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Thematic Article

Restorability of Teeth: A Numerical Simplified Restorative Decision-Making Chart

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Abstract

A decision to extract or to keep a tooth was always a debatable matter in dentistry. Each dental specialty has its own perspective in that regards. Although, real life in the dental clinic showed that the decision is always multi-disciplinary, and that full awareness of all aspects should be there in order to reach to a reliable outcome. This article presents a simple evidence-based clinical chart for the judgment of restorability of teeth for better treatment planning.

Keywords: *Prognosis; Extraction; Treatment Plan; Evidence-Based*

Introduction

The development of a treatment plan, which is predictable to achieve long-term success, requires careful evaluation of many factors, which will influence the prognosis of involved teeth and the possible choice to keep them, or not in the oral cavity [1].

One of the biggest dilemmas in dental clinic is the identification of when a tooth by the unfavorable prognosis and low predictability of other therapeutic options is indicated to extraction [2].

Failure to reach an evidence-based decision can have several effects on different levels based on the work nature of the healthcare providing facility. This may include referral to specialty clinics seeking for prognosis, which disadvantages the patient and may cause complications during the time passed till final decision is made.

This article presents a simple numerical evidence-based customized clinical decision-making chart for the judgment and prognosis of restorability of teeth for better treatment planning.

Review of Literature

Current literature does not present sufficient evidence to enable clinicians to attach an absolute prognostic value to individual teeth. The difficulty in attaching a prognostic value to individual teeth and predicting their survival has been well documented [3-6].

The difficulty is enhanced by the fact that multiple factors may influence the prognosis of teeth. These include certain diseases and systemic conditions that affect tooth prognosis, the patient's motivation for treatment and maintenance of oral health, the quality of treatment rendered, etc [5].

For these reasons, Samet and Jotkowitz proposed a classification; and the goal of this classification was not to determine an absolute prognostic value for individual teeth, but rather to attach a relative prognostic value, which aimed to enable clinicians to distinguish between favorable teeth and those that considered compromised to a certain degree [7].

In the age of evidence-based dentistry, clinicians strive to reach decisions made on sound scientific research [7]. As for the attempts throughout the article reviews showed, the current article is going within several reviews: periodontal, restorative, and endodontic literature.

Periodontal literature

Most of the attempts to attach a classification for the prognosis of individual teeth come from the periodontal literature [8-10]. The traditional systems were based on tooth mortality [11] and did not look at the possibility of classifying a tooth's prognosis, based on the ability to control the disease process and successfully maintain the tooth as a working unit in the dentition. In general, these studies look at whether a tooth "survived," and not whether it would be appropriate to be included into a restorative-treatment plan [6].

Restorative literature

The restorative literature includes effective classification systems, but lacks a classification system that gives clinicians a tool to assess the condition and the prognostic value of individual teeth. It has been widely documented that the key to long-term success in the restoration of endodontically treated teeth is directly related to the amount of remaining sound coronal tooth structure [12-18]. A systematic review [11] concluded that the most critical aspect when dealing with a non-vital tooth is "tissue preservation". Similarly, the importance of providing an adequate ferrule is generally accepted [12,14,16]. Thus, the amount of remaining sound tooth structure should be considered key in assessing restorability [17,18].

Endodontic literature

The endodontic prognosis of a tooth in isolation of the other categories is largely linked to the difficulty of the case at hand [19]. Potential problems include calcifications, inability to isolate the tooth, resorptive defects, extra roots and/or canals, retreatment cases, existing posts, ledges, and perforations.

Many different guides have been compiled to help clinicians determine the degree of treatment difficulty for a given case. These include the UCSF (University of California, San Francisco) Endodontic Case Selection System, guidelines put out by the American Association of Endodontics, the Canadian Academy of Endodontics, and the Dutch Endodontic Treatment Index [20].

The other factor influencing the endodontic prognosis is the presence of periapical radiolucency [21]. Clinical trials have shown a lower success rate in endodontic cases with periapical radiolucencies because the causative pathology has been present for a longer period [22]. The ability to determine the cause of radiolucency is key to understanding if a root canal can be predictably treated [7].

A strong association has been noted between the crowning of endodontically treated teeth and their long-term survival [22-26]. This emphasizes the closely intertwined relationship between endodontic and restorative prognosis. It is commonly stated that endodontic therapy is not complete until a coronal restoration has been placed [27-29] and that the coronal seal is at least as important, if not more important, than the apical seal when looking at the long-term success of endodontically treated teeth [22,27-30].

