

Implant Body Fracture and Abutment Screw Loosening: Is It a Chicken and Egg Situation?

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Loosening of an abutment screw is a common complication of the implant-supported prosthesis.¹ The implant abutment screw-loosening incidence ranges between 7 and 11%, while the abutment screw fracture incidence was found to be 0.6%.² The implant body fracture and/or the abutment screw fracture are considered to be the most serious mechanical complications and they are very hard to manage clinically.³ Improper fit of the prosthesis, occlusal interference, inadequate seating of the abutment, and manufacturing errors are some of the causes that can result in an abutment screw fracture. Generally, the abutment screw fractures occur due to the screw loosening.⁴ However, the implant body fractures and its association with the abutment screw loosening have not been studied sufficiently.

Yu and Kim⁵ retrospectively evaluated the factors affecting implant body fractures with 13 implants in 12 patients. They observed the loosening of the screw, peri-implantitis, and loss of marginal bone before implant body fracture.⁵ Lee et al.⁶ retrospectively investigated fracture rates and risk indicators of total 19,006 implants supporting fixed prostheses in 5,124 patients at the Dental Hospital of Veterans Health Service Medical Center. The results indicated that the diameter, location, history of bone graft, and the presence of the microthreads were significantly correlated with the implant body fractures. Another retrospective cohort study by Tabrizi et al.⁷ estimated the incidence of implant fractures with 18,700 implants and found that only 37 (0.002%) implants had fractures with the 1–5-year risk of implant fracture was 0.38/1,000 and 1.46/1,000, respectively.

The majority of studies^{1,3,8–10} have evaluated the incidence rate, the risk factors, and management strategies of the abutment screw loosening and abutment screw fracture. Yang et al.³ retrospectively explored the predisposing factors and the cumulative mechanical complications of the implant-abutment connections at 1–9-year follow-up. A total of 25 (2.65%) cumulative abutment mechanical complications were observed in total of 945 implants in 495 patients. The abutment fracture was the most common complication ($n = 13$, 1.38%), followed by abutment screw loosening ($n = 12$, 1.27%). The gender, type of prosthesis, abutment design, and implant diameter were identified as the causative factors for abutment fracture. Huang and Wang¹ reviewed total of 99 articles for similar parameters and found that the internal connections, abutments with anti-rotational features, and conical designs have better resistance to screw loosening. The cantilever prostheses increase the risk of screw loosening.¹ Al-Zordk et al.⁸ evaluated, in *in vitro* study, the impact of the abutment angulation on loosening torque and torque loss in the prosthesis and abutment screws after ageing of the implant-supported prosthesis, and indicated that the screw loosening increases with increasing abutment angulations. Rizvi et al.⁹ reviewed

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a total of 40 studies on the types of implant-abutment connections in regard to the use of original and nonoriginal abutments. They observed that the original abutments showed better precision of fit, ability to resist microleakage, prevention of rotational misfit and micromotion, and fatigue strength compared with nonoriginal abutments. Sun et al.¹⁰ evaluated the influence of artificial saliva and mouthwash contamination on screw loosening and concluded that antimicrobial lubrication may improve the anti-loosening performance of abutment screws and prevent excessive wear on the threaded surface.

Misfitting of the superstructure can result in the loosening of the screws, reduced preload, and in some cases, significant stress around the implant.¹¹ This may be one of the causative factors of the implant body fracture. Referring to a personal experience, I was puzzled when almost nine implants in seven patients were referred to me for management of implant body fractures in the last 18 months at our International Medical University Oral Health Center. All these loose prostheses were either in the region of the second premolars or first or second molars. Coincidentally, most of these patients reported a prior history of loose prosthetic crowns or bridges, which they continued to carry in their mouth for a certain period (with or without using it for active chewing function). I was curious on the sequence of the events that happened in such patients, whether the loosening of the abutment screw led to the fracture of the implant body or the other way round? Apart from the loosening of the screw, researchers also found out that peri-implantitis and loss of marginal bone are also frequent causative factors for implant body fracture.⁵ Several other biomechanical factors, such as implant overloading, crown to implant ratio, implant diameter, location, history of bone graft, implant designs, and the presence of the microthreads may contribute to and are correlated with implant body fractures.⁶ Hence, the possibility of the implant body fracture as a first event before the abutment screw loosening

cannot be denied. And the puzzle is—could this be a “chicken and egg” situation? We could only assume that the occurrence of abutment screw loosening could be the first event before the implant body fracture based on the literature indicating the higher incidence rate of the screw loosening.² However, it is very difficult to predict which event happened first without exploring the other factors causing implant body fractures and without understanding the nature and severity of the screw loosening.

Several clinical symptoms before the implant body fracture can be predicted.⁵ Clinicians need to tighten the abutment screw to the recommended torque and increase the frequency of follow-ups to retighten the loosened screws in time.¹ There is a lack of comprehensive literatures for the mechanism of and factors associated with the loosening of the implant abutment screw and subsequent sequel of complications and their management strategies.

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