CASE REPORT
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# Repeated Abutment Screw Fracture during Implant-Supported Prosthesis Fabrication Due to Internal Fixture Defect: A Case Report and Management Strategy

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## Abstract

**Objectives:** Dental implants have a high success rate for patients without teeth. However, complications can occur, particularly those related to mechanical issues such as abutment screw fractures. This case report presents an unusual incident of repeated abutment screw fracture during the impression and prosthesis fabrication stages which can be considered the first reported case of screw fracture during the prosthetic fabrication, while it usually presents years after delivery. **Case:** A 65-year-old female patient presented with repeated fractures of the abutment screws during prosthetics procedures. The initial tightening of the abutment to 32 N caused the fracture, and subsequent analysis revealed defects in the internal surface of the patient's fixture that correlated with the abutment screw fractures. In a conservative management approach, transitioning to a lower torque abutment setting (20 N) was successful without complications. **Conclusion:** This case highlighted the critical importance of examining the internal structure of dental implants during complication management. The implant's internal surface defects indicate a potential relationship between incorrect insertion torque and mechanical failures.

**Keywords:** Dental Implants; Abutment Screw Fracture; Torque Management; Mechanical Failure

## Introduction

Dental implants are a widely accepted and reliable treatment for partially or completely edentulous patients, with success rates ranging from 97% to 99%.[1, 2] However, despite their efficacy, biomechanical and biological complications can potentially impact long-term outcomes.[3, 4]

Complications associated with implant-supported prostheses can be broadly categorized into biological and biomechanical categories. Biological complications include peri-implant radiolucency, signs of peri-implantitis such as deepening of peri-implant pocket probing depths, and radiographic evidence of osseointegration loss, which includes horizontal bone loss and vertical defects. Biomechanical complications, on the other hand, encompass issues such as loss of crown retention, screw loosening, and fractures of porcelain, framework, or screws.[5, 6]

Among these biomechanical challenges, abutment screw fractures are concerning, with an incidence ranging from 0.5% to 8%. These fractures can occur due to various factors, including patient-related factors such as bruxism, which exerts excessive occlusal forces, and variations in bone density that affect implant stability and stress distribution. Additionally, defective design of prosthetic superstructures may lead to uneven load distribution. On the other hand, component misfit, often resulting from inaccuracies in the impression or fabrication process, can create stress concentrations that lead to screw fracture. Mechanical factors, such as excessive loading beyond the biomechanical limits of the implant system, also play a crucial role, especially when occlusal schemes are not optimized or in the presence of parafunctional habits. Furthermore, metal fatigue resulting from repeated loading cycles can lead to the accumulation of microscopic cracks, particularly in screws that have previously experienced loosening and subsequent tightening.[6-8]

Management of fractured abutment screws presents a significant clinical challenge, mainly when the fracture occurs below the implant head. In such cases, conservative attempts to retrieve the fractured screw are initially employed. However, if these efforts are unsuccessful, more specialized retrieval systems may be necessary to remove the broken fragment without damaging the internal surface of the implant.[9]

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This case report described a 65-year-old female patient presenting with recurrent abutment screw fractures. To our knowledge, this case report represented the first instance of an abutment screw fracture during impression taking and the prosthetic procedure before delivery of the final prosthesis. This case strongly indicated that the sole reason for the screw fracture was internal deformities of the fixture, resulting in repeated fractures of the abutment screw even when subjected to the recommended torque specified by the manufacturing company. An investigation into the internal structure of fixtures and subsequent management strategies highlights the critical role of mechanical and potential defects in these complications.

## Case Report

A 65-year-old woman visited the Department of Prosthodontics at Shahid Beheshti University, Faculty of Dentistry, Tehran, Iran. She was fully edentulous with seven Neodent Grand Morse implants (Straumann Group; Curitiba, Brazil) in the maxilla (sites 3,4,6,8,10,11,14) and eight in the mandible (sites 30,28,27,26,23,22,21,19). The treatment plan involved screw-retained, implant-supported fixed prosthetics using Neodent GM Mini Conical abutments (Straumann Group; Curitiba, Brazil).
All implants were approximately parallel, and one-piece, non-hex multiple abutments were selected with appropriate gingival heights. Following the manufacturer's instructions, the abutments were tightened to 32 N using a Neodent external driver and torque meter (Straumann Group; Curitiba, Brazil). The abutment at site 8 in the maxilla fractured at the first thread, which can be categorized as an ASF3 fracture.[10] (Figure 1)

**Figure 1: Clinical photograph showing the fractured abutment in situ at site 8 in the maxilla.**

Following the protocol described by Mizumoto et al. [9], the level of the fractured screw was first confirmed with periapical radiographs (Figure 2). The fractured fragment was slightly mobile and exhibited an uneven surface. With counterclockwise rotation, the fragment was retrieved using a dental explorer (TU17/23 double-ended explorer; Hu-Friedy Manufacturing, Co., Chicago, IL, USA).[11]
A new Neodent GM mini abutment (Straumann Group; Curitiba, Brazil) was placed and tightened to 32 N. This second abutment also broke at the first thread and was retrieved similarly. This repeated fracture raised concerns about possible defects in the fixture.