Discussion

Treatment planning is a multistage process that involves the analysis of each tooth from various aspects. Many of the diseases affecting the dental structures are bacterial or infectious in nature. Other etiologies may also cause the destruction of tooth and supporting structures. Any chosen treatment modality requires management and monitoring of the cause and of the disease process in addition to mechanical/surgical treatment, as well as the adherence to a long-term maintenance protocol [31-36].

Based on the reviewed literature and accepted best practices, Samet and Jotkowitz 2009, proposal have based the classification of the condition of teeth and their relative prognosis on 4 main criteria (Class A, B, C, D) and 2 additional factors (Anatomic irregularities and Iatrogenic compromising factors). Patient-level factors may alter the overall prognosis of a case, especially when these factors cannot be modified by the patient or by treatment [7].

The proposed classification system [7] aimed to help clinicians in the treatment planning process, by focusing on individual and overall prognostic value of teeth. Thus, if a tooth that was originally planned to serve as an abutment for a prosthetic unit is found to be a questionable tooth (Class C) or a compromised tooth (Class D), an alternative treatment plan should be considered. On the other hand, if these teeth were supposed to be restored as individual units, the patient goals, financial considerations, and plans may lead to preserving them as an interim solution.

Samet and Jotkowitz 2009, presented a classification system that aimed to create a meaningful and standardized tool for use among dental professionals. The authors were aware of the complexities and the limitations of that tool that aimed to attach prognostic values to teeth. However, they thought that modern dentistry would benefit from having a classification system that is comprehensive and standardized [7].

According to Ávila., *et al.* 2009, the main factors that determine the decision-making of extract or not a tooth include the patient expectation, the finances and the commitment of the patient to the treatment and esthetic. These are factors that cannot be measured objectively, but have critical relevance on developing the treatment plan [35].

Other factor, that influence the compromised teeth's prognosis, such as periodontal features, endodontic and restoratives, also should be carefully evaluated during the development of planning, for the treatment to be predictably a long-term success. All of these factors, whether local or systemic, must be identified in clinician initial evaluation [7].

Ribeiro., *et al.* 2012, presented a literature review, to assist the dentist in evaluating clinical situations requiring decision making between keeping or extracting a tooth, establishing a correct prognosis. They concluded that the hard task of deciding to extract or keep a tooth involves several factors, objective and subjective, that should be analyzed carefully, aiming to attend the different therapeutic needs and individualize the treatment plan. This must be a critical analysis grounded on scientific evidence [36].

Kapoor., *et al.* (2013) stated factors considered for extraction; on basis of different references and regarding the Ávila., *et al.* restorability chart (Figure 1) [37]:

1. Teeth with a crown/root ratio that is greater than 1:1 should be considered extraction.
2. Teeth that are Class II mobile or greater should be considered for extraction if they cannot be treated predictably with equilibration or splinting [38].
3. Bone loss on questionable teeth that jeopardizes the support of adjacent teeth should be considered for extraction [39].

4. Teeth with a guarded periodontal prognosis or worse need crown-lengthening surgery for ferule that may alter esthetics, or the support of the adjacent should be considered for extraction.
5. Teeth with a guarded or poor endodontic prognosis due to the size of an apical lesion need for a large post and core for support, or lack of ferule should be considered for extraction [40].
6. Teeth adjacent to edentulous spaces that require several procedures to save and may be in a beneficial place for dental implants should be extracted due to the strategic nature of its position, and potential benefit to the restoration.

