Bone structure regeneration after low induction magnetic field treatment in teeth chosen for extraction

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Abstract

Purpose: The aim of the work was to use and to evaluate the usefulness of the slow variable magnetic fields to aid the treatment of the teeth chosen for extraction. The marginal paradontium of periapical bone of teeth was in a state of extensive destruction. The teeth were chosen for extraction.

Material and methods: 13 patients were chosen. 10 of them had with endo-perio changes and 3 suffered from full tooth luxation and had the teeth replanted. Those people were to have an extraction procedure or were declared as impossible to treat in other dental offices. Patients underwent non-aggressive skaling, endodontic treatment and were exposed to slow variable magnetic fields generated by Viofor JPS, accordingly to methods and parameters suggested by Department of Propaedeutics in Dentistry of Pomeranian Medical University in Szczecin. The process of healing of changes was evaluated radiologically.

Results: RTG done after 2 weeks and after 2 months were evaluated in respect of bone regeneration. They show the bone structure concentration. A RTG evaluation after half a year, two and three years show a preservation of the bone structure concentration.

Conclusions: The use of slow variable magnetic fields contributed to bone structure regeneration and to preserve teeth with recorded endo-perio syndrome. Endodontic treatment of replanted teeth, aided with magnetostimulation has stopped the osteolisis process.

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Introduction

Nowadays stomatologists are seeking methods that help to preserve teeth chosen for extraction. It is due to the increase of patients' expectations, privatisation of stomatology, and tendency to preserve one's own teeth, despite the rise in implantology. Unequivocal reasons to tooth extraction are an extensive destruction of bone structure and considerable tooth luxation. In our work there was an attempt to use low variable magnetic fields in some teeth. They had endodontic-periodontic paradontium damages and traumatic – tooth dislocation. A preservative treatment was undertaken at patient's will. Those states are the biggest tooth damages and are often qualified to extraction [1]. Pathological endo-perio states that were due to changes in endodontium and periodontium are connected through apical gap and lateral canal. This is the reason why the healing of those chronic inflammatory states is a complex problem, which often results in a tooth extraction [2]. It is also difficult to gain good therapeutic result after a complete tooth luxation – a total loss of connection between a tooth and a dental alveolus. Such a tooth is usually dry-stored and kept long outside the oral cavity for more that 120 minutes.

Material and method

10 patients were chosen to endodontic treatment. They had endodontic-periodontic syndrome. It was identified with the use of clinical check-up, diagnostic tests (electric pulp vitality test) and radiological tests. The treatment was preceded by a non-aggressive skaling. After processing the canals they were filled with gutta-percha with AH Plus or Diaket. The roots were filled using one-cone or side condensation method. Since the first day of endodontic treatment, after eliminating possible contraindi-

Figure 1. **Tooth 41 – extensive apical and border osteolisis. At the beginning of treatment a surveying image was done with a needle. In the paraapical area on the RTG there is a large limited translucence. Around there is a bone calcification line. A bone septum between tooth 41 and tooth 31 has large bone holes. The rarefaction of the bone structure and irregular horizontal destruction of the alveolar, almost intermixed with an extensive periapical change are visible**

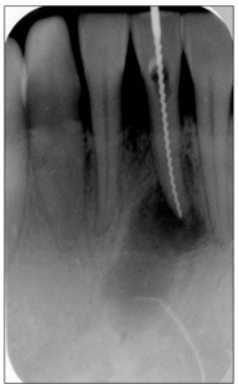


Figure 2. **Tooth 41. Status after two weeks of treatment together with magnetostimulation sessions. The tooth is filled with an iodoform substance that shows a direction of healing fistula in the periapical area. A fast rate of healing of the bone structure is visible. The diameter of the translucence of the periapical area became smaller. The alveolar bone became denser, what was confirmed with a use of Digora 2.1 programme**

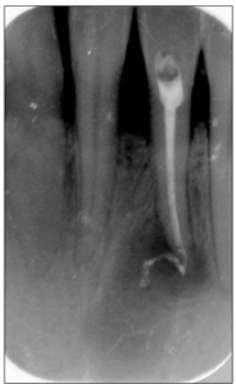


Figure 3. **Tooth 41. After two months of treatment and magnetostimulation a follow-up improvement is visible. The size of osteolisis has been reduced, and the bone structure has become denser. The root canal was filled with Diaket material**

Figure 4. **Tooth 41. A control image done after half a year shows almost perfect recovery. The trabecular bone structure is completely rebuilt. A border line of the alveolar bone with a blurred border.**

cations, magnetostimulation treatment was applied with the use of Viofor JPS. A A3M1P3 programme was used. The initial 4 intensity was increased every three days, up to 6. The minimum number of sessions was 20. The technical details are in the Viofor JPS manual. A control RTG was done after 2 weeks, 2 months, half a year, 2 years and 3 years. Then it was evaluated with the use of Digora 2.1 system or on standard RTG.

