

Retrograde Peri-Implantitis - Review

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Abstract: ***Introduction:** The retrograde peri-implantitis is a condition, that is not very common, but threatens seriously the implant survival. **Aim:** The aim of this review was to summarize the basic data about the retrograde peri-implantitis and clarify the causes and treatment options for the condition. **Material and Methods:** The review includes articles in English language, which were published in the period of 1992 to 2019. Articles, which were directly related to the topic were selected, as the search was conducted using the following combinations of keywords: “retrograde peri-implantitis”, “implant periapical lesion”, “apical peri-implantitis”. **Results:** In the different articles the condition was termed three different ways: retrograde peri-implantitis, implant periapical lesion and apical peri-implantitis. The selected articles described different classification systems, etiological factors and treatment options. **Conclusion:** Unified classification system for retrograde peri-implantitis combining all the available classification models should be considered. Various factors could lead to development of implant periapical lesion, as the most important remains the infectious component. The treatment plan in the cases of retrograde peri-implantitis depends on the evolution stage of the disease, considering the clinical and radiological findings.*

1. Introduction

The retrograde peri-implantitis is a condition, that is not very common, but threatens seriously the implant survival.

2. Aim

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3. Material and Methods

The review includes articles in English language, which were published in the period of 1992 to 2019. Articles, which were directly related to the topic were selected, as the search was conducted using the following combinations of keywords: “retrograde peri-implantitis”, “implant periapical lesion”, “apical peri-implantitis”.

First implants demonstrating radiotransparency in their apical area were described by McAllister et al [1].

Classification systems

Different systems for classification of retrograde peri-implantitis were proposed. The classification could be based on: radiographic findings [2, 3]; etiology [4]; nature of the lesion [5] or its evolution [6]. According to the radiographic findings, the retrograde peri-implantitis is classified into three classes, depending on the amount of bone resorption in the apical portion of an implant, visible on radiography. The bone loss was presented as a percentage of the entire length of the implant, according to which the lesion is classified into one of the following classes [2]:

- mild
- moderate
- advanced

Shah et al. [3] concluded, that this classification is reliable and useful, providing options for a treatment plan and for prognosis.

According to the etiology there were two proposed types [4]:

- Type 1: Implant to tooth. It develops, when the adjacent teeth are directly or indirectly damaged during implant bed preparation, which results in pulp devitalization.
- Type 2: Tooth to implant. It develops in a short time after implant insertion, when signs of periapical pathology occur in the adjacent tooth, either by pulp damage during intervention or by reactivation of a pre-existing apical lesion.

It also was suggested, that the lesions could be classified as inactive and infected [5]:

- Inactive implant periapical lesion: Result of placement of a shorter implant into deeper implant bed.
- Infected implant periapical lesion: Result of placement of the implant apex near already existing infection or insertion of an implant, which already was contaminated.

Authors considered also bone overheating during the osteotomy resulting in bone necrosis as a potential etiological factor in the development of implant periapical lesions [5].

According to its evolution, the disease is classified as [6]:

- Acute
 - Non-suppurated
 - Suppurated
- Chronic or periapical abscess

Diagnosis

The pain and the radiolucency at the apical part of the implant are mostly reported findings [7, 8, 9, 10, 11]. The pain could first appear during chewing and then could become spontaneous [9]. The pain could be resistant to analgesics [8].

A fistula could be observed [12, 13, 14]. According to some authors [14] the fistula is the most frequent clinical finding, with a prevalent occurring in the upper jaw. It is also possible to be observed reaction from the maxillary sinus [10].

According to Peñarrocha-Diago et al. [15] even without radiographic alterations, the condition is suspicious for periapical implant lesion, if after insertion localized pain occurs in the area of the implant apical portion.

Etiology

As potential etiologic factors were suggested: implant insertion adjacent to an endodontic treated tooth [16, 17], the endodontic infection from adjacent teeth [18, 19], recurrence of apical periodontitis [18, 4], placing implants into areas, with a persisted infection, caused by endodontic pathology of the extracted tooth [18, 20], bone overheating [13, 5], immoderate tightening of the implant [13], contamination of the implant prior to its insertion [12] and placement of implants with apical hollow [12, 13]. Qu et al. suggested that the etiology of the implant periapical lesion could be multifactorial, with a prevalence of the prior infection [21]. The prevalence of the infectious component is supported also by other authors [14].

It was established that the incidence of the retrograde peri-implantitis of implants placed close to endodontic-treated teeth was 7.8%. The authors concluded, that the possibility of retrograde peri-implantitis development could be decreased, when the distance between the implant and the treated tooth is increased or by delay of the implant insertion for longer time after the endodontic treatment [16]. Brisman et al. [17] reported as possible cause for implant failure the implant insertion next to an endodontically treated tooth, even when it did not demonstrate any symptoms of pathology.