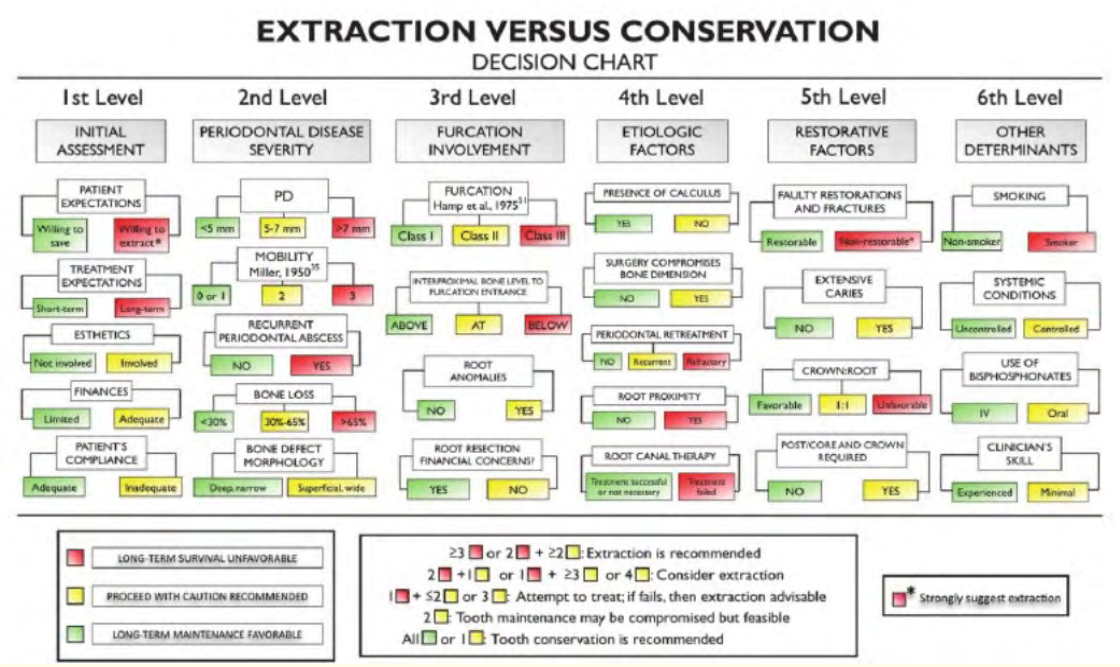

Figure 1: *Ávila., et al. restorability chart.*

The following is a list of when to consider saving the tooth (Figure 1) [37]:

1. When endodontic treatment (if necessary) can be performed and the tooth can be sealed with a well-fitting single-tooth restoration with adequate ferrule.
2. When the vertical osseous defects can be grafted predictably.
3. When the patient is psychologically motivated to keep his or her teeth and has been informed of the various options.
4. When the patient has very good compliance and performs good oral hygiene.

Description of the Numerical Restorative Decision-Making Chart

The workflow of patients can overlook some of the factors that lead to the numerical restorative decision-making chart (Figure 2):

- Restorative factors considered were based on Ávila., *et al.* [35] chart and the review done by Kapoor., *et al.* to be involving certain factors with its indications and extent [37].
- Restorative factors considered were: pocket depth, mobility, recurrent periodontal abscesses, root proximity, root anomalies, root canal therapy, faulty restorations and fractures, extensive caries and crown/root ratio.

- Restorative factors considered after caries removal and all unsupported enamel, considering the remaining tooth structure is providing an adequate ferrule.
- The chart was color coded according to Ávila., *et al.* chart and numbered according to the condition and factor extent after both radiographic and clinical examination to be: 0 for green, 1 for yellow and 2 for red.
- Extraction is recommended if the score is 4 or more. Attempt to treat the tooth or specialty consultation referral is indicated when the score is 2 or 3. Restorative treatment for teeth granted with score 0 or 1.
- General dentist should consider referral for a specialist opinion on options for periodontal therapy unless it is very clear that it will not be effective "score is 4 or more".
- The patient should also understand the implications of this and dentist should document these discussions and agreements.

Factor	Ailing	Failing	Score
Pocket Depth	5 - 7 mm	> 7 mm	
Mobility (Miller 1950)	2	3	
Recurrent Periodontal Abscesses	No	Yes	
Root Proximity	No	Yes	
Root Anomalies	No	Yes	
Root Canal Therapy	Successful/Not Necessary	Treatment Failed	
Faulty Restorations and Fractures	Restorable	Non-Restorable	
Extensive Caries	No	Yes	
Crown:Root	1:1	Unfavorable	
Total Score			

Figure 2: *The customized restorability chart.*

Conclusion

Decision making regarding whether to keep or extract a tooth presents a daily challenge in any dental clinic. Individual discipline-based judgment; whether endodontic, periodontal, or restorative, was always there although, none of them provided a wider scope in relation to the comprehensive treatment planning. Few charts are available in the literature, which provided that wider look, although they were not easy to apply and time consuming. The provided simplified chart in this article aimed to provide dentists with a simple numerical evidence-based clinical decision-making tool for the judgment and prognosis of restorability of teeth for better treatment planning.

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