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CASE REPORT/TECHNIIQUE GTR

Surgical Treatment of a Large Through-and-Through Periapical Lesion with Apicomarginal Defect using Guided Tissue Regeneration (GTR): A Case Report of a Two-Year Follow-Up

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The acronym ‘GTR’ at the upper right icon means that article contains a description of the technique of guided tissue regeneration (GTR) during endodontic microsurgery.

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ABSTRACT

In case of a long-term periapical lesion, destruction of both vestibular and oral cortical plates is sometimes observed and even a through-and-through periapical lesion occurs. The success of the treatment decreases when an apicomarginal defect is added to the through-and-through periapical lesion. Large periapical lesions should be treated initially by orthograde root canal therapy. When the signs and symptoms of the infection don't recede after the treatment, then surgical approaches should be considered. In this case report, a 22-year-old female with previously initiated therapy was referred for an endodontic microsurgery of tooth 22. After the endodontic treatment the patient was referred to the oral surgeon for apicoectomy with augmentation of the bone defect. The sinus tract in the apex area of the tooth 22 remained active since the surgical intervention. Endodontic microsurgery and guided tissue regeneration were

performed. After two-year follow-up, radiographic examination revealed significant bone reconstruction and clinical signs and symptoms were absent. The patient hasn't reported any symptoms since.

KEY WORDS

Through-and-through periapical lesion, apicomarginal defect, sinus tract, endodontic microsurgery, guided tissue regeneration (GTR)

INTRODUCTION

The main cause of unsuccessful periapical healing after primary endodontic therapy or retreatment is the persistence of bacteria and infected tissue in the endodontic space [1]. The anterior region of the maxilla (especially lateral incisors) is the most common involved area [2]. In instances where nonsurgical retreatment cannot solve the problem a significant number of persistent nonhealing cases can be saved by endodontic microsurgery with a predictably favorable prognosis [3]. According to meta-analysis of the literature the success rate for traditional root-end surgery 59% and for endodontic microsurgery 94% respectively [4, 5]. By removing the diseased tissue, debriding the canal system, and sealing the defect or cavity, the surgeon prevents or reduces the spread of microorganisms within the periradicular tissues.

Regeneration of periapical defects may have a significant problem in periradicular surgery. In such circumstances, the gingival connective tissue can proliferate, or the oral epithelium can migrate into the defect, preventing the development of normal trabecular bone. Hard tissue can be restored using guided tissue regeneration (GTR) [6].

An apicomarginal defect is a mix of two communicating bone defects: a periapical bone defect plus a total root dehiscence [7]. These defects are associated with relatively lower success rates after endodontic surgery [8, 9]. It has been reported [10, 11] that, when the apex of the root is totally surrounded by bone, the success rate is higher than when there is a lack of one cortical bone plate (it decreases to 37%) [9] or two cortical bone plates (to 25%) [8].

Treatment of large periapical defects using GTR increases overall treatment success [12]. Use of GTR in endodontic surgery of through-and-through lesions that involve both the buccal and palatal alveolar cortical plates is recommended [13].

CASE REPORT

The patient (age 22, female) was referred for an endodontic microsurgery. Tooth 22 was symptomatic, luxated (II degree). A sinus tract observed above the apex contained purulent exudation and xenograft debris (Fig 1). Periodontal probing depths around teeth 21, 22, 23 were within the normal range. The patient had had orthodontic treatment (fixed braces), but tooth 22 hadn't been involved.

In anamnesis it was indicated that the patient had had endodontic treatment of extensive lesion of tooth 22 on 23 August, 2018 (Figs 2–4) After it the patient was referred to the oral surgeon for apicoectomy with augmentation of the bone defect. The sinus tract in the apex area of tooth 22 remained active since the surgical intervention.

The cone beam computed tomography (CBCT) analysis revealed partial bone reconstruction in the palatal part of the defect in the apex area of tooth 21 (tooth is vital). The bone defect was filled with heterogeneous, contrasting material (xenograft) (Figs 5–7).

Preoperative Procedure

Before the surgical procedure, the patient's venous blood (20 ml) was drawn via venipuncture of the antecubital vein. It was collected in four 10-ml sterile glass tubes coated with an anticoagulant (acidcitrate dextrose). The blood was centrifuged with Centurion PRO-PRP S (Centurion Scientific Limited, Chichester, West Sussex, UK) at the speed of 2700 rpm for 10 minutes to separate platelet-rich fibrin (PRF) from platelet-poor plasma. PRF was stored in a PRF box (Doctor Tools, Vladimirescu, Romania). A presurgical rinse with 0.2% solution of chlorhexidine (Eludril Classic; Pierre Fabre Group, Paris, France) was performed.

Surgical Procedure

The entire surgical procedure was performed using a dental operating microscope (Microscope Carl Zeiss EXTARO 300, Germany). Anesthesia was achieved with buccal infiltration of 3 capsules (5.4 ml) of 2% lidocaine hydrochloride with 1:50,000 epinephrine (Xylodont; Molteni Stomat, Florence, Italy). The full-thickness triangular flap was raised with vertical incision in frenulum and horizontal sulcular incision from teeth 21 to 24.

The bone defect was cleaned from a substantial amount of granulation soft tissue and loosed xenograft granules. An apicomarginal bone defect was detected (class 2B, purely endodontic origin, according to apicomarginal defects classification [14] (Fig 8).

