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ORIGINAL ARTICLE/ARTICOLO ORIGINALE

Application of platelet-rich fibrin in endodontic surgery: a pilot study

Applicazione del platelet-rich fibrin in endodonzia chirurgica: studio pilota

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KEYWORDS
Endodontic surgery;
Healing;
Platelet-rich fibrin;
Postoperative pain;
Swelling.

Abstract
Aim: To assess preliminarily the potential benefits of the use of the platelet-rich fibrin (PRF) in modern endodontic surgical procedures in terms of radiographic healing acceleration and postoperative discomfort reduction.
Methodology: Eleven patients with chronic apical periodontitis were randomly assigned to either the PRF ($n = 7$) or the control group ($n = 4$). Postoperative swelling and pain were assessed with a questionnaire. Radiographic healing was scored according to Molven's scale up to a period of one year. Data were statistically analyzed with non-parametric tests.
Results: In the PRF group the patients experienced less pain in the 2—6 h postoperatively as well as oedema, which never exceeded the moderate intraoral swelling. Radiographic healing was detectable earlier in the PRF group, with the majority of cases scored as complete healing after 2—3 months.
Conclusions: The adjunctive use of PRF might promote the acceleration of the radiographic healing and reduce the postoperative discomfort.

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PAROLE CHIAVE
Endodonzia chirurgica;
Guarigione;
Platelet-rich fibrin;
Dolore postoperatorio;
Gonfiore.

Riassunto
Obiettivi: Valutare preliminarmente i potenziali benefici dell'uso del platelet-rich fibrin (PRF) nella moderna endodonzia chirurgica in termini di accelerazione della guarigione radiografica e riduzione del discomfort postoperatorio.
Materiali e metodi: Undici pazienti con paradentite periapicale cronica sono stati assegnati casualmente al gruppo PRF ($n = 7$) o al gruppo controllo ($n = 4$). Gonfiore e dolore postoperatori sono stati valutati con un questionario. Nell'arco di un anno di osservazione è stato assegnato un punteggio alla guarigione radiografica secondo la scala di Molven. I dati sono stati analizzati statisticamente con test non parametrici.
Risultati: I pazienti del gruppo PRF hanno provato meno dolore nelle 2—6 ore postoperatorie e sviluppato minor edema, che era sempre limitato e intraorale. Nel gruppo PRF la guarigione radiografica era individuabile precocemente, con la maggioranza dei casi classificata come guarigione completa dopo 2—3 mesi.
Conclusioni: L'uso aggiuntivo del PRF sembra promuovere l'accelerazione della guarigione radiografica e ridurre il discomfort postoperatorio.

Introduction

Untreated pulp tissue necrosis may lead to periapical periodontitis, which represents a response of the bone around the apex to restrain the local infective offence. Periapical healing can be achieved by root canal treatment, whose purpose is to remove bacteria and remnants of infected tissue by shaping, cleaning and filling with an inert material the entire root canal system.[1] The main cause of unsuccessful periapical healing after primary endodontic therapy is the persistence of bacteria and infected tissue in the endodontic space[2] even after orthograde endodontic treatment and retreatment; in such cases, the last resort to maintain the tooth is represented by apical surgery.[3] In the choice between orthograde re-treatment and surgical approach, the latter has to be preferred when the root canal filling is adequate, but symptoms are persisting, when re-treatment involves high risk procedures or long posts are present in the root canal.[4]

Improvement in technical instruments and in surgical techniques might enhance the outcome of endodontic surgery.[5] In fact, the employment of microsurgical techniques and modern obturation materials raised the success rates after root-end resection and retrograde filling to about 80—90%.[6,7] In order to induce bone regeneration and soft tissues healing after oral surgery, the local application of hormones, grow factors and plasma derivates has been advocated.[8] 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.[8] Nevertheless, the effectiveness of their application in endodontic surgery is still questionable and the advantages they provide to both surgeon and patient have been reported to be moderate and remain still controversial.[9—14]

It has been advocated that Platelet-rich Fibrin (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.[15] Moreover, the platelets in the PRF network are capable of slowly releasing platelet-derived growth factor (PDGF) and insulin-like growth factor (IGF),[16,17] even up to one week.[18] The osteogenic potential of these molecules has been already demonstrated.[19,20] PRF can be thought as a grow factor reservoir that can be employed without exposing the patient to any immunogenicity or infection risk,[21] because it is entirely composed of nothing but the patient's blood. The application of such a specific biomaterial to endodontic surgery has already been described in some recent case reports[22—24] and a randomized clinical trial in the specifical field of the treatment of apicomarginal defects.[25]

Considering that the teeth undergoing apical surgery have less predictable prognosis and even a single tooth can be strategic in the whole oral prosthetic rehabilitation, the possibility of accelerating the bone regeneration in periapical surgical defects might be of great interest to the clinician, in order to proceed sooner with the permanent rehabilitation.

The aim of the present one-year follow-up pilot study is to evaluate the radiographic healing and the postoperative discomfort in patients undergoing apical surgery, either by leaving the apical surgical cavity empty or by filling it with the PRF gel. The null hypotheses were that periapical surgical defects filled with the PRF gel require the same healing time of sites treated by conventional surgical techniques and that the patients experienced the same postoperative discomfort with or without PRF application.

Materials and methods

Patient selection

In this study 11 patients underwent endodontic surgery for the treatment of refractory periapical periodontitis. The whole experimentation was conducted in accordance with the declaration of Helsinki of 1983. The patients involved were fully informed about the intent and the design of the study and they were asked to give their approval by signing a written consent.

Patients with severe systemic disorders (i.e. non-controlled diabetes, immunologic diseases, malignant neoplastic processes), thrombocytopenia or insufficient compliance were excluded from the present study. For inclusion of