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Case Report

Periapical Cysts. Surgical and Implantology Contemporary Approach. Case Series

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Abstract

Currently, our patients come to our consultations with knowledge of oral implantology requesting immediate resolution protocols, having us as clinics to apply more advanced technologies where diagnosis plays a determining role. The appearance of periapical lesions until some time ago meant an inconvenience in the development of these treatment plans, having to delay for 3-6 months the completion of the case. The study, development and benign behavior of this type of search is quite clear in the literature, demonstrating over time the importance of a timely diagnosis and an effective surgical technique for its resolution. There are many consensuses described in the literature on immediate implementation, but it is necessary to make case reports with clinical and radiographic follow-up where the management and application of minimally invasive surgical techniques that allow extraction, cyst enucleation, bone curettage, can be shown. guided bone regeneration and finally immediate implantation, definitively shortening the treatment time and increasing the regenerative potential of our jaws and therefore the satisfaction of our patients.

Introduction

Nowadays in our practice the oral rehabilitation with dental implant protocols in partial or complete edentulous patients is a routine practice using immediate implant placement in fresh extraction sockets (at the same time of extraction) combined, or not, with other regenerative procedures; in the maxilla (sinus augmentation, osseodensification, guided bone regeneration, soft tissue management, etc.) and in the mandible (ridge split, osseodensification, guided bone regeneration, soft tissue management, etc.). All these arises in a technology world where our patients go through a series of routine dental image studies as: OPG (Orthopantomography), Periapical Xrays and CBCT (Cone Beam Computed Tomography). A thorough analysis of these, combined with the intraoral condition will help the clinician to stablish a diagnosis and a proper treatment plan. The evaluation of these studies is very important for the clinician because all the anatomical structures can be observed and analyzed to place dental implants, detect any possible periapical pathologies at the moment of extraction or anatomical structures that may interfere with the treatment. Periapical cysts are associated with non-vital teeth and identified in the apex. Traumatic caries conditions produce pulp´s tissues death and this inflammatory stimulus reaches the periapical zone to stimulate Mallassez epithelial cell rests producing a periapical cyst. When it is mentioned an interference with the treatment, we referred to the possibility of doing the extraction with the periapical cyst enucleation, curettage and immediate implant placement; condition that has been controversial due to some authors supporting a two-stage surgical treatment. The first one: extraction, cyst enucleation, curettage, socket´s revision and the use, or not, of a guided bone regeneration protocol (socket preservation) and the second: implant placement after socket healing. This is why considering an immediate implant placement protocol where a single surgical procedure is done (extraction, cyst surgical management, implant placement, definitive abutment placement, one abutment one time and guided bone regeneration) would not only help to reduce treatment time that translates to patient´s satisfaction, but to have more physiological meaning because of the bone loss decrease at the crest level (direct consequence of the socket healing after extraction) and at the same time in the bone maintenance with a peri implant complex conformation, favoring hard and soft tissue (papilla formation).

Objective

Report three clinical cases with periapical processes diagnosed on CBCT associated with immediate implant placement, or not, with complementary surgical techniques. The periapical cyst belongs to the inflammatory odontogenic cysts and is the one with the highest incidence within these, 63.3% specifically [1]. It is formed as a result of an apical periodontitis caused by pulp necrosis, which gives rise to Malassez cell rests (epithelial rests), which will later form the cyst [2]. Regarding the histopathological characteristics, we found that the cyst is covered by a stratified squamous epithelial tissue, which may present exocytosis, spongiosis or hyperplasia. The thickness of the epithelium can be discontinuous, and varies between 1 to 50 cell layers, however the most common thickness among them is 20 layers. On the other hand, it is also common to find some mucous cells or even areas of the respiratory epithelium. Likewise, we can find linear or circular calcifications in the epithelium, which are known as Rushton bodies [3]. According to Shear and Speight, they described the periapical cyst with walls of variable thickness, from very thin to about 5 mm thick, with an internal surface texture that can be smooth or corrugated. The color of the internal fluid can be observed as brown due to the presence of blood and cholesterol crystals [2].