After cleaning the root section surface with a surgical bur (Lindemann H254E, Komet, Germany), the lack of retrofilling was identified. The vertical root fracture wasn't identified with the help of dying with 1% aqueous solution of methylene blue Canal detector (Cerkamed, Poland) (Fig 9). 3 mm-deep retrograde preparation with an ultrasonic tip and device was performed (E11D, Woodpecker, Guilin Zhuomuniao Medical Devices Co., China). The root canal was filled with MTA+ (Cerkamed, Poland).

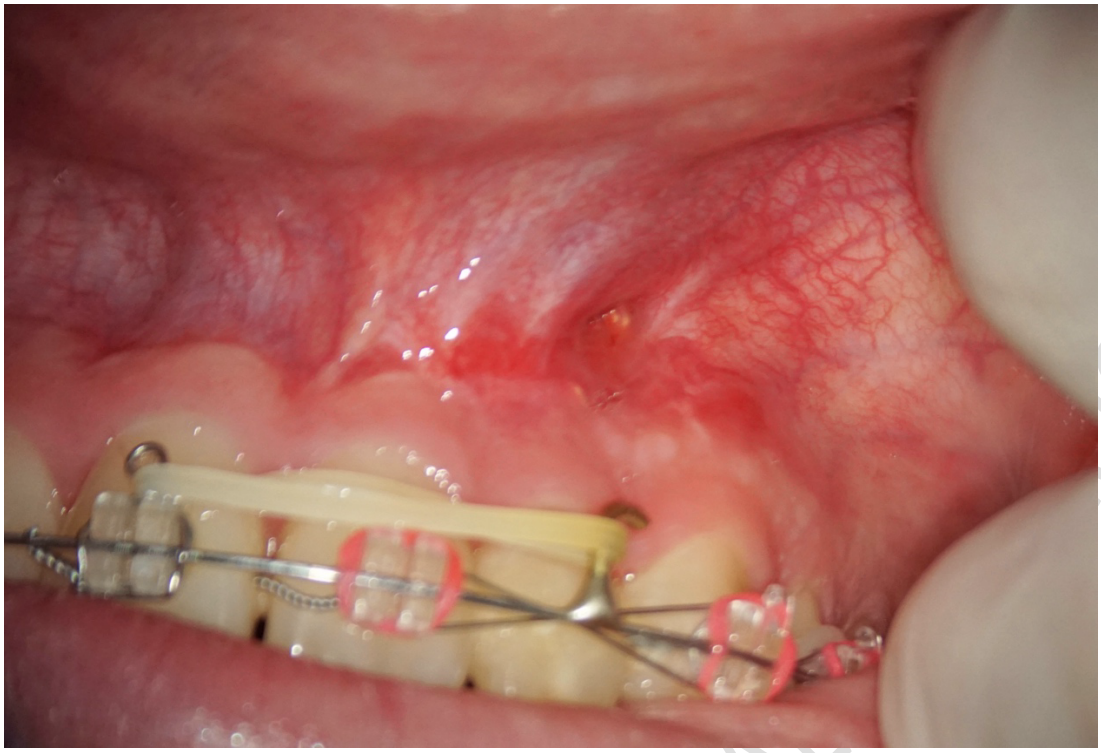
The bone defect was filled with a PRF plug and covered with a collagen membrane (SinossMem, B&B Dental Implant Company, Italy) (Figs 10–11). It was covered with a PRF membrane and the wound was sutured with polypropylene (Luxylene 6/0, Lux-sutures S. A. Luxembourg) (Fig 12).

After surgery X-ray was performed on 17 August, 2020 (Fig 13).

A follow-up which was carried out in 5 days revealed a sinus tract with serous exudation (Fig 14). The sutures were removed.

During subsequent visits gradual decrease of the sinus tract was observed. After 4 months the sinus tract closed completely (Fig 15).

The CBCT made after 2 years. Revealed significant bone reconstruction. The patient hasn't reported any symptoms since (Figs 16–18).



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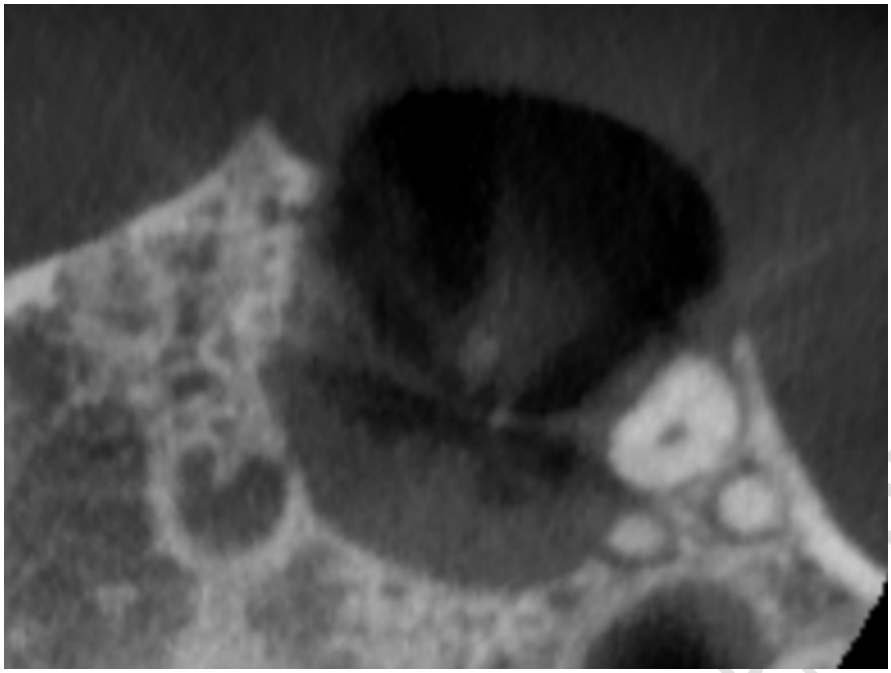

