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Self-reported tooth and implant prognosis evaluation based on radiographic bone loss: a cross sectional study.

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Abstract

Introduction: Tooth prognosis evaluation involves continual assessments to guide patient-centered treatment plans. This means that the tooth prognosis may dictate whether a tooth is restored, extracted, or maintained.

Aim of study: The aim of this work was to evaluate current trends in tooth prognosis evaluation based on radiographic bone loss amongst dental practitioners.

Material and Methods: A survey including demographic questions and ten radiographs (vertical bitewings or peri-apical) showing bone loss around teeth and implants were distributed to dental practitioners. Practitioners were asked to determine the prognosis of the tooth or implant and suggest a percentage describing the likelihood of the tooth or implant surviving for ten years.

Results: One of the ten radiographs provided for assessment was given good to fair prognosis by 100% of the participants. Only three out of the ten radiographs presented had strong suggestions for tooth retention. Recommendation for extraction by dental practitioners varied from 1-66% across the radiographs. Furthermore, practitioners predicted a 0% chance of ten-year survival for many of the teeth.

Conclusions: Assessing prognosis based on radiographs only, is insufficient and clinical data provides invaluable information to establishing tooth prognosis. Dental professionals should understand that compromised teeth can outlive dental implants and our role as dental professionals is to prevent and treat oral diseases to preserve the dentition as long as possible.

Keywords: periodontitis, plaque, prevention, peri-implantitis.

Introduction

Tooth prognosis is arguably one of the most important evaluations in dentistry. Tooth prognosis uses assessments to predict the longevity of a tooth [1,2]. The purpose of this evaluation is to guide treatment planning such as extractions, restorations, and periodontal therapy. Unfortunately, incorrectly evaluating tooth prognosis can lead to several downstream consequences. Such consequences include increased cost for the patient as treatment plans change and oral hygiene is challenged when plaque retentive restorations are suggested, such as bridges or partial dentures. Therefore, it is important that tooth prognosis is accurately evaluated on a continuous basis to limit these downstream consequences as some patient risk factors can be modified and preventative maintenance can have a strong influence [3, 4].

In regard to periodontal disease, several prognostic tools have been suggested in the literature [5,6]. A commonly used one is the McGuire and Nunn Classification [6]. This specific tool guides practitioners to classify each tooth as good, fair, poor, questionable, or hopeless [6]. These classifications are based on assessments such as furcation involvement, crown to root ratios, mobility, clinical attachment loss and bone loss [6]. Such tools are developed to guide the practitioner to provide evidence-based treatment plans for the patient. However, although teeth may be labelled with hopeless prognosis based on existing prognostic tools, this does not always mean the tooth cannot survive any longer and needs to be extracted immediately. The success of proper periodontal treatment followed by supportive periodontal therapy should not be overlooked. Patients with poor tooth prognosis are shown to maintain their teeth for long periods of time if they are compliant with supportive periodontal therapy [7-10]. This finding highlights the lack of fully validated methods for tooth prognosis. This lack of accurate prognostic tools may be related to the

growing concern that practitioners are too focussed on "fixing" problems caused by dental diseases instead of concentrating on preventing them [11]. This has been evidenced by patient complaints of over-servicing by dental practitioners [12-16]. The emphasis on teaching technical skills versus an in depth understanding of dental disease during dental training may be the underlying cause of practitioners' tendency to "fix" instead of "cure" or manage the disease [12, 17]. Furthermore, the rapid development of the dental implant industry may be making the decision to extract teeth easier [12]. Therefore, it is important to assess how practitioners are establishing prognosis in order to eventually improve treatment planning and dental education in the future.