The lumen or its interior may be filled with fluid, cellular debris, dystrophic calcifications, multinucleated giant cells, erythrocytes, and haemosiderin, among others. The cyst wall is composed of dense fibrous connective tissue, with an inflammatory infiltrate containing a variable mixture of lymphocytes, neutrophils, plasma cells, histiocytes, and eosinophils [2,3]. A characteristic that differentiates periapical cysts from other cysts is the presence of endotoxins in them, and there are studies that suggest that these derived endotoxins of the necrotic pulp, are the key factor of initiation of the cyst. Likewise, they propose that the existence of bacteria such as Aggregatibacter actinomycetemcomitas, Porphyromonas gingivalis and

Escherichia coli, could be involved in the process of epithelial proliferation, the greater the number of bacteria, the greater the proliferation [2]. In most cases, when dealing with endodontic teeth, these are not usually symptomatic, unless they suffer a flare-up. In the case of chronic processes, it is normal for them to present fistulous paths, which eventually lead to purulent exudate, generating inflammation and redness in the area. Their size can compromise dental stability, and can lead to tooth mobility in cases where the cyst reaches a significant size [2]. As mentioned above, the best method to diagnose this type of pathology is through complementary imaging studies. Rosenberg et al. described the cyst radiographically as a periapical radiolucency with uniform and well-defined corticalized borders and bone resorption of the adjacent teeth [2]. Regarding the treatment of the cyst, it can be variable, sometimes with an endodontic treatment, apicectomy or marzupialization of the tooth (depending on the size), it could be enough, however, this is not feasible in all cases, and it is for this reason, on numerous occasions it is necessary to resort to the extraction of the affected tooth, enucleation of the cystic lesion and bone curettage to ensure that all the infected tissue is removed (as in these clinical cases). Likewise, it is important to highlight that the step mentioned above is considered key for the treatment, since it has been proven that the state of the receiving bone is decisive when it comes to achieving an effective treatment, which is why said bone remanent must be absent of inflammatory processes or any pathological activity that may negatively influence subsequent bone regeneration and osseointegration of the implant [1,2,4].

Figure 1: Lateral incisor with apical lesion.

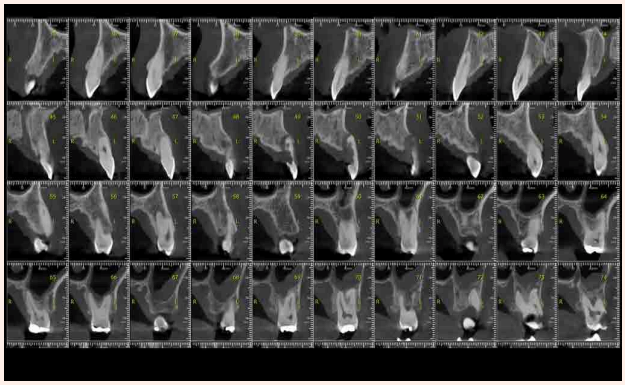

Figure 2: CBCT (Slices from affected bone).

Case Report

Case 1

75-year-old female patient with a penicillin allergy and controlled diabetes presents to consult with localized pain in the first quadrant. In the clinical evaluation a fistula is observed in the attached gingiva with pus discharge. With the Xray evaluation a diagnosis of odontogenic infectious process associated with the maxillary right first premolar was made with the presence of an apical lesion compatible with CBCT image, a round cortical image in the apical third of that tooth. Pre medication was prescribed with Clindamycin 300mg oral every 8 hours for 7 days starting 3 days prior to the surgery and Dexketoprofen 25 mg oral every 8 hours after the surgical intervention. Under local anesthesia the 14 atraumatic extraction was done with cyst enucleation, bone curettage, Chlorhexidine 0,12% decontamination for 1 minute in the periapical site and sequential drilling protocol with immediate Neobiotech® 3.5x11.5 mm implant placement achieving a primary stability towards the palatine root of 25NW. The healing abutment was placed with a GBR and xenograft+APRF (Plug) in the buccal space. Monofilament 5-0 suture, Xray follow ups in time and 4 months of healing period for prosthetic restoration.