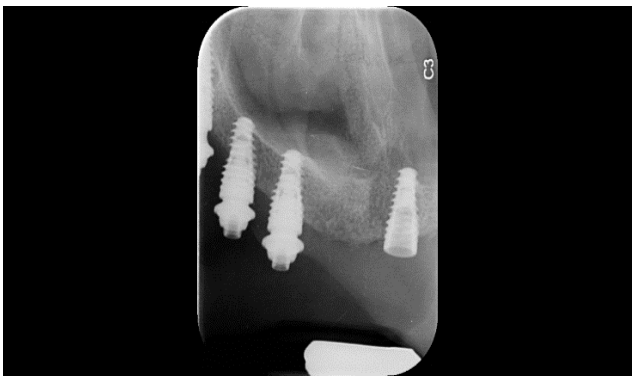


**Figure 2: Periapical radiograph demonstrating the fractured abutment screw within the implant at site 8.**

To investigate further, an impression of the fixture's internal surface was made using Panasil light body silicone impression material (Kettenbach Dental, US), as shown in Figure 3. The internal surface was subsequently examined with an endoscopic microscope (Zeiss, Germany) and compared to an impression from a new, intact Neodent GM fixture (Straumann Group; Curitiba, Brazil). The examination revealed defects on the internal surface of the patient's fixture, possibly due to insertion torque or manufacturing flaws. The fractured abutment also showed similar surface and first thread defects, as illustrated in Figure 4.

3A:

3B:

**Figure 3: Clinical photographs showing impressions of the**

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**internal surface of implants. (A) Impression of the internal surface of a normal, intact implant. (B) Impression of the internal surface of our patient's implant, showing visible defects.**

4A: 

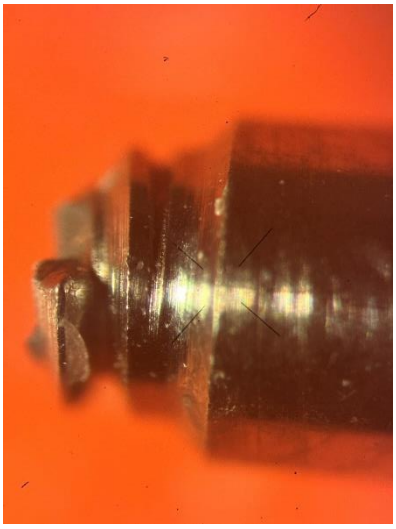
4B: 

**Figure 4: Microscopic images showing (A) defects on the internal surface of the patient's fixture, (B) defects on the fractured abutment surface and first thread.**

The GM mini conical abutment was replaced with a GM abutment tightened to 20 N torque to prevent explantation. The restoration was successfully designed and delivered, with a one-year follow-up with no complications.

## Discussion

The current case highlighted the challenges of managing abutment screw fractures, particularly during the prosthesis fabrication process. Most existing literature focus on screw fractures after prosthesis delivery. This case, in contrast, highlighted the potential for complications during the prosthetic treatment workflow.[12] The repeated fracture of abutment screws at the same site indicated a local issue. Our microscopic examination revealed defects in the fixture's internal surface and the fractured abutments, possibly responsible for the fractures near the 32 N torque threshold. Notably, the defect in the abutment was found to correspond precisely to the defect in the fixture, indicating that the abutment defect was a direct result of the fixture defect. The defect in the fixture was probably due to improper insertion torque, but manufacturing errors could also be responsible. Considering the precision of the manufacturing process; however, the insertion torque was likely responsible.

Our approach to managing this complication aligned with the risk-based decision tree proposed by Mizumoto et al. [9]. Before more detailed investigations, conservative approaches were initially employed with basic dental instruments for retrieval, which proved successful. The decision to switch to an abutment with a lower recommended torque (20 N) facilitated treatment without requiring more invasive approaches. Nonetheless, the impact of high insertion torque values on the internal surfaces of dental implants should not be ignored. Brancacci et al. demonstrated that insertion torques above 45 Ncm can significantly deform the internal fixture surface, particularly at the connection areas.[13] Moreover, Gehrke et al. reported that torque values surpassing 80 Ncm could result in the rounding of the fitting systems and cracks. This is especially true for implants with smaller diameters, such as 3.5 mm, which are more susceptible to deformation under high torque conditions.[14] In the current case, the implant diameter was 3.75 mm, indicating that similar defects could arise from high insertion torque. These findings emphasized the necessity of adhering to recommended torque protocols during implant placement to minimize surface damage and to improve long-term viability.

As for the limitations of the study, first, we identified internal fixture defects as the primary cause of abutment screw fracture, and other potential contributing factors may have been overlooked. Second, while our findings suggested that reduced torque values may be practical in some contexts, the long-term outcomes of this approach necessitate further investigation and extended follow-up beyond the one year reported in this study. Continued monitoring and evaluation are critical in understanding torque adjustments' true implications on implant-supported prostheses' longevity and success.