Despite the popularity of dental implants, there is increasing literature developing around the prevalence of peri-implantitis and dental implant failure [18]. As a logical follow-up to this, ethical dilemmas in dental implant treatment are rising [12,17]. Gross et al. highlight ethical parameters that should be considered in dental implantology to ensure responsible treatment of diseased implants and the prevention of dental implant failure [12]. Such parameters include a critical self-assessment of the dental practitioner's skills and knowledge as well as a thorough evaluation of the indications for dental implants in order to ensure all other treatment options are exhausted first [12]. Gross et al. also discussed the importance of patient compliance and responsibility in dental implant treatment as well as emphasizing after care for dental implant patients [12]. Not only are these important evaluations for dental implant planning, but for establishing prognosis of natural teeth as well.

Dental implants are not risk-free options, yet, tooth retention seems to be a decreasing priority among dental practitioners [7, 19, 20]. Tooth prognoses is sometimes undervalued and as a result, tooth extractions can happen early, and implants might be placed too soon. This trend has lead to a call to action to preserve teeth instead of rushing to replace them [9]. However, in order to preserve teeth, practitioners must first be successful in establishing accurate tooth prognosis evaluation. Furthermore, practitioners must also be educated about how to maintain teeth with poor prognosis. Therefore, the aim of the present study was to assess the accuracy of tooth prognosis evaluation amongst dental practitioners.

Material and methods

A 15-item questionnaire was developed and validated with a group comprised of dental practitioners who reviewed the questionnaire and modified the questions for clarity until consensus was achieved. The questionnaires were distributed to graduated dental professionals prior to the start of continuing education courses at the University of Alberta. All of the course attendees were invited to participate in the study. An explanation of the questionnaire's format was provided to respondents and questions related to filling out the questionnaire itself were answered. No assistance was given in interpreting the radiographs and a specific prognostic tool was not suggested. Questionnaires were answered individually by participants and returned at the end of the course. The questionnaire included demographic information such as the age, gender, place of graduation, years practicing, type of office at which they are employed (general, periodontal, etc), and their dental profession title. Bitewing and peri-apical radiographs with varying levels of bone loss around teeth and implants were included in the questionnaire (Figure 1). No clinical information was provided to the practitioners.

For each radiograph, the participants were asked to determine if the prognosis was good, fair, questionable, or poor based solely on the radiograph. After choosing a prognosis for the teeth in question, the participants were asked to give a percentage value that described the likelihood that the tooth would be maintained for 10 years after acquiring the radiograph. Finally, the participants were asked to choose whether the tooth should be extracted or maintained. Ethics approval was obtained by the University of Alberta Ethics Board.