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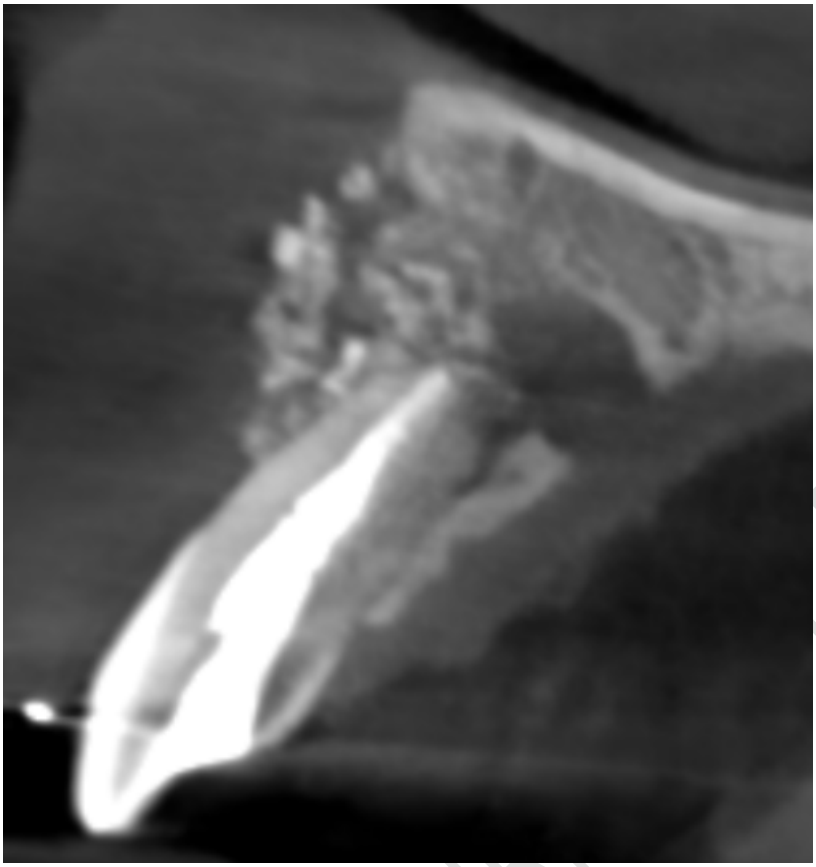

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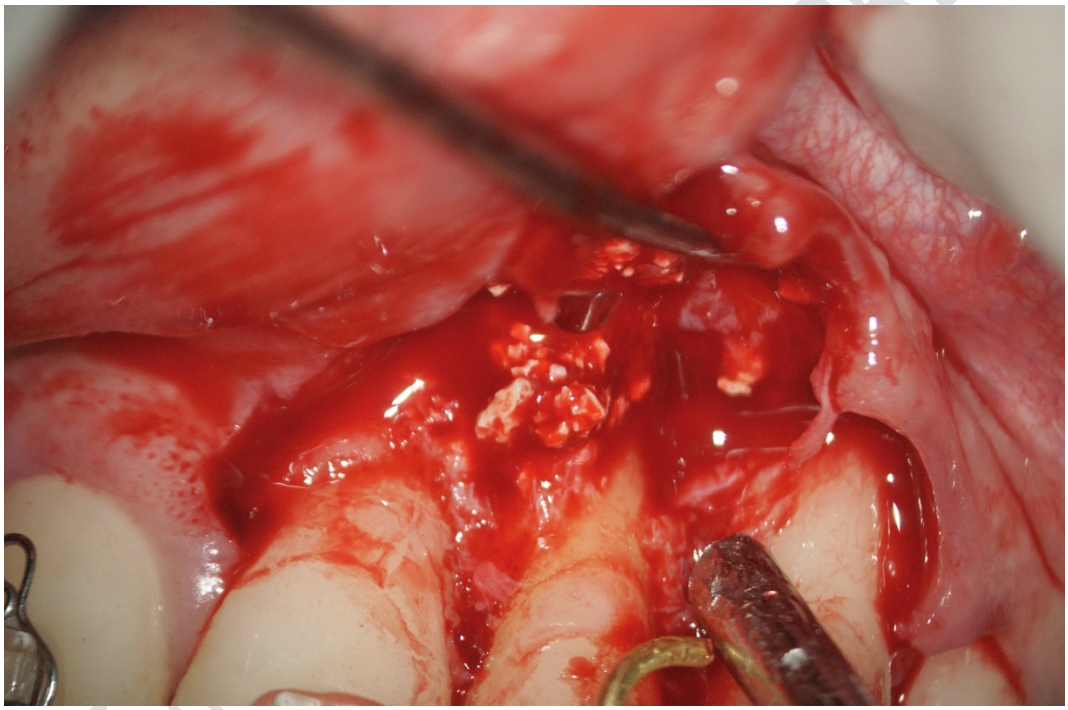

