

Fatigue performance of the On1™ restorative system

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Introduction

- The On1™ (Nobel Biocare AB, Gothenburg, Sweden) restorative concept uses a final two-piece abutment that raises the prosthetic interface from bone level to tissue level.
- The On1 base, placed at the time of surgery, provides restorative flexibility (Figure 1).
- This concept avoids repeated disruption of the peri-implant soft-tissue interface by the disconnection and reconnection of healing abutments common in traditional protocols [1].
- Although comparative reports are few, fatigue resistance has been shown to be higher for a two-piece zirconia abutments compared to traditional one-piece system [2].

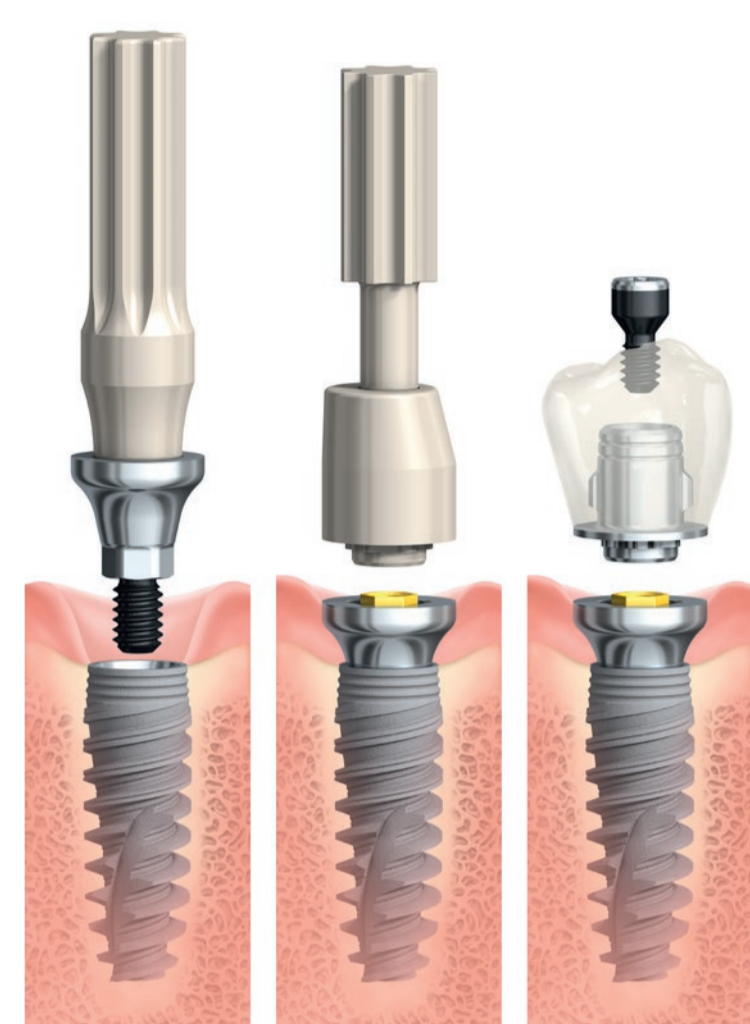


Figure 1: Prosthodontic procedure with the On1 concept.

In contrast to the traditional prosthodontic procedure for a bone-level implant, the base of the On1 abutment is installed at implant placement and is never removed thus implant is bone level and soft tissue is fully preserved.

Objective

This study evaluates and compares fatigue performance of the On1 restorative system to one-piece systems in clinical use.

Materials and methods

- Fatigue performance of the On1 1.75mm base narrow (NP) and regular platform (RP) systems on conical connection (CC) implants was assessed according to ISO 14801 (Figure 2).
- Testing in saline solution at 37°C; Frequency: 2 Hz; Run-out Cycles: 2'000'000
- Evaluation of screw residual torque after testing
- Results were compared with:
 - NP and RP one-piece titanium Snappy™ Abutments (Nobel Biocare AB, Gothenburg, Sweden) on CC (TI-snappy), and
 - NobelProcera® Zirconia Abutments (Nobel Biocare AB, Gothenburg, Sweden) on internal tri-channel connection implants (ZI-NobelProcera).
- Maximum load levels of NP and RP groups were compared using Kaplan-Meier test.