## Conclusion

This case report highlighted the impact of internal implant defects on abutment screw fractures during prosthesis fabrication. It emphasized the need for adherence to recommended insertion torque protocols and thorough internal examinations to address mechanical failures. The resolution of the issue by adjusting the abutment screw torque to 20 Ncm can be a potential corrective strategy.

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While our findings demonstrated that modification of torque values could be beneficial, further research is essential to explore the long-term outcomes of proper insertion techniques and optimized abutment screw torque. Additional research can clarify the primary causes of internal fixture defects and identify methods to improve the longevity of implant-supported prostheses. This case highlighted the ongoing challenges in implant-supported prosthesis management and the need for continuous investigations for patient outcomes.

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**Author Contributions:**

S.S: Formal Analysis, Investigation, Resources, Data Curation, Writing – Original Draft and R.E.A: Conceptualization, Methodology, Validation and N.N: Writing – Review & Editing, Visualization, Supervision.

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**Ethical Approval Code:**
Informed consent was obtained from all subjects involved in the study.

**Informed Consent Statement:** Written informed consent was obtained from the patient for publication of this case report and accompanying images.

**Using AI:** Authored without the use of AI tools.

**Data Availability Statement:** Data Availability Statement: The datasets generated during and/or analyzed during the current study are available from the corresponding author upon reasonable request.

**Conflict of Interest:** No conflicts of interest to declare.

## References

1. Adell R, Lekholm U, Rockler B, Brånemark PI. A 15-year study of osseointegrated implants in the treatment of the edentulous jaw. Int J Oral Surg. 1981;10(6):387-416. doi: 10.1016/s0300-9785(81)80077-4
2. Resnik RR, Misch CE. Misch's contemporary implant dentistry. [St. Louis]: Elsevier; 2021.
3. Lindquist LW, Carlsson GE, Jemt T. A prospective 15-year follow-up study of mandibular fixed prostheses supported by osseointegrated implants. Clinical results and marginal bone loss. Clin Oral Implants Res. 1996;7(4):329-36. doi: 10.1034/j.1600-0501.1996.070405.x
4. Ekelund JA, Lindquist LW, Carlsson GE, Jemt T. Implant treatment in the edentulous mandible: a prospective study on Brånemark system implants over more than 20 years. Int J Prosthodont. 2003;16(6):602-8.
5. Brägger U, Aeschlimann S, Bürgin W, Hammerle C, Lang N. Biological and technical complications and failures with fixed partial dentures (FPD) on implants and teeth after 4 to 5 years of function. Clin Oral Implants Res. 2001;12:26-34. doi: 10.1034/j.1600-0501.2001.012001026.x
6. Schwarz MS. Mechanical complications of dental implants. Clin Oral Implants Res. 2000;11 Suppl 1:156-8. doi: 10.1034/j.1600-0501.2000.011s1156.x
7. Eckert SE, Meraw SJ, Cal E, Ow RK. Analysis of incidence and associated factors with fractured implants: a retrospective study. Int J Oral Maxillofac Implants. 2000;15(5):662-7.
8. Bakaeen LG, Winkler S, Neff PA. The effect of implant diameter, restoration design, and occlusal table variations on screw loosening of posterior single-tooth implant restorations. J Oral Implantol. 2001;27(2):63-72. doi: 10.1563/1548-1336(2001)027<0063:TEOIDR>2.3.CO;2
9. Mizumoto RM, Jamjoom FZ, Yilmaz B. A risk-based decision making tree for managing fractured abutment and prosthetic screws: A systematic review. J Prosthet Dent. 2018;119(4):552-9. doi: 10.1016/j.prosdent.2017.05.016
10. Chowdhary R, Sonnahalli NK, Gala JN. Implant abutment screw fracture and techniques of retrieval: a literature review based on a novel abutment screw fracture classification. J Osseointegr. 2023;15(1):32-9. doi: 10.23805/JO.2023.15.01.06
11. Melo Filho AB, Tribst JPM, Ramos NC, Luz JN, Jardini MAN, Borges ALS, et al. Failure Probability, Stress Distribution and Fracture Analysis of Experimental Screw for Micro Conical Abutment. Braz Dent J. 2019;30(2):157-63. doi: 10.1590/0103-6440201902401
12. Raju S, Nair VV, Karunakaran HK, Manjuran NG. Management of perishing implants with abutment screw fracture - A systematic review. J Indian Prosthodont Soc. 2021;21(3):229-39. doi: 10.4103/jips.jips_295_20
13. Brancacci E, García González S, Galve-Huertas A, Bennani A, Hernández Alfaro F, Aboul-Hosn Centenero S. Influence of Insertion Torques on the Surface Integrity in Different Dental Implants: An Ex Vivo Descriptive Study. Materials (Basel). 2023;16(6). doi: 10.3390/ma16062330
14. Gehrke SA, Pereira GMA, Gehrke AF, Junior NB, Dedavid BA. Effects of insertion torque on the structure of dental implants with different connections: Experimental pilot study in vitro. PLoS One. 2021;16(5):e0251904. doi: 10.1371/journal.pone.0251904

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