DENTAL IMPLANTS

What Are the Incidence and Factors Associated With Implant Fracture?

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Purpose: Implant fracture is a serious complication, which leads to treatment failure. The purpose of this study is to estimate the incidence of implant fractures and identify factors associated with them.

Materials and Methods: In this retrospective cohort study, the sample was derived from 2 implant centers. The predictors were grouped into the following categories: demographic, location of implant, physical characteristic of implant, implant-abutment connection, type of prosthesis, type of retention, and outcome variable (time to implant fracture). The Kaplan-Meier test was used to estimate implant survival. A Cox regression model was applied to evaluate the time-to-event effect of variables on implant fracture.

Results: Of 18,700 implants, 37 (0.002%) had fractures. The 1- and 5-year risk of implant fracture was 0.38 per 1,000 and 1.46 per 1,000, respectively. Implant fractures more often occurred in the premolar and molar area (94.6%) than in the anterior of the jaws. The Pearson correlation test did not show any correlation between age, implant diameter, or implant length and time of fracture ($P > .05$). Analysis of the data by the log-rank test showed a significant difference for survival between cemented and screw-retained crowns ($P = .001$). The Cox regression model showed a hazard ratio of 0.23 for tapered implants versus cylindrical fixtures and for screw-retained crowns (hazard ratio, 296.54) versus cemented crowns.

Conclusions: According to this study, conical implants and screw-retained prostheses may have lower survival rates due to implant fracture.

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Fixture fracture is an uncommon complication of dental implant treatments.[1] Implant fracture is nonetheless considered a failure.[2] Various factors have been suggested as possible etiologic causes of implant fractures such as implant design, passive fit of abutments, and biomechanical overload.[3] The incidence of fixture fracture varies. Berglundh et al[4] reviewed 159 articles on dental implant complications during a 5-year period and reported the prevalence of fixture fracture to be less than 1% (0.08 to 0.74%).

Fractures of dental implants are often associated with inflammatory reactions at the site of fracture. Bleeding on probing and bone loss are common clinical features of implant fractures.[1] Screw loosening occurs before implant fracture and may be a warning sign that the prosthetic structure should be realigned.[5] There have been few studies assessing factors relating to fixture fracture with a large study sample and long-term follow-up.[6] The timing of implant fracture after loading also has varied in reported studies.[7]

The study purpose was to address the following question: Among patients who have undergone dental implant treatments, what factors are associated with implant fracture? The null hypothesis was that various variables would not be an influential factor on the occurrence of fixture fractures. We sought to assess whether variables can affect the occurrence of dental implant fractures. Therefore, the aim of this study was to estimate the incidence of implant fractures and identify factors associated with fracture.

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UNCORRECTED PROOF

Materials and Methods

In this retrospective cohort study, the sample was derived from the population of patients referred to the Oral and Maxillofacial Surgery Department of Shahid Beheshti Dental School and GD Implant Clinic between September 1, 2000, and October 31, 2016. The medical ethics committee of our university approved the research. Patients eligible for study inclusion had missing teeth and underwent dental implant treatment. Patients were excluded from study enrollment if they had dental implant fracture due to trauma.

The predictive variables were as follows: demographic characteristics (age, gender), anatomy (location of implants), physical characteristic of implants (cylindrical or tapered, size, and shape), type of implant-abutment connection, type of prosthesis (single crown or multiple implants with fixed prosthesis or cantilever prosthesis), and type of retention (screw-retained or cement-retained prosthesis). The outcome variable was time to implant fracture.

STATISTICAL ANALYSIS

Statistical analyses were performed with SPSS software for PCs (version 21; SPSS, Chicago, IL). The independent *t* test was applied to compare the fracture times after implant loading. Analysis of variance was used to assess fracture time and implant sites, type of implant-abutment connection, and type of prosthesis. The Pearson correlation test was conducted to assess the correlation among fracture type, age, implant diameter, and implant length. The Kaplan-Meier test was used to estimate the risk of implant fracture. A Cox regression model was applied to evaluate the time-to-event effect of variables on implant fracture.

Results

The incidence of implant fracture was 37 of 18,700 implants (0.002%). Of the fractured implants, 27 were in male patients and 10 in female patients. The 1- and 5-year risk of implant fracture was 0.38 per 1,000 and 1.46 per 1,000, respectively. The mean age of the patients was 53.18 ± 9.8 years. The mean diameter Q8 of the implants was 3.86 ± 0.34 mm, and the mean implant length was 10.86 ± 0.34 mm. The follow-up time was 120 months for all patients. The mean time between loading and occurrence of implant fracture was 45.1 ± 31.44 months. Figure 1 shows the risk of implant fracture using the Kaplan-Meier test. The fractured implants had 4 various implant-abutment

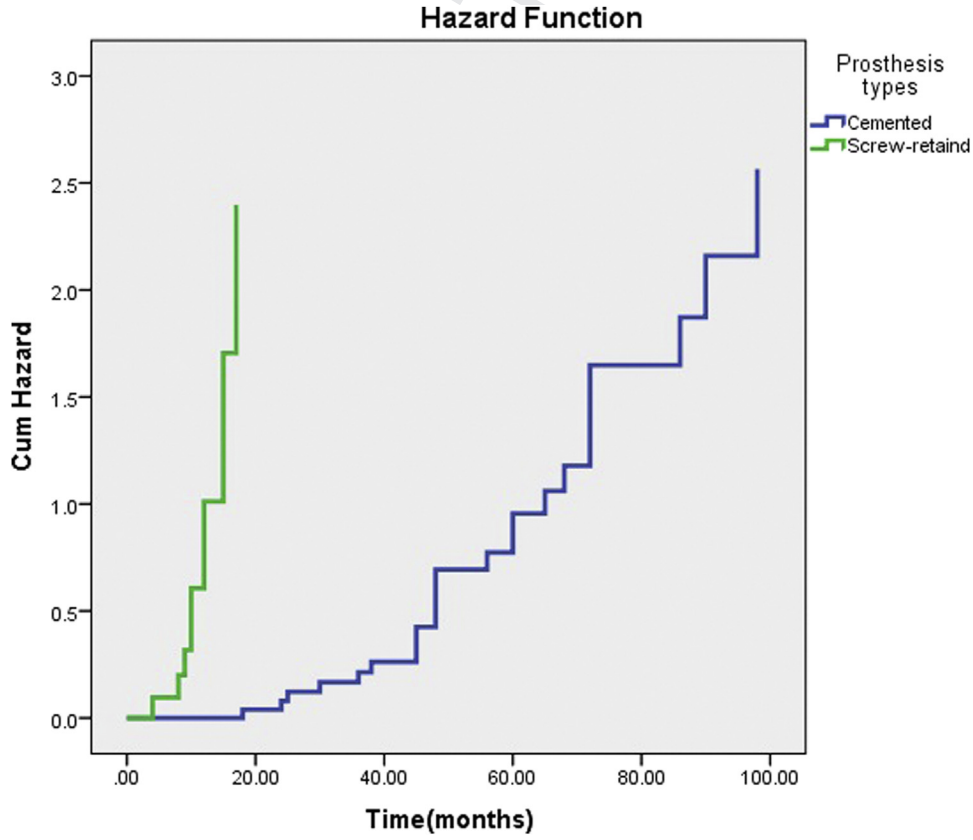

FIGURE 1. Hazard of fixture fracture using Kaplan-Meier test between cemented and screw-retained crowns. Cum, cumulative. Q15

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