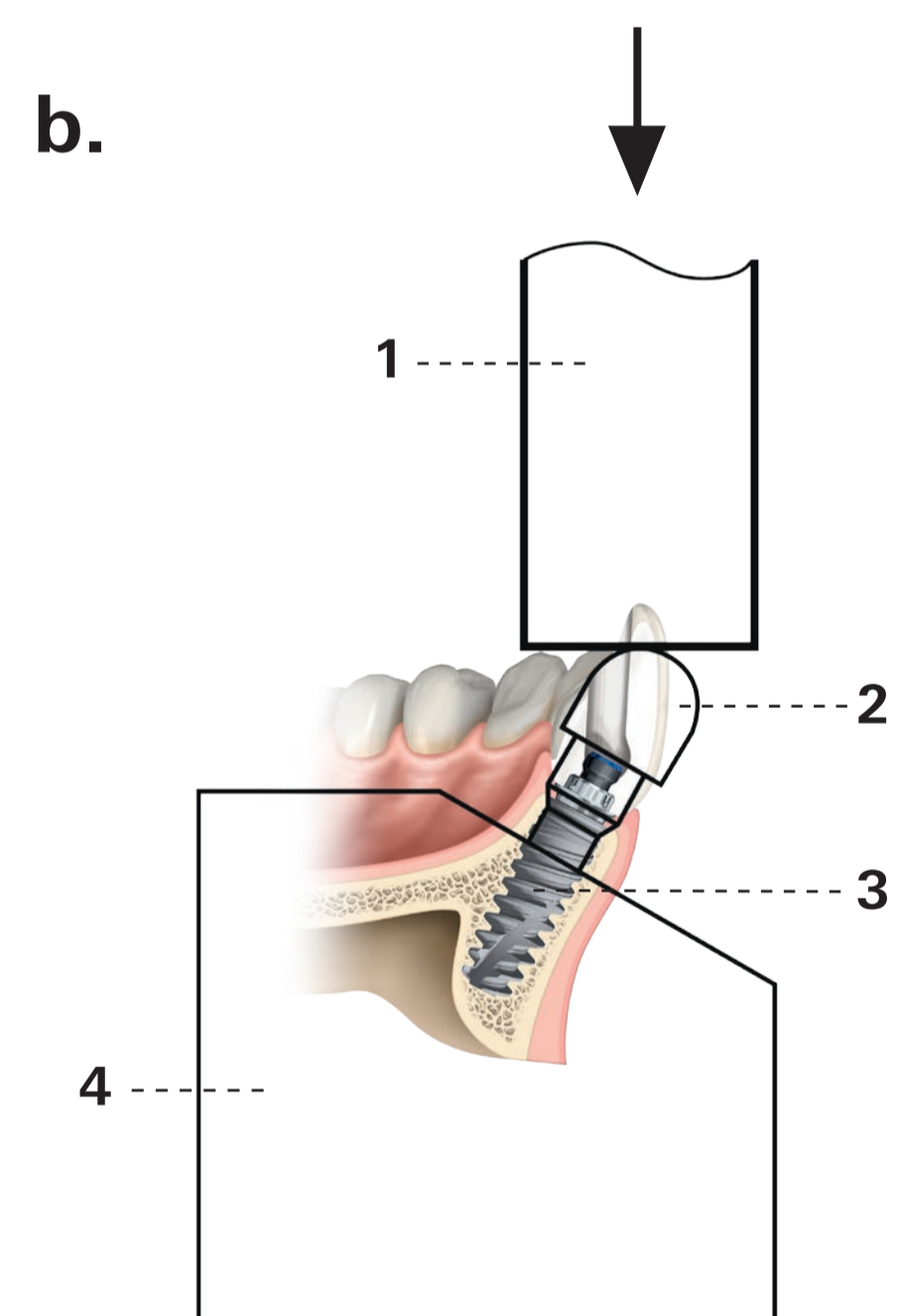