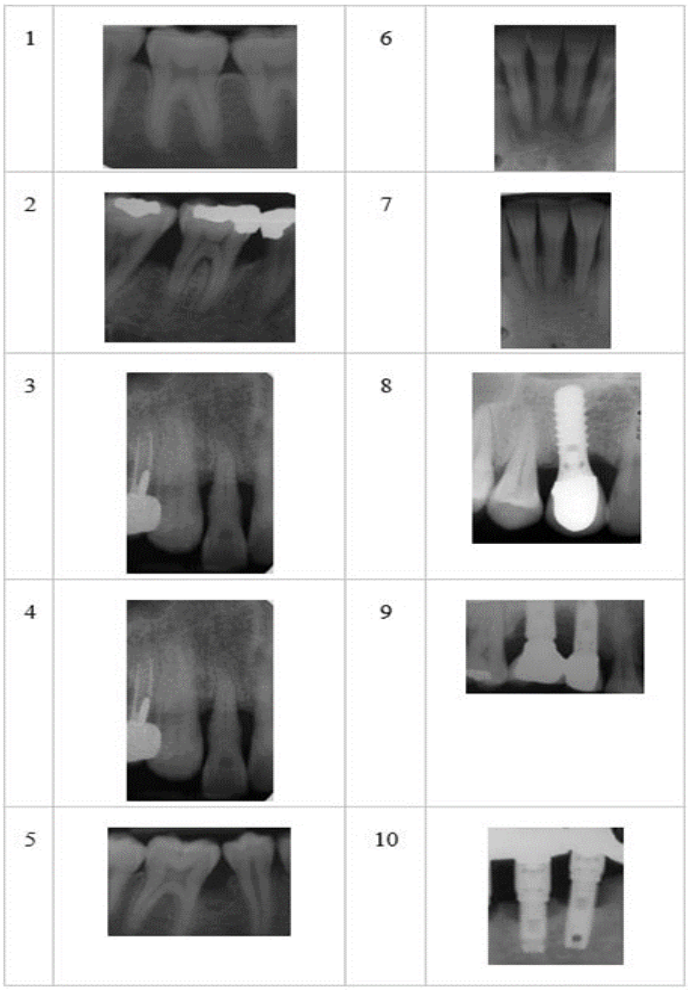

Figure 1. Radiographs presented to dental practitioners

Results

A total of 100 questionnaires were collected and analyzed in this study. The age of practitioners averaged 35.26 (SD=12.21) years and the average number of years practiced was 11.67 (SD=11.99) years. Regarding prognosis, 100% of participants agreed that only one tooth (radiograph 1) had good to fair prognosis (Figure 2). Only three out of the ten radiographs presented had strong suggestions for tooth retention (Figure 2).

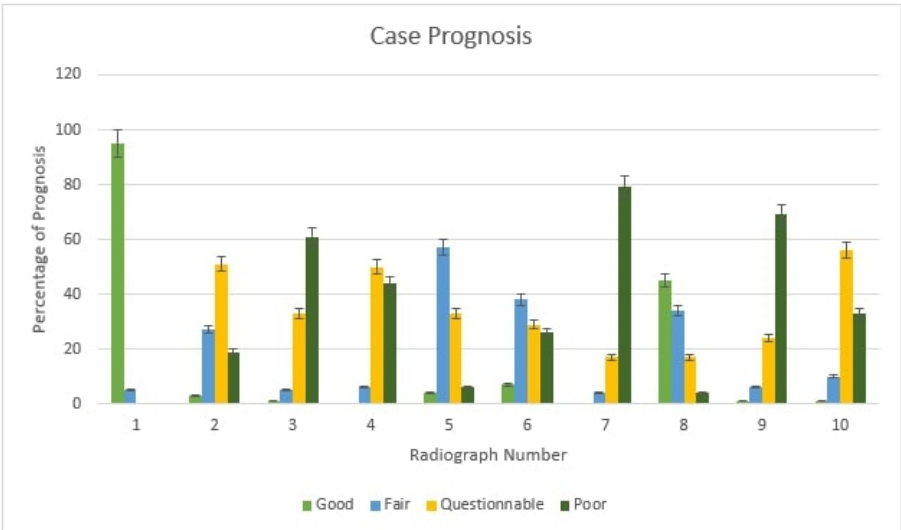

Figure 2. Prognosis of each radiograph assigned by the participants

However, for every other radiograph, suggestions to extract ranged from 1-66% (Figure 3). Radiographs 3, 7, and 9 had strong suggestions for extraction: 44%, 66%, and 52% respectively. Interestingly, 6/10 of the radiographs were estimated to have less than a 50% chance of survival for ten years (Figure 4). Based on Figure 4, the average ten-year survival fluctuated between 80% and 20%. A 0% chance of ten-year survival was the lowest recorded value for 6/10 of the radiographs presented (Figure 4). Pearson correlation tests showed no correlations between extraction, survival rates or prognosis with the descriptive factors of the sample such as the years of experience or type of dental specialist.