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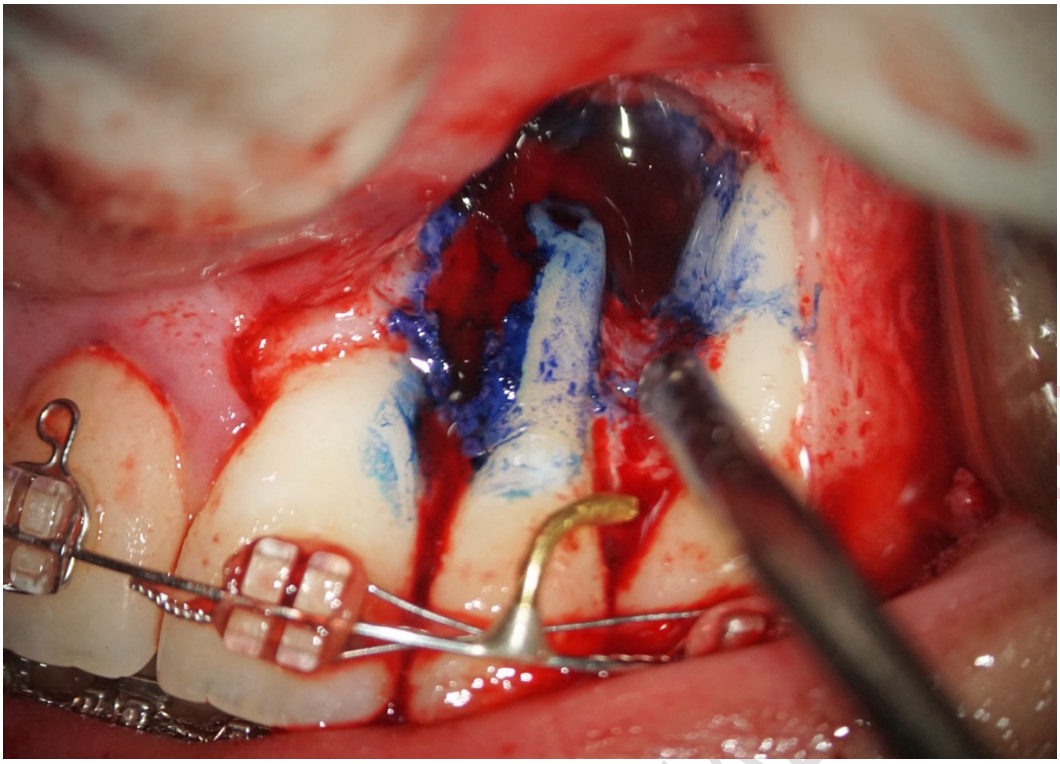

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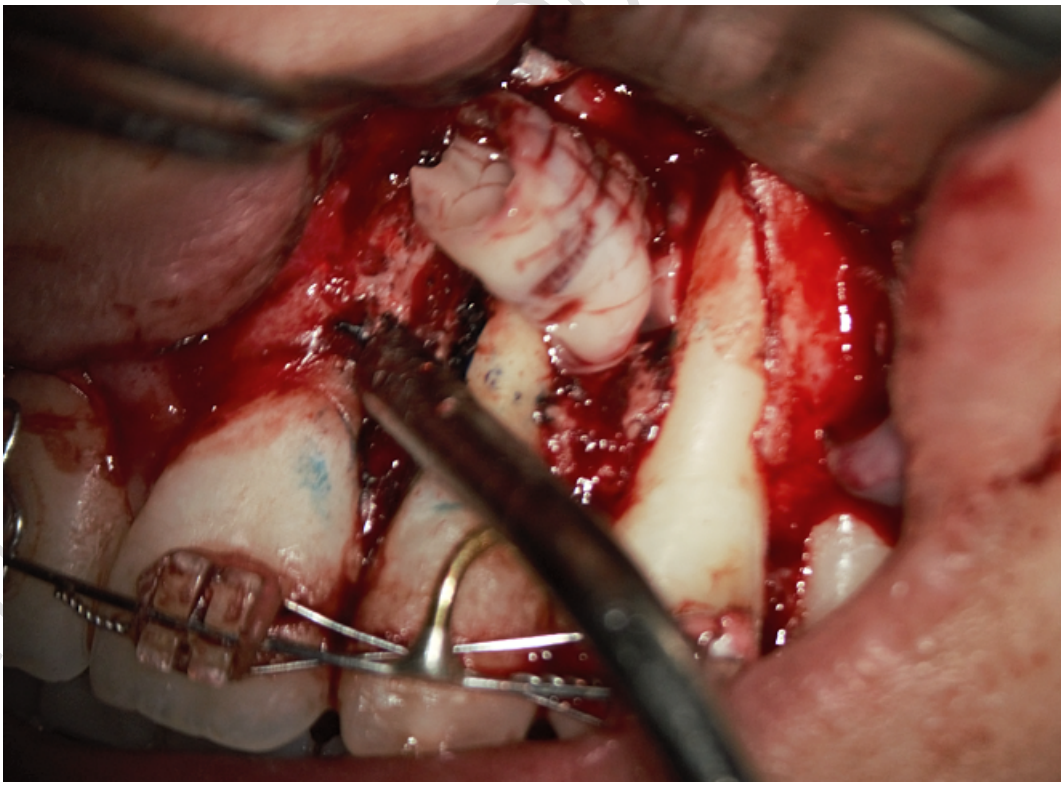