Figure 3: Premolar with apical lesion.

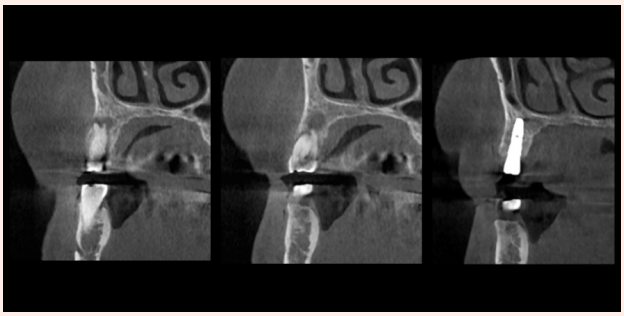

Figure 4: (a) CBCT before surgery (b) CBCT after surgery.

Case 2:

25-year-old female patient presents to consult with chief complain "I have been feeling discomfort in my left lower zone for a while after an endodontic treatment". In the CBCT evaluation an apical lesion in the mandibular left first molar was observed located in the two apical thirds (mesial and distal) corresponding to a previous endodontic treatment associated with periodontal ligament space enlargement and furcation compromise. Under local anesthesia the atraumatic extraction was performed with curettage of the two lesions, Chlorhexidine 0,12% decontamination for 1 minute in the periapical site and osseodensification technique to perform the immediate Neobiotech® 4.0x10mm implant placement, achieving a primary stability in the interradicular septum with a 25NW torque. Guided bone regeneration was performed with xenograft and platelet-rich fibrin (A-PRF). Prescription was made, Amoxicillin with Clavulanic Acid 875/125mg every 8 hours for 7 days and Dexketoprofen 25mg for pain management every 8 hours for 3 days. After 4 months the prosthetic portion was done.

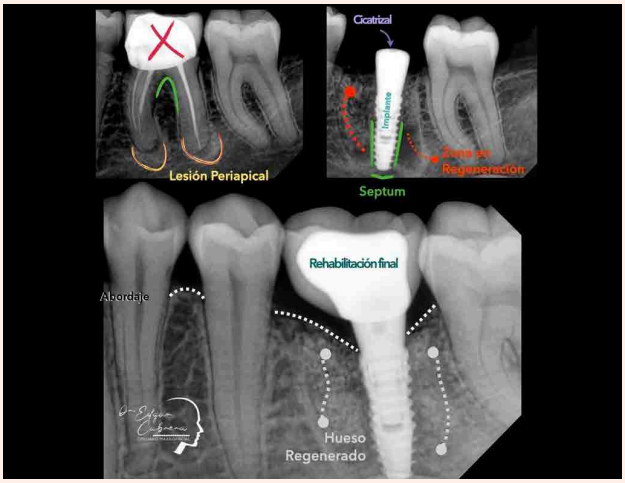

Figure 5: Treatment sequence.

Figure 6: Molar with apical lesion.

Case 3:

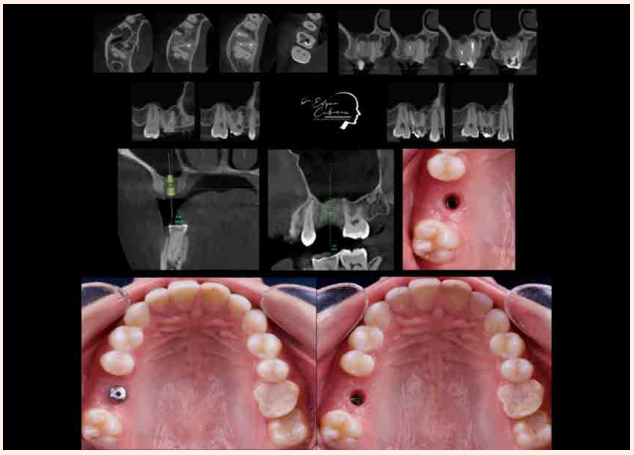

Figure 7: Treatment sequence.

