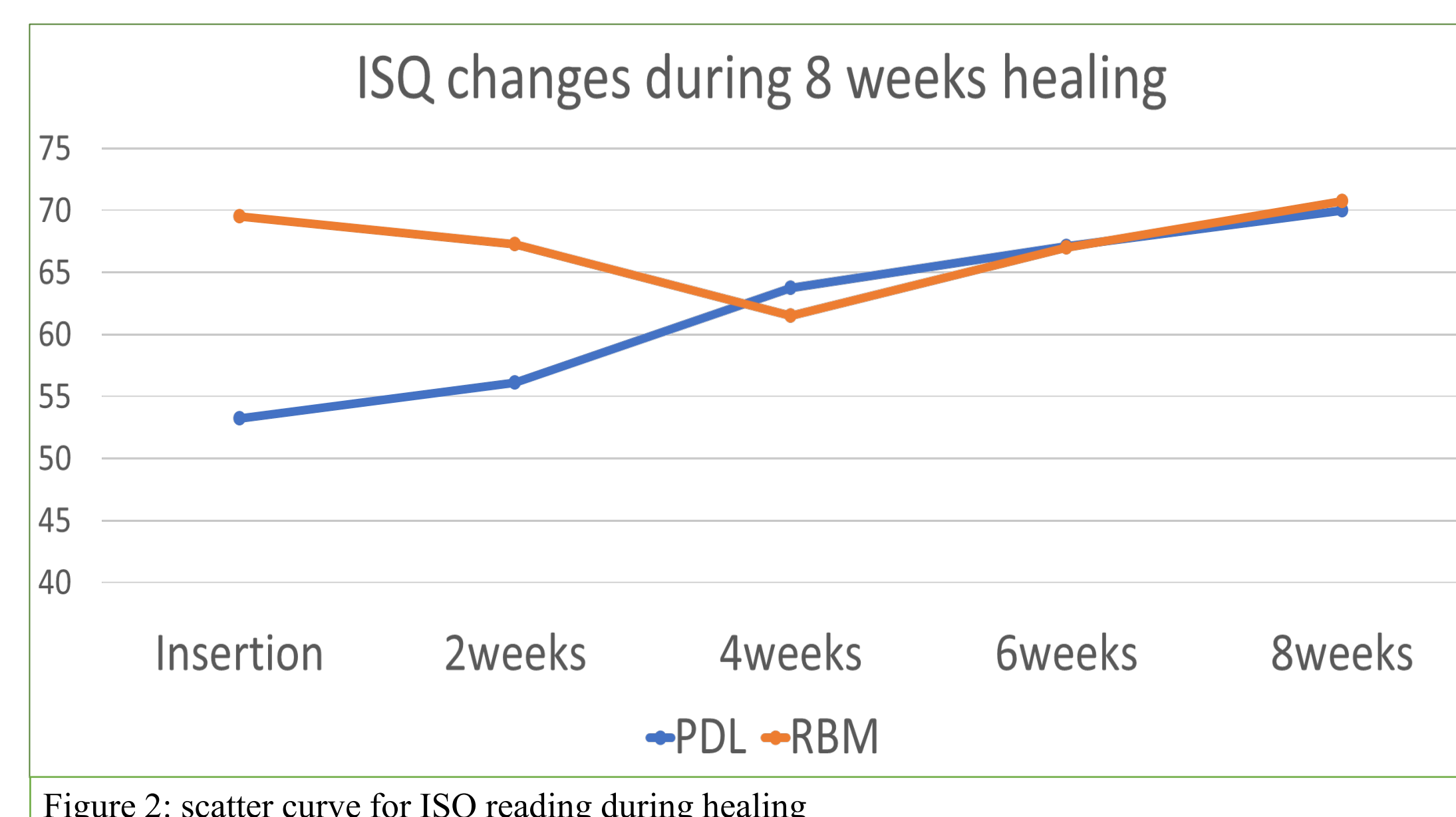


Figure 2: scatter curve for ISQ reading during healing

## INTRODUCTION

The surface treatment of dental implants showed tremendous revolutions since the early turned implant surface introduced by Branemark. Modern subtractive implant surface treatments aim to increase surface area and activity by providing surface roughness with higher hydrophilicity to blood to improve wetting. Improved wetting acts to improve bone deposition along the implant increasing bone to implant contact ratio (BIC). The variations in implant surface aims to increase BIC ratio and also to increase the speed of bone formation. This has dropped the required healing time from 6-9 months in turned surfaces to 2-3 months only for conventionally used micro roughened implant surfaces (RBM). Although the rate for bone formation for RBM is much faster turned surfaces, still, the pattern of bone remodeling and new formation increased it is characterized by a stability dip between week 2 and 6. Such a dip has an impact on early and immediate loading protocols for such surfaces. Additionally, great concerns face such surfaces due to difficulties of post treatment cleaning. The introduction of precision dimension laser implant surfaces has been suggested to provide a clean uncontaminated implant surface with regular controlled rough surface with a claim of faster bone formation<sup>1</sup>. Studies on the clinical impact of such PDL surface on clinical implant stability are still scarce.