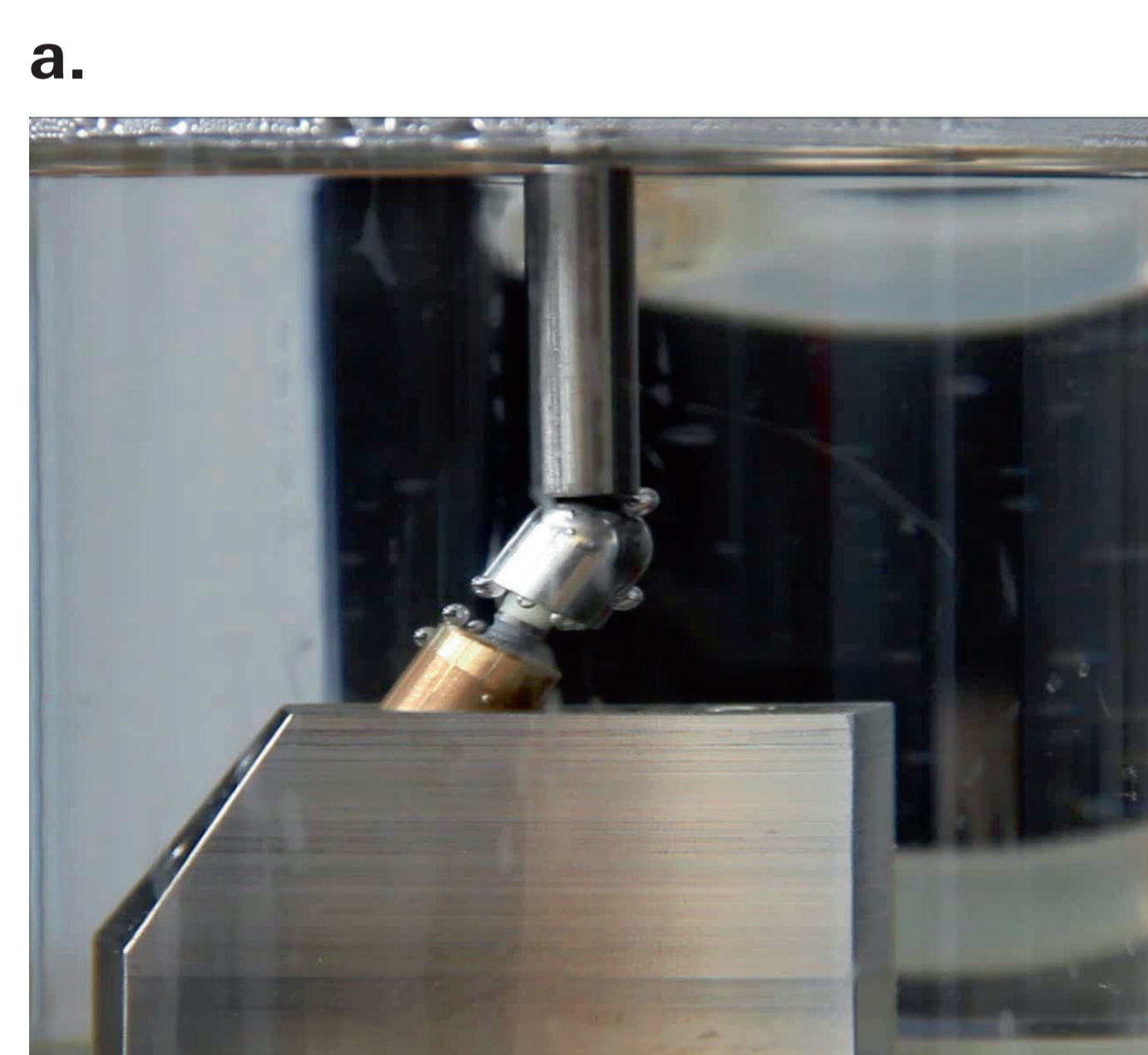