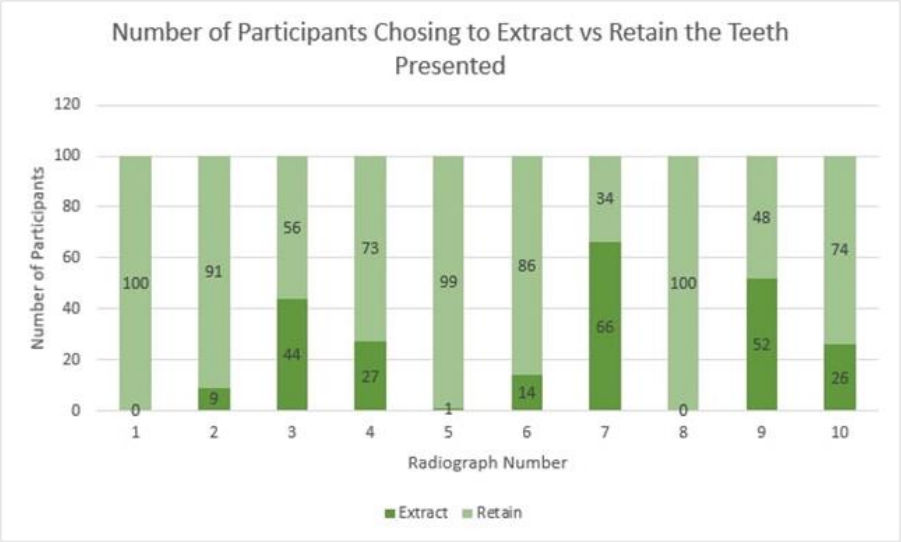

Figure 3. Distribution of participant's suggestions to extract or retain the teeth/implant in the radiographs