27-year- old female patient presents to consult with discomfort in the first quadrant. After CBCT evaluation a big cyst-like lesion was observed associated with the maxillary right first molar (previously endodontically treated) with maxillary sinus compromise in the 3 roots (Schneider membrane enlargement). Prescription was made for Amoxicillin with Clavulanic Acid 875/125mg every 8 hours for 7 days, starting 3 days prior the surgery, and Dexketoprofen 25mg every 8 hours. Under local anesthesia the extraction was done with enucleation of the lesions that were in direct contact with the sinus floor having an oro-antral communication so it was decided to decontaminate with Chlorhexidine 0,12% for 1 minute in the periapical site and use a socket preservation and guided bone regeneration with xenograft techniques and platelet-rich fibrin protocol with collagen membrane covering the regeneration site. The immediate implant placement was differed due to lack of primary stability. 5 months after, under local anesthesia, the Neobiotech® 4.0x10mm implant placement was performed with a 35NW torque oriented towards the palatine root septum to achieve a better anchorage (primary stability). After 4 months the implant was loaded with the restoration.

Case 4:

31-year-old female patient presents to consult with discomfort in the first quadrant localized in the maxillary right first molar. After some image evaluation, a moderate size cystic lesion was observed associated with the apical third of the maxillary first molar (endodontically treated). Prescription was made for Amoxicillin with Clavulanic Acid 875/125mg every 8 hours for 7 days, starting 3 days prior the surgery, and Dexketoprofen 25mg every 8 hours. Under local anesthesia the extraction was performed with enucleation of the lesion, that was not affecting the maxillary sinus floor cortical, decontamination with Chlorhexidine 0,12% for 1 minute in the periapical site and drilling sequence with osseodensification (to expand the crest and elevate the sinus floor at the same time), immediate Klockner® 3.6x8mm implant placement with primary stability on the septum with a 25NW torque. Healing abutment was placed with a GBR protocol with xenograft and APRF (plug) in the buccal space. 5-O monofilament suture and radiographic follow ups. 6 months later the prosthetic phase was finished.

Case 5:

43-year-old male patient presents to consult with history of dentoalveolar trauma (tennis racket hit with 3 months of evolution) that was managed with root canal treatment and teeth splinting. Without any improvement the patient is referred to the consult with a fistula in the attached gingiva and pulsating pain, in the CBCT evaluation a cystic-like lesion was observed in the apical third of the maxillary right central incisor. Prescription was made for Amoxicillin with Clavulanic Acid 875/125mg every 8 hours for 7 days, starting 3 days prior the surgery, and Dexketoprofen 25mg every 8 hours. Under local anesthesia the extraction was performed with enucleation of the lesion that was not affecting the buccal cortical, decontamination with Chlorhexidine 0,12% for 1 minute in the periapical site and drilling sequence towards the palatal third. Immediate Neobiotech® 4.0x11,5mm implant placement with primary stability with 25NW of torque. Healing abutment was placed and the immediate loading was differed. GBR with xenograft was performed and connective tissue graft was taken from the maxillary tuberosity, fixating it with 5-0 monofilament suture. Radiographic follow ups were done and 4 moths later the prosthesis phase was finished.

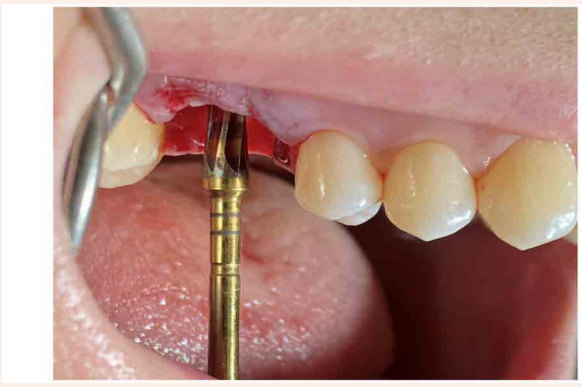

Figure 8: Drilling sequence for implant placement.