Figure 2: ISO 14801 assessment setup

- a) Dynamic tension compression test in saline solution at 37°C.
 b) Sketch of the test system overlaid with a NobelActive RP 5.0 x 18 mm in jaw.
 (1) Loading device, (2) loading member (3) implant body, (4) specimen holder.

Results

- The fatigue limit of On1 NP ZI exceeded the fatigue limit of On1 NP TI, therefore TI systems were selected as worst case scenario for analysis (Figure 3).
- The fatigue limit of the On1 TI NP and RP was 205N and 250N, respectively.
- The median fatigue limit of On1 TI NP was 24% and RP was 34% greater than the reference one-piece ZI system (ZI-NobelProcera).
- On1 maximum load levels outperformed the one-piece ZI system (ZI-NobelProcera) significantly in fatigue performance for both NP (P<0.001) and RP (P=0.004).
- Maximum load levels of the two-piece system were lower than the one-piece TI system (TI-snappy) in RP (p<0.05), but slightly higher than NP (p<0.001).

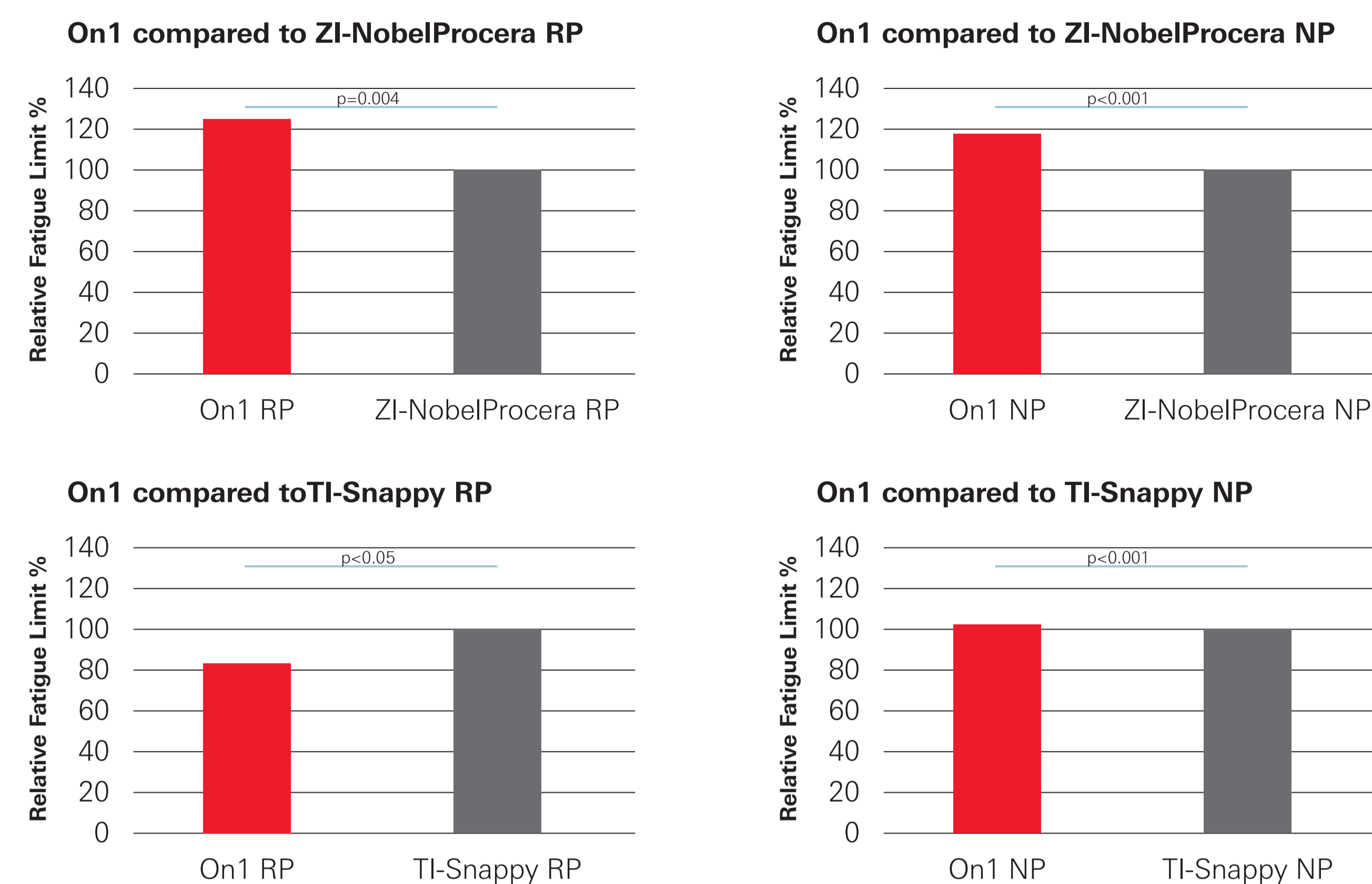


Figure 3. Relative fatigue limit of the reference system normalized to 100% in each case to show the relative performance of On1 system.

Clinical case

- Patient: Female, 36 year old
- Clinical situation: Missing tooth after extraction of lower left second molar
- Surgery date and total treatment time: August 30, 2016; 3 months – implant placement to final functional prosthesis
- Surgical solution: NobelReplace CC RP 5 x 10 mm; On1 Base CC RP 1.75 mm; On1 Healing Cap RP 1.5 mm
- Restorative solution: On1 Universal Abutment RP 0.3 mm with a full-contour zirconia crown