The treatment of three patients with full tooth luxation (extraction) began. The time of seeking help and the way of keeping the tooth (dry) did not suggest preserving the tooth in a bone. After inserting the teeth into the dental alveoluses and fixing it, the magnetostimulation sessions has started accordingly to the method described above. Simultaneously, the teeth were treated endodonticly, accordingly to the method presented above. In case of the youngest patient (5 and a half year old) the endodontic treatment was not done. It was due to the unfinished development of the tooth root and to finding a broad bleeding neural-vascular bundle.

Results

Radiological description of the case

A.K. 45 years old patient with endodontic-periodontal syndrome. Due to extensity of changes her odds were low (see *Fig. 1-4*).

S.N. patient, 5 and a half year old, after a complete tooth 21 luxation and destruction of outer lamina of the alveolar bone. A Radiological presentation of a case and a bone structure regeneration process is presented in *Fig. 5-8*.

Discussion

The research on using the slow variable magnetic fields in stomatology was due to good results in treating inflammatory and degenerative states of movement organ and also traumatic states in general practice [4]. The research in stomatology continues for 5 years and is still continued [5]. Many mechanism of the influence of those fields on the tissue were recognised. In the Viofor JPS device the parameters of the induction of the fields are chosen in order to sustain the homeostasis of the organism. In case of the dysfunction of homeostasis the parameters allow to quickly regain the normal status. The electrodynamic, magnetomechanic influence and ion cyclotron resonance causes biophysical and biological effects in the organism [6]. It is believed that the magnetomechanic effect has an influence on bone matrix due to calcium reuptake and returning to bone. Some of the examples of the influence of the fields on the molecular level are the activation of the enzymatic reactions, the capacity enhancement of the cell membrane and the influence on the movement of electric charges. It is believed that the intensification of an osteogenic process is connected with vasodilatative and angiogenetic effect, which enhances process of oxygenation and nourishing tissues [7].

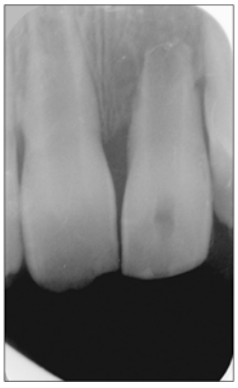
Extensive destruction of the side paradontium and apical

Figure 5. **The status at the beginning of treatment – 6 hours after the injury. The tooth was dry-preserved in xylogen.**
On the RTG an empty dental alveolus of the knocked out tooth 21. The damage of outer lamina of alveolar bone (break) is matching to the length of the developing root. Next there is a tooth 11 with unfinished development of the tooth – large latitude of the root canal

Figure 6. **After two weeks after immobilising the tooth and using magnetostimulation sessions the tooth integrates with a bone in the root apical area. The teeth are joined with a use Splint-it tape**

Figure 7. **RTG after two months from the replantation. Status after taking of the splint. The contact between tooth root and bone is minimal. A high risk of loosing the tooth**

Figure 8. **RTG after 4 months from injury. The root of teeth 21 does not grow lengthwise. There are no symptoms of root resorption. The line of the tooth root apes calcification is noticeable. There is an alveolar bone regeneration and the root is fusing with the bone**



structure are still difficult dental problems. A decision of not removing a tooth was caused by the tooth localisation, patient's hygienic status, his or her attitude towards therapy, age and financial status.

An endoosteum localisation of the paraapical osteolisis and their structure prevents the antibiotic to reach its aim. This is why the antibiotic therapy was unsuccessful in that cases [8]. However, in endo-perio changes, especially II and III type, there is a need to give an antibiotic.

In the given clinical material the endodontic-periodontic treatment, aided with magnetostimulation was implemented after diagnostics. Among the results of the treatment were good effects in stopping the process of paradontium and apical destruction and stopping or slowing the process of root resorption and the osteolisis of the border bone tissue.

A positive influence of the magnetic fields on the intensification of the osteogenic process, even in cases of extensive osteolisis, was observed. The influence on the piezoelectric and magnetostrictic structures, such as collagen, dentine or keratin, leads to enzymatic transformation's intensification and to calcification of the bone structure [9].

Conclusions

1. The used magnetostimulation method contributes to thickening of bone structure and is very useful in healing the endodontic-periodontic syndromes.

2. The use of slow variable magnetic field with low induction slowers or stops the begun process of bone osteolysis after replantation.

3. The use of low induction magnetic fields allows the patient to keep his or her own tooth for many years despite of unfavourable prognosis. The treatment confirmation is gained in this way.

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