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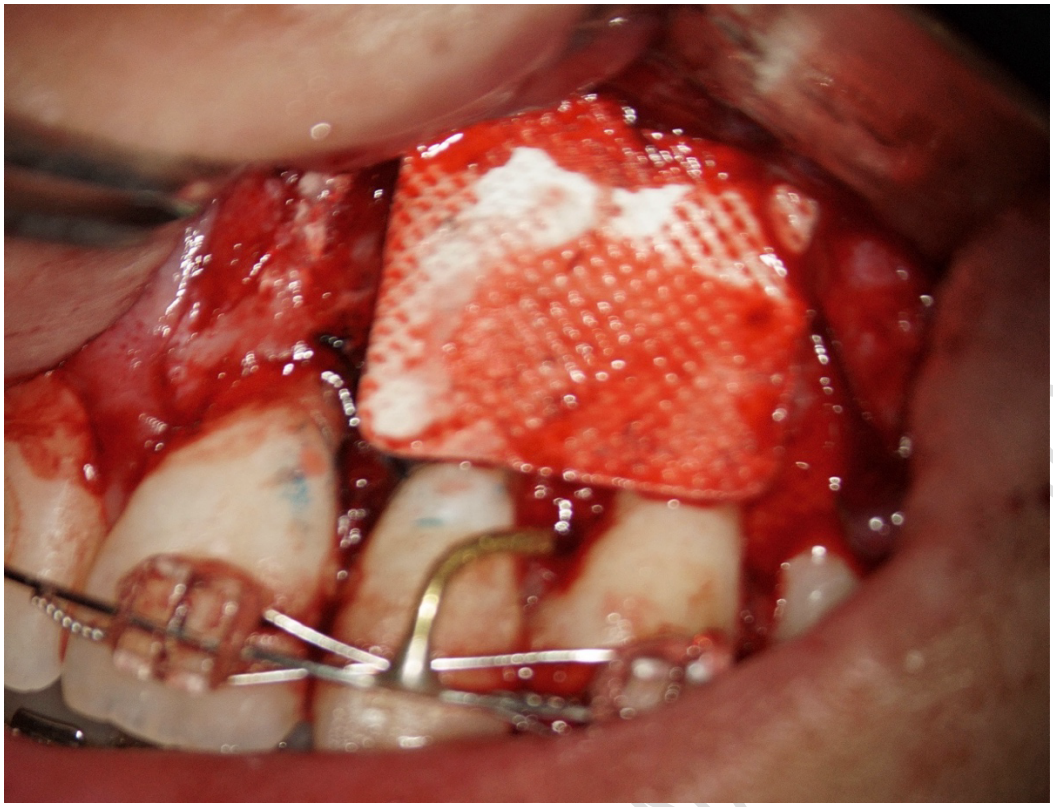

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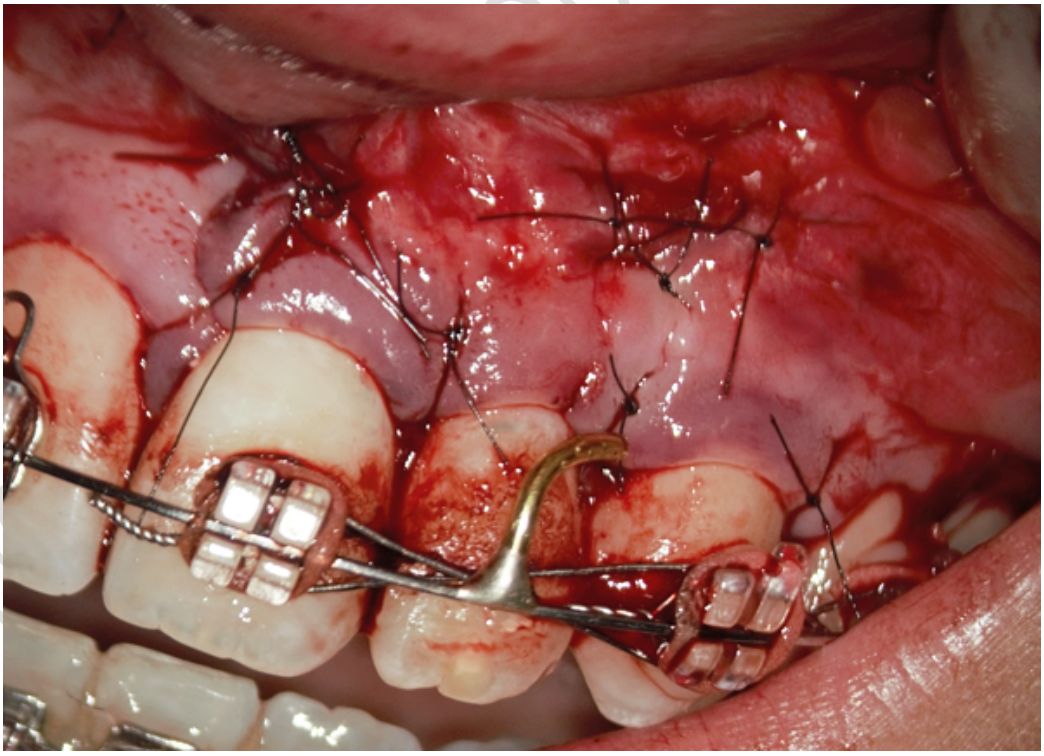