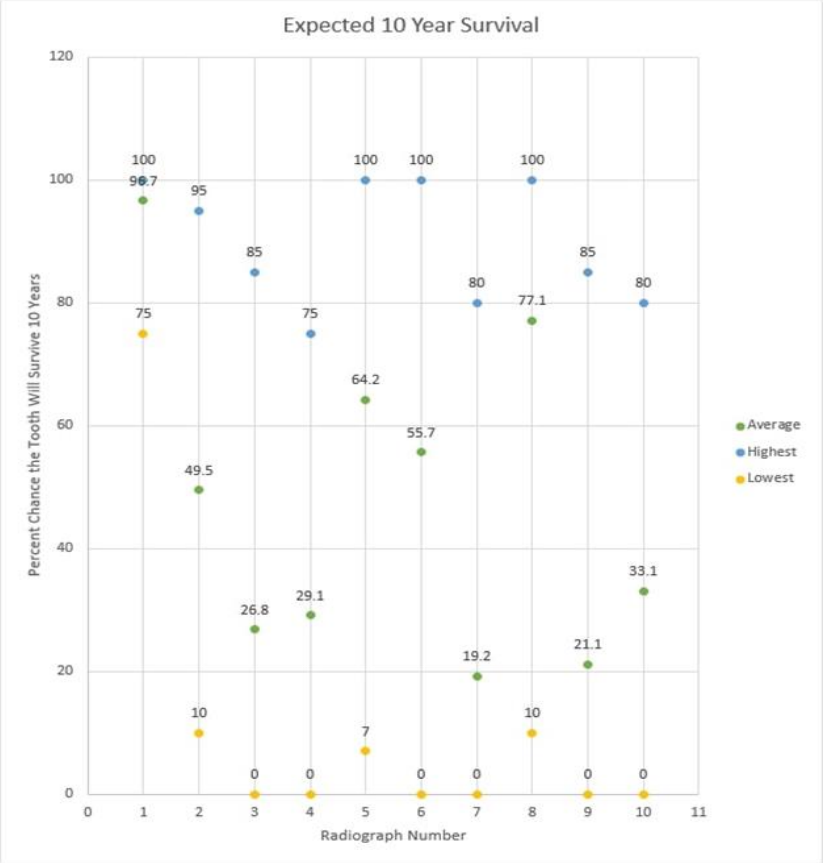

Figure 4. Expectation of tooth survival for 10 years

Discussions

The results of this study suggest many of the teeth presented in the radiographs had a relatively poor prognosis according to the surveyed practitioners. This is evidenced by the choice of extraction varying from 1-66% across the radiographs. This variation is likely attributed to the different levels of bone loss across the different radiographs. Furthermore, practitioners predicted a 0% chance of ten-year survival for many of the teeth. In reality though, 7/10 radiographs which were of natural teeth, are currently still functioning in the patient's mouths at least 5 years since the radiographs were taken. Unfortunately, the authors do not have data on the dental implant cases that were presented. Regardless, the five-year retention of natural teeth labelled questionable or even hopeless by some practitioners suggests that how prognosis is established should be reviewed. In the event these teeth were extracted, the treatment plan can become extensive. Any invasive treatment involves risk to the patient as well as cost. These are factors that need to be considered carefully before teeth are extracted by the dental practitioner [9,12].

Treating periodontal disease is not impossible and periodontally involved teeth can function and be maintained for years [1,21]. Dental practitioners must understand that treating and maintaining teeth is a viable option but more importantly, communicate this to the patient. Dental implants are revolutionary in the field of dentistry however the decision to extract a tooth and replace it with an implant needs to be made carefully [22]. Previous studies suggest that diseased teeth still have a longer lifespan than a dental implant [19, 21, 23-26]. Dental implants are susceptible to dental disease and peri-implantitis is quite prevalent amongst implant patients [27]. Fortunately, there is encouraging evidence for compromised teeth. Even in the case of severe (formerly aggressive) periodontal disease, teeth labelled hopeless have survived for many years with supportive periodontal therapy [10]. The results of this study suggest that practitioners need to be reminded that "We have been trained to preserve teeth. Let us face the challenge." [9].

The authors acknowledge that a small sample size of 100 participants is a limitation to this study. The small sample size may have limited the ability to correlate the prognosis evaluation provided by the dental practitioners with their dental education, specialty and years of experience. The sample was also a convenience sample as the practitioners were attending continuing education seminars. This specific cohort may be biased in that they are practitioners seeking current evidence to implement in their practices. Therefore, the reality may involve even more practitioners performing extractions too early. Interpretation bias may have also occurred when practitioners assessed the radiographs only with no clinical information provided.

Clinical information is critical in establishing tooth prognosis. Another limitation to the study is the limited information (radiographs only) provided to the practitioners to determine prognosis which is different from the real-life situation when examining a patient. Clinical data, such as oral hygiene, clinical attachment levels, medical history etc, are very important factors in evaluating prognosis. However, it is important to note that radiographic bone loss is heavily weighted on the McGuire and Nunn Classification as well as a modified McGuire and Nunn Classification used by Checchi et al. [7, 6]. Again, despite the heavy weighting on radiographic bone loss, patient parameters such as compliance and oral hygiene should also be involved in the evaluations of prognosis. Oral hygiene plays an astounding role in periodontal disease and this should be emphasized to both practitioners and patients [28]. Assessing radiographic bone loss alone is subject to bias, and the use of the current prognostic tools should be implemented with caution.

Overall, this study gives insight to practitioner's interpretation of radiographs for prognosis. Compromised teeth might be extracted too soon, and the number of replacement options are probably contributing to practitioner's bias when establishing prognosis. Therefore, there is a need to improve this situation which may involve reviewing the role of the dental practitioner and placing more emphasis on preserving the

dentition. Emphasizing this as the role of the dental professional needs to be engrained during dental school and reiterated in continuing dental education.

Conclusions

Correctly establishing tooth prognosis is a critical assessment in the field of dentistry. This study suggests dental practitioners are unable to accurately determine tooth prognosis based on radiographic bone loss alone which is a heavily weighted factor in many prognostic tools. Assessing prognosis based on radiographs only, is insufficient and clinical data provides invaluable information to establishing tooth prognosis. Therefore, it is important to recognize the importance of clinical data when establishing tooth prognosis, the limitations of prognostic tools, as well as the evidence for the success of long-term periodontal treatment and supportive periodontal therapy. Even compromised teeth stand a chance and it is the dental practitioner's duty to preserve the dentition as long as possible.

Conflict of interest: None declared.

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