Histopathologically the retrograde peri-implantitis is presented by cyst development or chronic inflammation. Bacteria, such as *Streptococcus*, *Porphyromonas gingivalis*, *Klebsiella pneumoniae* and *Corynebacterium* were isolated from the lesions [18]. In another study was observed the presence of *Eikenella corrodens* [22]. *Streptococcus* species and *Porphyromonas gingivalis* were also found in cases of chronic apical periodontitis [23]. Periapical periodontitis associated with Epstein-Bar virus is also discussed as possible source of apical peri-implantitis [24].

When placing implants to adjacent root fragments left accidentally, Langer et al. [25] experienced severe bone loss in the coronal portion of the implant, instead of bone loss apically, which is typical for retrograde peri-implantitis.

Truninger et al. [26] compared the results of treatment with immediately placed implants into sockets demonstrating periapical pathology and into healthy sockets, considering the clinical and radiological findings. The authors reported comparable results with the both groups after 3 years. In none of the implants, inserted into sockets with periapical pathology was observed retrograde peri-implantitis after the mentioned period of time. The authors concluded, that after accurate debridement of the socket, the immediate implant insertion in the areas with prior periapical pathology did not demonstrate any disadvantages compared to the immediate implant insertion into healthy sockets, considering the clinical and radiological results. According to other study the authors also came to the similar conclusion [27].

During histologic examination of explanted implant demonstrating signs of implant periapical lesion was found necrotic bone in the implant external and apical part of the antirotational hole [8]. In other case necrosis of the bone and inflammatory infiltrate inside the implant hollow part were

observed. The authors suggested as a probable etiological factors vascular damage and fracture of the bone tissue inside the implant during placement, implant contamination before the seating or poor bone quality [12]. In a similar study as a potential cause of implant periapical lesion were considered overheating of the bone, related to an immoderate tightening of the implant and compression of the bone tissue inside the hole in the apical portion of the implant, which could lead to necrosis [13].

Treatment

Waasdorp and Reynolds [28] described nonsurgical retrograde peri-implantitis treatment via antibiotic course. The authors reported resolution of the radiographic lesion after 9 months.

It has been reported, that systemic antibiotic treatment including amoxicillin and acetaminophen did not improve the symptoms of implant periapical lesion, unlike the substitution of prednisolone, augmentin and mefenamic acid. The authors observed disappearance of the lesion, considering the radiological results [7]. In other studies implant surgery was undergone, because of the unsuccessful systemic course of antibiotics [13, 10]. Guided bone regeneration is also available option in implant periapical lesion treatment [29, 30, 31].

Some authors discussed removal only of the implant apical portion as a reliable treatment option [32, 33]. Peñarrocha-Diago et al. [10] reported resolution of the symptoms after implant periapical surgery.

Flanagan [11] reported a successful case resolution, with a debridement and curettage of the apical lesion, without surface detoxification and without use of a membrane. Into so formed bone cavity was placed calcium hydroxide paste. The debridement should be performed carefully to avoid impairment of the implant surface [30]. Antiseptics such as chlorhexidine could be used [30].

If the condition is diagnosed and treated at early stage, that could help avoiding the necessity of explantation [15]. Peñarrocha Diago et al. [6] suggested periapical surgery of the implant in the acute phase and explantation in cases, in which entire bone-to-implant contact is affected or implant mobility is observed.

Dental lasers are used in periodontitis [34, 35, 36, 37] and in peri-implantitis treatment [38, 39]. Montoya-Salazar et al. [31] reported 94.44 % survival rate of implants placed in infected sockets, which were treated with Er,Cr:YSGG laser in combination with debridement, curettage, cleaning with 90% hydrogen peroxide and irrigation with a sterile solution. The authors also performed guided bone regeneration. A systematic literature review also support the opinion that implants could be inserted into areas with infections of periapical or periodontal origin after accurate debridement and substitution of systematic antibiotics [40].

4. Results

In the different articles the condition was termed three different ways: retrograde peri-implantitis, implant

periapical lesion and apical peri-implantitis. The selected articles described different classification systems, etiological factors and treatment options.

5. Discussion

All of the proposed classification models [2, 4, 5, 6] differed significantly from one another. In the majority of the studies similar symptoms were reported, including pain, apical radiolucency [7, 8, 9, 10, 11] and fistula formation [12, 13, 14]. Various etiological factors have been suggested [5, 12, 13, 16, 17, 18, 19], as the infectious nature of the condition prevails [21, 14]. The data about the treatment decision is controversial. Different approaches were proposed, such as antibiotic treatment [28, 7], debridement and curettage of the lesion [11], resective surgery of the implant apex [32, 33], guided bone regeneration [29, 30, 31] and explantation [6, 12, 13].

6. Conclusion

Unified classification system for retrograde peri-implantitis combining all the available classification models should be considered. Various factors could lead to development of implant periapical lesion, as the most important remains the infectious component. The treatment plan in the cases of retrograde peri-implantitis depends on the evolution stage of the disease, considering the clinical and radiological findings.

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