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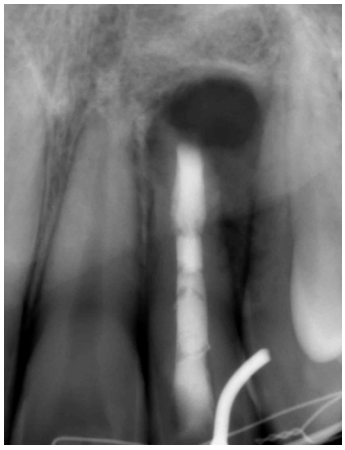

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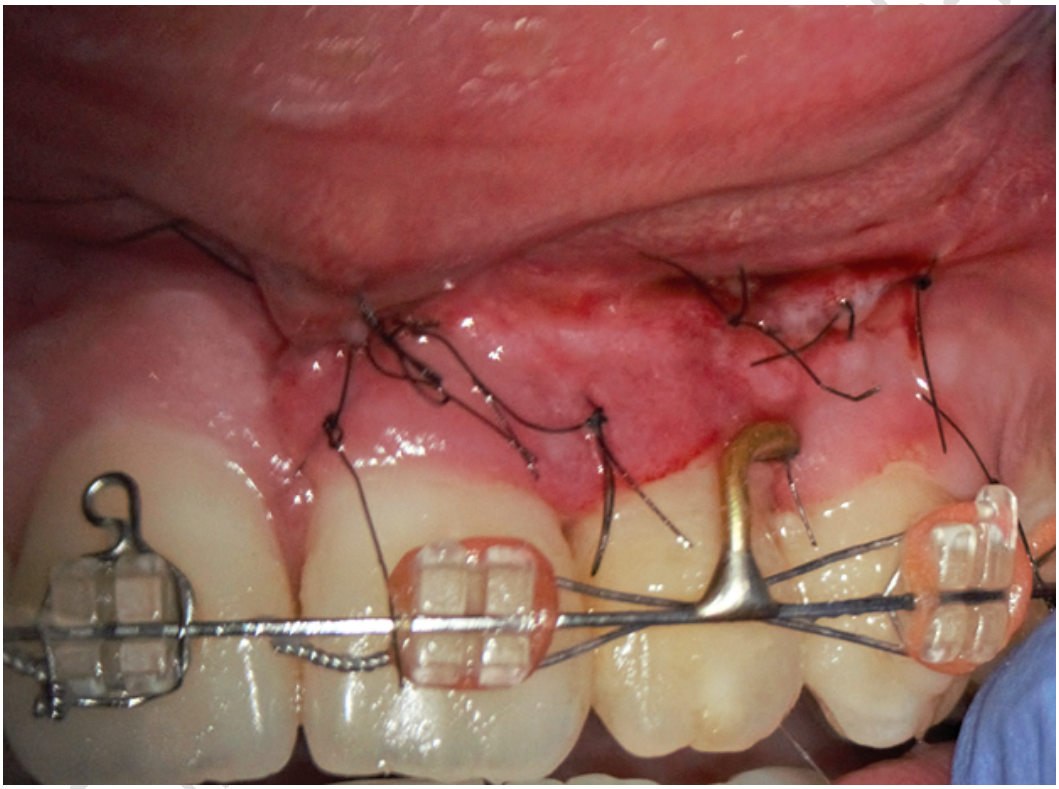

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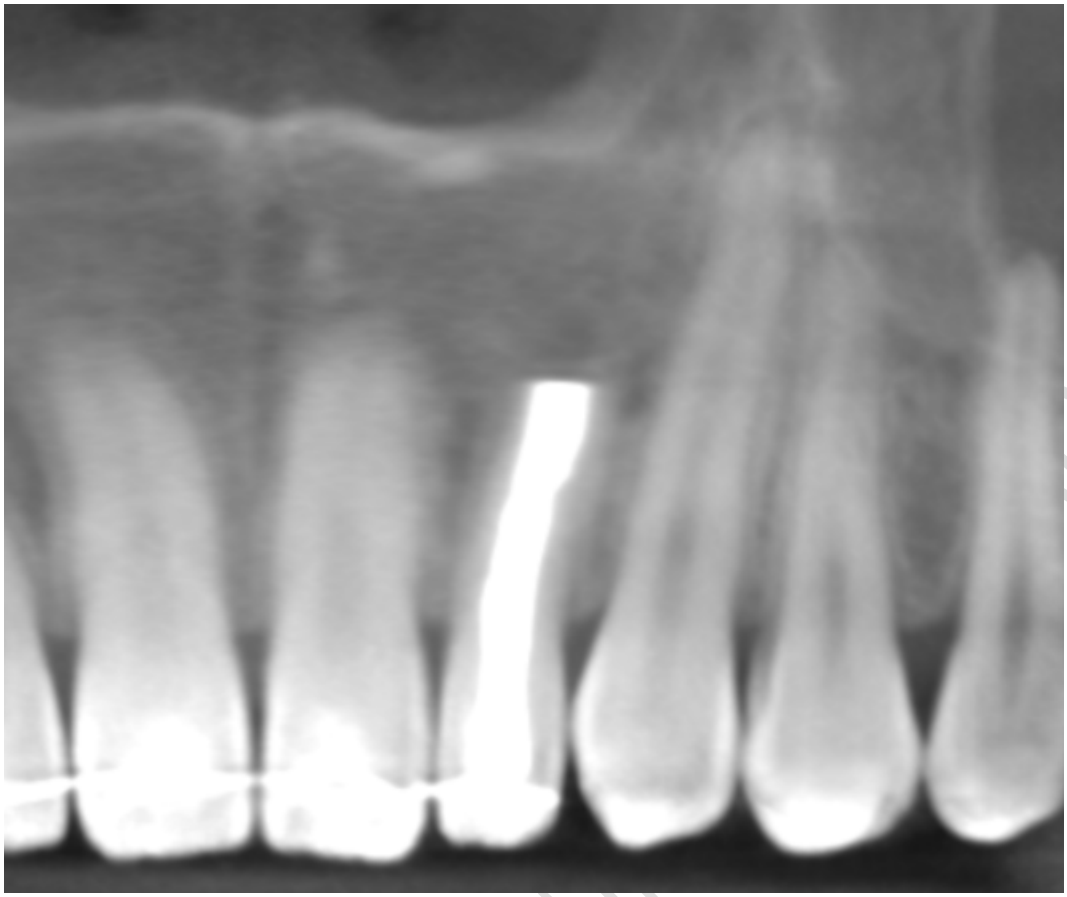