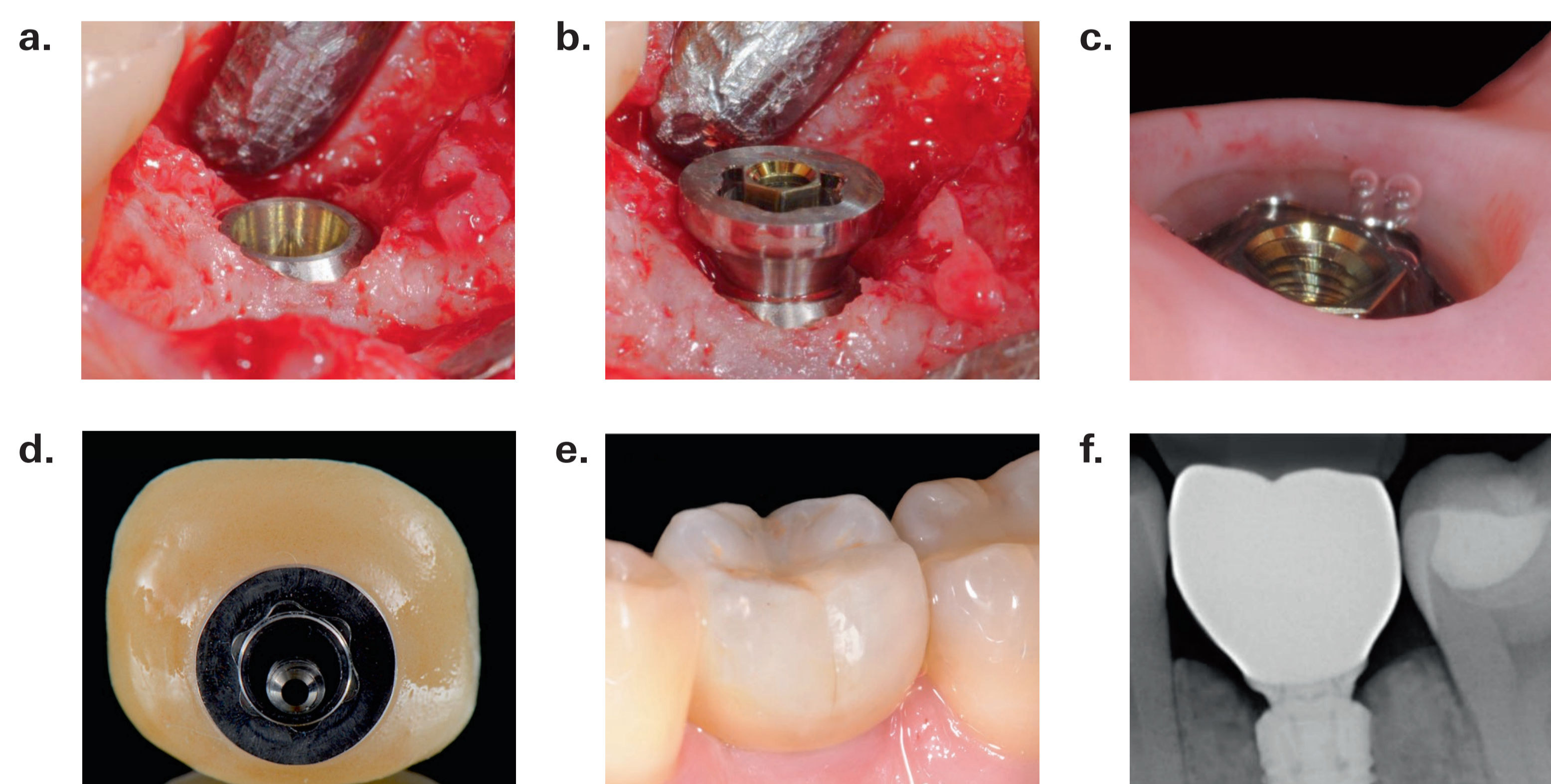


Figure 4. Clinical case representing On1 concept.

- a) A NobelReplace CC implant is placed (torque 35Ncm) slightly below the residual bone crest in order to maintain a soft tissue thickness of 3 mm above the implant platform.
 b) An On1 base is placed on the implant (torque 35Ncm).
 c) Eight weeks after the implant surgery, the soft tissue shows good healing after removal of the On1 healing cap.
 d) The final restoration, a monolithic screw-retained full-contour zirconia prosthetic, cemented onto the On1 universal abutment.
 e) Intraoral view of the final prosthetic outcome (screw access hole was closed with Teflon and composite).
 f) X-ray evaluation after one month of function.
 Case report courtesy of Dr. Giacomo Fabbri (Italy).

Conclusions

- The two-piece On1 restorative concept preserves both soft tissue attachment and restorative flexibility.
- Fatigue performance of the On1 restorative system was superior to a well-documented one-piece zirconia abutment system with proven long-term clinical performance.

References

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2. Gehrke P, Johannson D, Fischer C, Stawarczyk B, Beuer F. In vitro fatigue and fracture resistance of one- and two-piece CAD/CAM zirconia implant abutments. Int J Oral Maxillofac Implants. 2015 May-Jun;30(3):546-54.

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