## AIMS

To evaluate the changes in implant stability quotient of PDL versus RBM implants during the healing period

## METHODS AND MATERIALS

Ten patients with bilaterally symmetrical edentulous sites were enrolled in a split mouth study. For each patient a PDL implant is inserted on one side and an RBM implant is placed in the contralateral side following the manufacturer drilling and insertion protocol (figure 1). The implant stability quotient is measured using RFA technique (Osstell) at implant insertion then 2,4,6 and 8 weeks postoperatively.

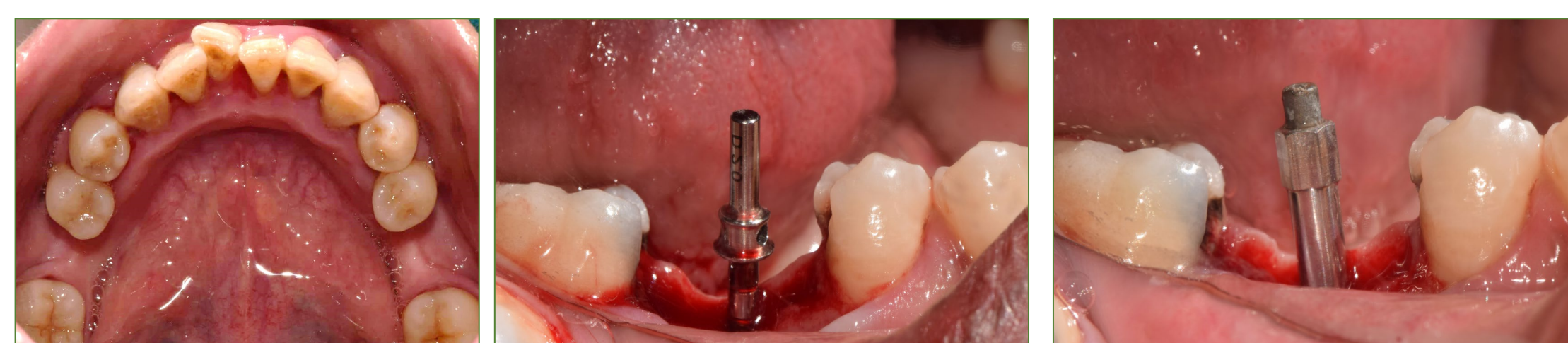


Figure 1: test and control implants are placed in bilateral symmetrical cases and ISQ is measured

## DISCUSSION

The selection of a split mouth strategy aimed to standardize many factors as patient sex, bone quality and healing potentials among other cofounders. The initial ISQ showed significant difference between groups. This can be contributed to the different drilling protocols and osteotomy to implant size difference suggested by the two different manufactures. For the PDL implant the manufacturer suggest smaller osteotomy to implant difference to allow for hand driven insertion with a torque as low as 30 Ncm to avoid bone over compression. Thus the recorded ISQ at insertion was lower than the RBM implant with greater osteotomy to implant difference. During the first 8 weeks of healing the initial mechanical stability is lost due to osteoclastic activity of the native bone. This causes a drop in the clinical implant stability which is verified by drop of ISQ values. For the RBM implant surfaces the formation of new is usually delayed to week 4-6. The new bone formation cause gradual increase in clinical stability from week 4 till optimum ISQ is regained at week 8. For the PDL surfaces the implant did not show a similar loss of clinical stability. This can be attributed to either slower rate of bone resorption or faster rate of bone formation or both. As the implants are inserted with less pressure the surgical insult is thought to be minimal resulting in less severe bone remodeling process. Additionally, the suggested PDL surface treatment seems to promote faster bone formation starting immediately after implant placement<sup>2</sup>. This was clinically evident by the gradual rise in ISQ values for PDL implants throughout the healing period without stability drop from week 2-6.

## REFERENCES

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