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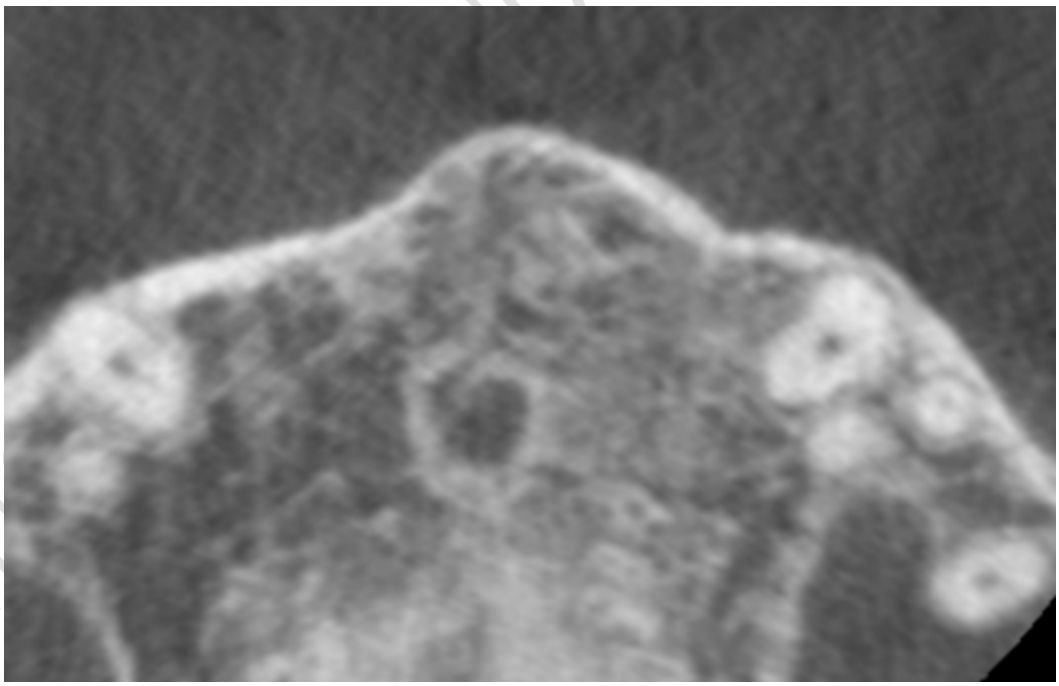

FIGURE 18.

DISCUSSION

This case perfectly shows that a success in treatment of such complex cases depends on many factors. The main ones are:

1. Understanding the cause-and-effect relationships in the development of inflammation and why failure occurred after the first surgical treatment.
2. Analysis of evidence-based articles and guidelines that provide recommendations on how to conduct treatment according to the patient's problem.
3. Technical provision of all necessary tools, materials and equipment for endodontic microsurgery.
4. Clinical experience and good manual skills of a surgeon.
5. Use of materials and methods of treatment that have the highest success rate according to the scientific evidence-based literature.
6. Factors that depend on a patient themselves (health condition, complexity of a clinical case, their responsibility, a desire to save a tooth).

Analyzing the first performed surgical manipulation (apicoectomy), we should pay attention to the main factors that contribute to the failure:

1. Insufficient cleaning and tightness of the filling mass in the root canal. The most common cause of failure in nonsurgical endodontic treatment is a leaky canal (30.4%) [15].
2. Resection of the root tip was performed without retrograde preparation and filling. Song et al. [16] determined that no root-end filling and incorrect root-end preparation were the most common causes of failure, followed by missing or leaky canals and unidentified isthmuses.
3. Absence of membranes in case of a through-and-through bone defect. Application of barrier membranes in through-and-through bony crypts after endodontic surgery might create a microenvironment, which is conducive for osteogenesis in a short-term experimental observation or clinical follow-up as compared to without barrier membranes [17]. Based on limited information in the literature, through-and-through bone defects could benefit from application of GTR technique using bioabsorbable barrier membranes after endodontic surgery to improve the rate of new bone formation in short-term observation [18–20].

