

# Topography analysis and surface alteration after insertion of laser surface treated implant: a preliminary study

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## INTRODUCTION

Implant surface manifestation after placement was not well understood. Surface alteration may arise after insertion, and especially in case of accidentally multiple re-insertion. The present study aims to describe surface character and measure surface topography of laser surface treated implant before used, after single insertion, and reinsertion.

## METHODS AND MATERIALS

Ten 4.0 x 10 mm Biomate plus dental implants were placed into D2 bone blocks from porcine lesser pelvic either once (group a; 5 implants, single insertion) or twice (group b; 5 implants, insertion + removal + reinsertion 2 mm deeper). The insertion torque was controlled within manufacture recommendation. Then, they were removed and cleaned under distilled water and acetone. (Fig. 1) Consequently, They were assessed surface morphological and topographical alteration compared with control implants.

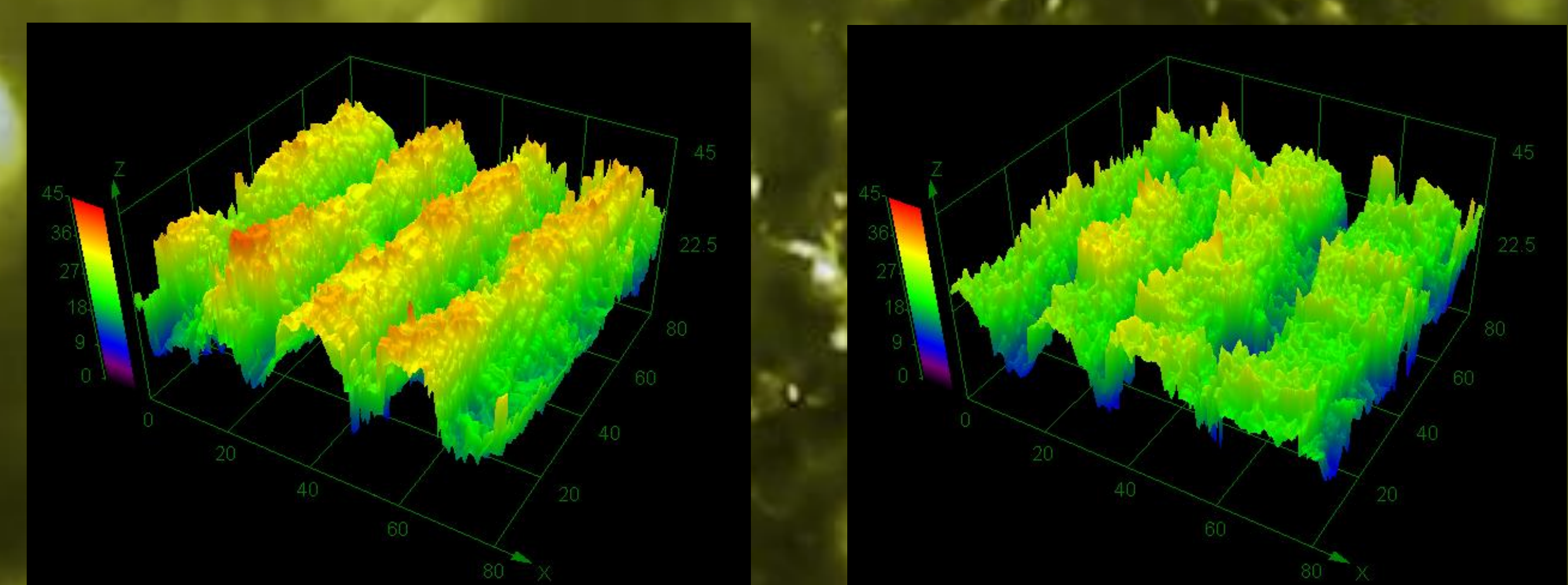
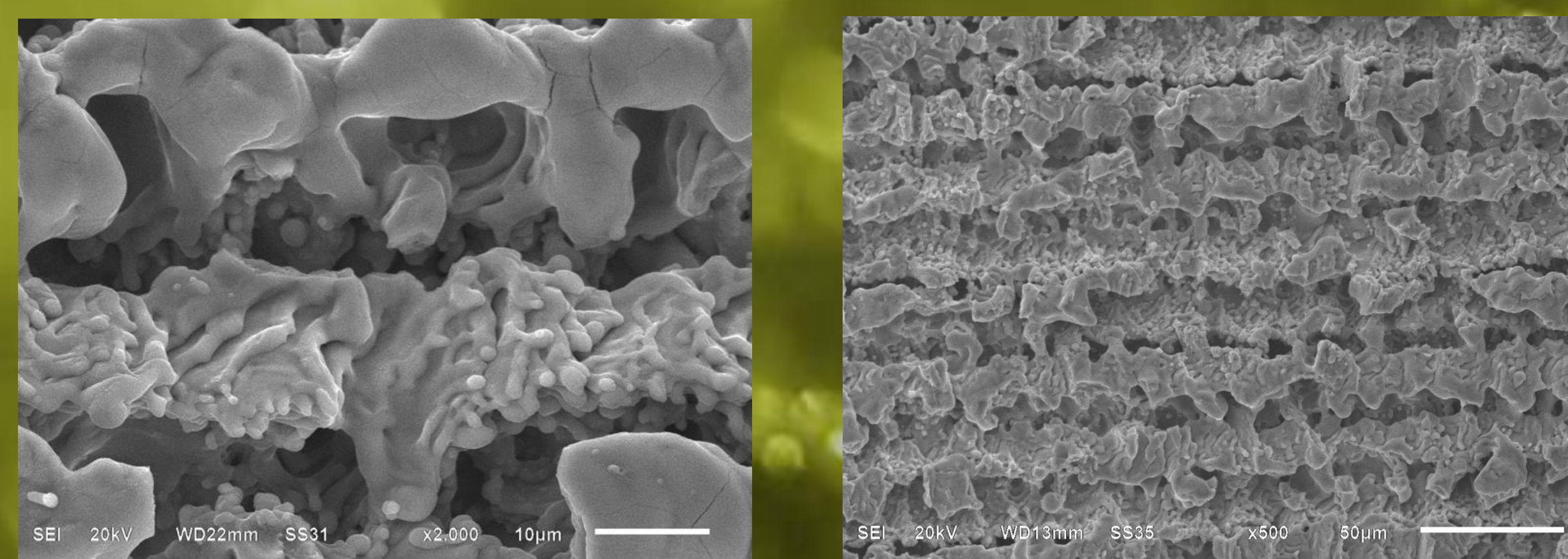
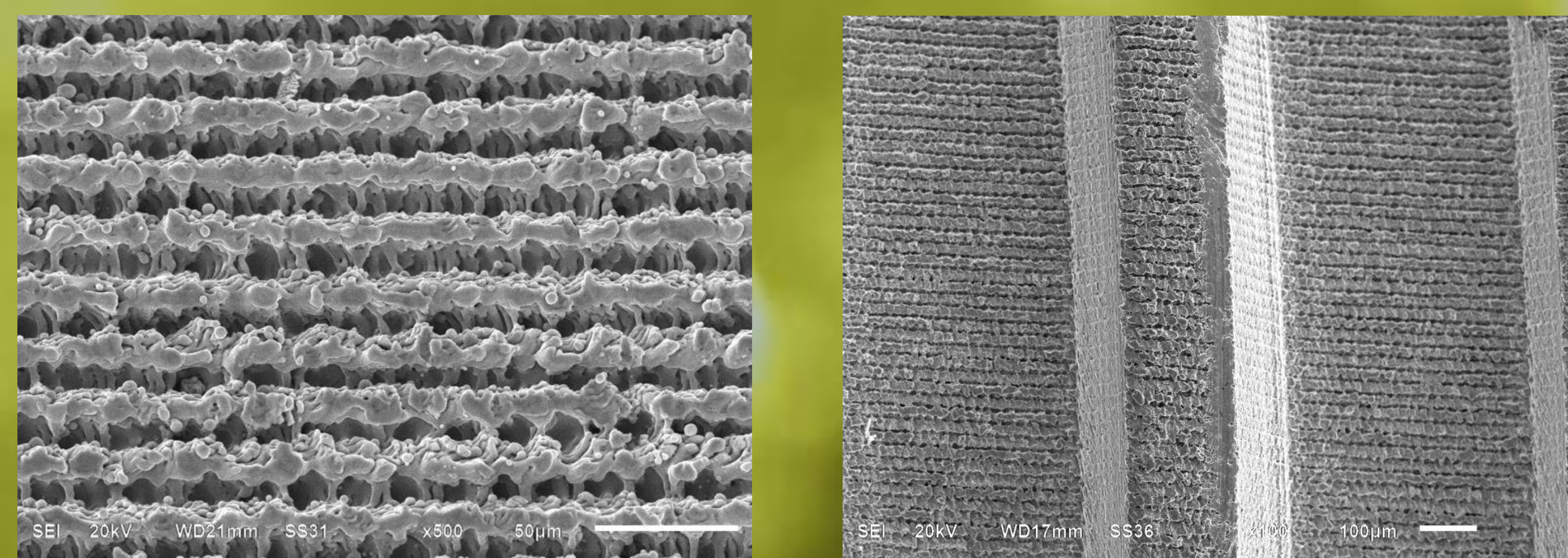
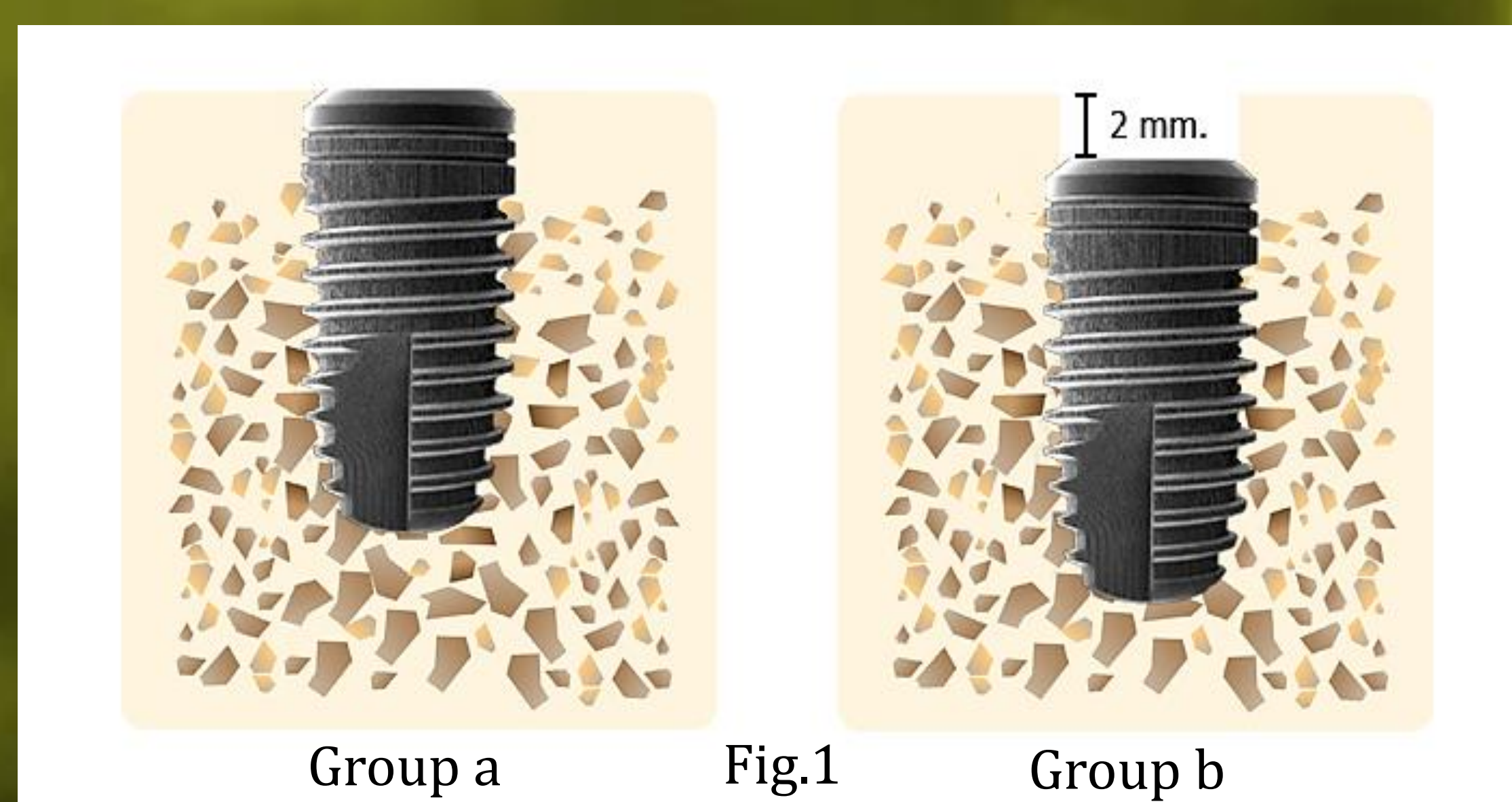