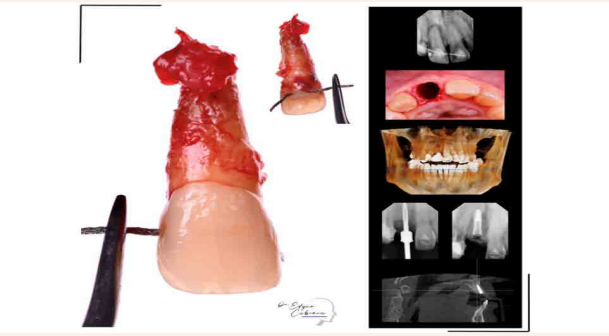

Figure 9: Central incisor with apical lesion (b) Xray of initial condition (c) Implant placed in extraction site.

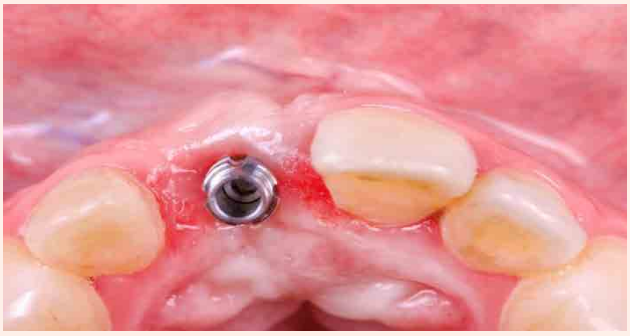

Figure 10: Implant placed after extraction.

Discussion

With the emergence of new technologies, implant dentistry continues in a constant improving process where almost all the systems look forward immediate solution protocols, minimizing treatment time for the patient that was impossible a few years back. Therefore, it is very important to apply detailed protocols where the diagnosis, patient selection, surgical technique, regeneration protocol, healing time, provisionalization and prosthetic phase help in the correct development of the treatment. The correct diagnosis for these periapical lesions and identifying anatomical structures are vital since the beginning of the treatment to stablish the extraction surgical technique, enucleation of the lesion, bone curettage and drilling sequence for the correct implant placement, considering the primary stability needed in a healthy bone free of any kind of pathologies. The immediate placement in infected sites (active) where primary stability is achieved using remanent bone does not elevate the complication rate and the integration of the implant is favorable. The literature describes a success rate of 92-100% in immediate placement in infected sockets [5-7]. Anitua et al. evaluated the immediate loading in implants placed in infected sites, their retrospective analysis of 43 implants placed in 30 patients with 6 years follow up indicated a success rate of 94% [8]. These successful results probably depend on biological events during the healing process, taking into account surgical and medical principles, implant stability, load control, biomechanics and inflammatory response together with systemic responsiveness.

Regarding the surgical technique, it is very important to consider several points: starting with the extraction of the affected teeth with the respective debridement of the granulation tissue or degranulation of the alveolus, which will lead to the eradication of the cultivated microorganisms [9]. The surgical technique definitely takes advantage of the regenerative potential of the organism after extraction and helps preserve the volume of both bone and soft tissues. In this way, it reduces the crestal bone loss that occurs after bone removal and healing. Immediate implant placement may be beneficial in maintaining the integrity of extraction sockets and contributing to the maintenance of interdental papillae around implant restorations [10]. The high survival rate and normal marginal bone changes obtained in several studies support the hypothesis that implants can successfully osseointegrate when placed immediately after extraction of teeth with endodontic and periodontal lesions when procedures are performed. suitable before implantation. In addition, the success of fresh socket implants placed in chronic and acute lesion sites can be explained by the behavior of endodontic infections because they are mixed infections dominated by anaerobic bacteria (Fusobacterium, Prevotella, Porphyromonas, Actinomyces, Streptococcus) commonly restricted in the infected local area. The extraction of the affected tooth usually leads to the eradication of the cultured microorganisms. This inflammatory reactive tissue protects the bone from direct bacterial attack [11]. In order to obtain these good and predictable results with follow ups over time, all the authors agree [12] that the determining factor is a rigorous alveolar debridement protocol and thorough cleaning after tooth extraction: first, the entire socket must be cleaned, granulation tissue carefully removed with curettage and debridement; secondly, the alveoli should be disinfected with gauze soaked in 0.12% chlorhexidine (applied for one minute); and lastly, copious irrigation with saline solution and 0.12% chlorhexidine is necessary to remove debris from the alveolus [13,14].