4. Improper use of bone-plastic material that sometimes masked chronic inflammation for a long time. Radiographically, the problem of using bone graft substitutes in endodontic surgery is the difficulty of differentiating incomplete healing (scar tissue) from uncertain healing (no healing) because bone graft substitutes are radiopaque [21].
5. Absence of control observations of clinical symptoms after the operation, the condition of the sinus tract, and the lack of control X-rays by a doctor who previously performed apicoectomy.

In periapical surgery the sulcular full thickness flap is often used [22]. The main disadvantage of the sulcular full thickness flap is recession and, especially, unpredictable shrinkage of the papilla during healing [23]. The risks of these complications are greater, especially when surrounding bone tissue is lost.

When discussing the issue of the rationality of filling a bone defect, it is worth noting the scientific data related to the use of PRF. Platelet-rich plasma (PRP), bone morphogenic proteins (BMPs), platelet-derived growth factor (PDGF), parathyroid hormone (PTH), and enamel matrix proteins (EMD) have been locally applied to promote the healing potential of the surgical site [24]. It has been advocated that PRF can be considered a healing biomaterial because it is constituted by a fibrin network in which platelets, leukocytes, cytokines and stem cells are enmeshed [25]. Moreover, the platelets in the PRF network are capable of slowly releasing PDGF and insulin-like growth factor (IGF), [26, 27] even up to one week [28]. The osteogenic potential of these molecules has been already demonstrated [29, 30]. PRF can be thought as a grow factor reservoir that can be employed without exposing the patient to any immunogenicity or infection risk [31].

A collagen graft can be another alternative; however, PRF has been proven to have a beneficial effect in regeneration [32, 33].

The article [34] analyzes the use of PRF in endodontic microsurgery. A control group of four patients (without PRF) and a test group of seven patients (with PRF) were involved. After endodontic microsurgery, the results of both groups were compared. Then the assessment was carried out according to three important indicators: the speed of healing, the intensity of pain and the amount of swelling. In the group where PRF was used, a statistically significant differences

in the three criteria were observed: the speed of periapical healing accelerated, the intensity of postoperative pain and the severity of postoperative swelling decreased.

Sometimes scar tissue formation with through-and-through periapical lesions during tissue repair is observed [35–37].

Ingrowth of connective tissue into the osseous defect prevents periapical bone regeneration. It can result in periapical scarring, which is often misdiagnosed as pathology and may lead to unnecessary surgical reentry by a practitioner who is not fully aware of the history. When the barrier membranes are placed over bony defects and closely adapted to the surrounding bone surface, an environment that prevents invasion of competing nonosteogenic cells from the overlying soft tissues can be created. This environment provides the bony defect time to heal [38]. The use of GTR principles enhanced the quality and quantity of bone regeneration in large periapical defects, especially in through-and-through lesions [39].

CONCLUSION

The presented case report describes a difficult case that was resolved by endodontic microsurgery a positive outcome of which was enhanced by a two-year follow-up. The use of PRF as an autologous graft in combination with a collagen membrane ensured complete healing, a good aesthetic result of soft tissues and the absence of any clinical signs and symptoms. Future long-term clinical observations and studies are needed to prove the effectiveness, predictability and success of this technique.

CONFLICT OF INTEREST

The authors declare that they don’t have any conflicts of interest.

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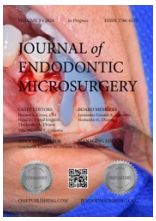

ЗВІТ ПРО ВИПАДОК/МЕТОДИКА

UKRAINIAN LANGUAGE

Хірургічне лікування великого наскрізного періапікального ураження з апікомаргінальним дефектом із застосуванням керованої тканинної регенерації (КТР): звіт про випадок із дворічним спостереженням

Вітольд Поповічь[a,*] та Олександр Борисович Ткаченко[b]

АНОТАЦІЯ

При тривалому періапікальному ураженні іноді спостерігається деструкція як вестибулярної, так і оральної кортикальних пластинок і навіть наскрізне періапікальне ураження. Успіх лікування знижується, коли до наскрізного періапікального ураження додається апікомаргінальний дефект. Великі періапікальні ураження слід спочатку лікувати за допомогою ортоградної терапії кореневих каналів. Якщо ознаки та симптоми інфекції не зникають після лікування, слід розглянути можливість хірургічного втручання. У цьому випадку 22-річна жінка з раніше розпочатим лікуванням була направлена на ендодонтичну мікрохірургію зуба 22. Після ендодонтичного лікування пацієнтку направили до орального хірурга для апікоектомії з аугментацією кісткового дефекту. Синус тракт в ділянці верхівки зуба 22 з моменту хірургічного втручання залишився активним. Виконано ендодонтичну мікрохірургію та керовану тканинну регенерацію. Після дворічного спостереження рентгенологічне дослідження виявило значну реконструкцію кістки, а клінічні ознаки та симптоми були відсутні. Відтоді пацієнт не повідомляв про жодні симптоми.

КЛЮЧОВІ СЛОВА

Наскрізне періапікальне ураження, апікомаргінальний дефект, синус тракт, ендодонтична мікрохірургія, керована тканинна регенерація (КТР)

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Акронім «КТР» у верхньому правому значку означає, що стаття містить опис методики керованої тканинної регенерації (КТР) при ендодонтичній мікрохірургії.

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