Fig. 2 Surface morphology and topography before (left) and after insertion (right)

## RESULTS

Scanning electron microscope (SEM) revealed two levels of roughness. First, a homogeneous micro groovy pattern which each groovy unit consisted top, cliff, and valley of 20-30  $\mu\text{m}$  width. Second, at high magnification, submicron knobby-like pattern was seen. Topography presents in Table 1. After the implants were inserted, scanning electron micrograph showed discontinuity of surface pattern from abrasion, especially at thread top. Although the surface was partially abraded, roughness at the cliff and bottom remained. The difference between single and reinsertion group was not noticed. Sa decreased 15-17% and surface area decreased 5-6% which were significantly different from the control group but not significant between test groups. (Fig. 2)

Table 1. Surface topography before, after single, and reinsertion.

Parameters	Control	Single insertion	Reinsertion
S-ratio	4.46 $\pm$ 0.38	4.24 $\pm$ 0.41*	4.21 $\pm$ 0.40*
Sa ( $\mu\text{m}$ )	5.21 $\pm$ 0.77	4.41 $\pm$ 0.94*	4.32 $\pm$ 0.90*
Ssk	-0.40 $\pm$ 0.20	-0.36 $\pm$ 0.23	-0.35 $\pm$ 0.23
Sku	2.49 $\pm$ 0.33	2.90 $\pm$ 0.91	2.98 $\pm$ 0.95
Str	0.18 $\pm$ 0.03	0.20 $\pm$ 0.10	0.21 $\pm$ 0.10

Mean values  $\pm$  standard deviations shown.

\* significant difference from control ( $P < .05$ ).

Parameter definition sees Liam Blunt KS, Dong W, Mainsah E, Luo N, Mathia T, Sullivan P, et al.

Development of methods for the characterisation of roughness in three dimensions. London: Butterworth/Heinemann; 2006.

## DISCUSSION

This study was the first study which investigated laser treated surface after insertion and effect of multiple insertion. Previous studies examined surface alteration in anodized and sandblasted acid etched implant and reported crack, smoothed, and chipping surface after insertion in plastic and bone block.<sup>1,2,3</sup> They also found the change of topography parameters. According to the results, non-clinical implant surface research may not truly reflect clinical relevant because physical and chemical properties changed during insertion. Reinsertion, followed manufacture protocol, was minimally harmful the surface. In addition, other implant surfaces are going on investigation.

## CONCLUSIONS

Laser treated implant had notable surface character. After insertion, surface alteration was minimally found under SEM. The roughness height and surface area decreased after insertion. Reinsertion did not jeopardize the surface.

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