Of all the factors involved, primary stability appears to be the most important determining factor in immediate implant loading. The functional loading placed on an immobile implant is an essential factor in achieving osseointegration [15]. If an implant is placed in soft cancellous bone with poor initial stability, it often results in the formation of connective tissue encapsulation. In addition to the high success rates achieved with this technique, the reduction in treatment time together with the high level of aesthetic satisfaction of patients has made immediate implant placement a routine procedure in many dental clinics [12]. Ensuring that the peri-implant bone and soft tissues are stable is a basic criterion for the success of dental implants. Another important factor is that the loading of the implants leads to the remodeling of the peri-implant bone to adapt the bone architecture to the biomechanical stimulus [16]. In the case of the space between the implants and the walls of the socket, the application of bone grafts is suggested, the main reason is to preserve the contour of the crest in the implant site., in addition, they can increase the BIC (Bone implant contact) during early healing [17]. In these cases, for the comfort of our patients and as they are small bone defects with a high percentage of probability of regeneration, we use a MatrixOssTM xenograft, which is a 100% spongy graft of porcine origin. Its exclusive low-temperature treatment guarantees the stability of the graft (high osteoconductive power) and rapid "in vivo" remodeling. Porosity, trabecular space and roughness are parameters that directly affect the reabsorption/remodeling process. An initial reduction in BIC, due to prior infection, may not be clinically relevant due to post-loading remodeling, as such a reduction in BIC does not impair implant stability. The long-term clinical success of implants placed in infected sockets argues that functional loading does indeed lead to increased BIC [17,18].

Regarding the success rates or predictability of the application of these protocols, implants placed in fresh extraction sockets had a statistically significantly higher risk of failure than implants placed in healed sites. There are a few possible explanations for the higher failure rate of implants when using the fresh extraction socket approach. As the extraction socket is wider than the implant in most cases, these implants do not usually engage all the walls of the alveolar bone, but only the apical part of the socket [19]. On the contrary, Siegenthaler DW et al [20] did not detect any difference between immediate implant placement at sites with chronic periapical infection or at sites with periapical radiolucency, fistula, and/or suppuration compared to sites without such pathologies. The extension and size of the periapical lesions do represent a determining factor in decision-making for immediate implant placement, because if there is proximity to vital structures such as the maxillary sinus, mental nerve or inferior alveolar nerve, it determines the possibility of deferring the implantation protocol waiting for the marked times of guided bone regeneration, to place the implant in an ideal place.

Conclusion

Immediate implant placement is a highly predictable protocol that reduces treatment plan, which patients appreciate, gives esthetic results while maintaining soft and hard tissue and these results are carried over time. Literature has shown a survival rate of 96.23% after 5 years in immediate implants placed in sites with periapical lesions [21,22]. This protocol can be successfully and predictably applied in infected teeth or with apical lesions as long as a series of requirements are meet. Before the surgery a thorough radiographic and clinical evaluation has to be done where anatomical structures and their contact with the lesion or tooth are studied, size and extension of the lesion and amount of healthy remaining bone [23,24]. During the surgery the goal has to be to perform an atraumatic extraction to preserve bone and a meticulous enucleation and bone curettage where all the lesion and granulation tissue is removed from the site. Another key factor during the surgery is to achieve primary stability in healthy bone without jeopardizing the correct implant angulation.

After achieving primary stability, GBR with xenograft and PRF protocols are used to cover bone deficiencies to have a successful esthetic and biological result. After surgery is completed, it is essential to evaluate patients continuously in radiographic and clinical follow ups to assure the condition of the implant and peri implant tissues. If is not possible to achieve all the mentioned steps, atraumatic surgery, enucleation and primary stability, a traditional 2 step surgery has to be performed. The first one performing the extraction with enucleation and GBR and the second one, after 4-5 months, the implant placement [25,26].

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