Application of Polyglycolic-Polylactic Synthetic Co-Polymer in Periodontal Intrabony Defects

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Summary

The paper presents two cases of clinical application of polyglycolic-polylactic co-polymer Fisiograft. In the first case periodontal abscess and damaged interradicular alveolar bone of tooth 46 was diagnosed. Interradicular damage to the bone was visible after opening the mucoperiosteal flap. Scaling of the root and careful elimination of the inflamed tissue was performed and the defect filled with Fisiograft implant (Ghimas S.p.A - Italy) in the form of gel and powder, moistened with blood and covered with a coronally positioned flap. Postoperatively the patient was advised to rinse her mouth with 0.2% chlorhexidine digluconate solution. The results of the treatment were monitored clinically and radiographically six months after the procedure. Probing the periodontal pockets before the procedure revealed a depth of 8 mm and loss of the level of periodontal attachment of 10 mm on tooth 46. Clinical evaluation six months after the procedure showed a reduction in the depth of the periodontal pocket from 8 to 4 mm and attachment level gain of 5 mm, which amounts to 50% of the original defect.

In the second case, after raising the mucoperiosteal flap of tooth 21, an extensive intrabony defect was revealed, which involved several bony walls. After scaling and planing the root we filled the defect with a Fisiograft implant in the form of gel and powder, moistened with blood. Because of the activity of the periodontal pocket we prescribed Amoxicilin tablets 500 mg, 3 times daily for 5 days. Postoperatively, the patient was advised to rinse his mouth with 0.2% chlorhexidine digluconate solution. Six months after the procedure the clinical finding showed reduced depth of the periodontal pocket and gain of attachment level 4 mm, i.e. 44.5% of the original clinical defect. The radiograph showed reduced radiolucency of the alveolar bone of tooth 21, indicating the formation of new supporting alveolar bone. Thus, it can be said that the application of Fisiograft proved to be successful in regeneration of the alveolar intrabony defect. Six months after the procedure the radiograph showed considerably reduced radiolucency and depth of the periodontal pocket was reduced by around 50%.

In the presented two cases the application of Fisiograft proved successful in the process of healing alveolar bone, damaged by periodontitis, and it is therefore proposed that this implant is applied in a larger number of subjects and further investigation carried out.

Key words: *intrabony defect, polyglycolic-polylactic synthetic implant, corrective periodontal surgery.*

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Introduction

Current knowledge of pathogenic periodontal diseases, which result in destruction of the supporting tissue of the tooth, indicates the necessity of anti-inflammatory treatment in periodontal therapy. Tissue destruction of the alveolar bones, associated with the effects of prostaglandin, metalloproteinase and other factors, creates conditions for acceleration of the destructive process (1). The checking and blocking of the effects of all inflammatory and destructive factors of periodontitis results in an anti-inflammatory effect on the periodontal tissue.

Research on the possibilities of periodontal therapy are focused on the increasing demands in periodontal therapy. Previous indicators of success in periodontal therapy were elimination of periodontal pockets by the application of non-surgical procedures and resective surgical methods. However, it was found that neither resective nor non-surgical methods in the treatment of periodontitis resulted in complete regeneration of periodontal tissues (2,3). This prompted clinicians to examine the success of periodontal therapy with methods which could have an influence on regeneration of the supporting tissue of the tooth (3,4).

During the 1990s investigations were directed towards the method and type of material which might have an influence on biological regeneration of periodontal tissues. Thus it was found that the application of osteoconductive and osteoinductive implants in certain cases can induce regeneration of the alveolar bone. This fact encouraged clinicians to evaluate the success of periodontal therapy with the application of various types of implants.

The materials used for implants are classified as: autogenic, allogenic, xenogenic, implants. One particular group comprises synthetic materials which are used individually or in combination with other materials or methods. The implant can be osteoconductive and act as a support for the formation of new bone, or osteoinductive and release factors for differentiation of osteoblasts and in this way enable the formation of new bone (5,6).

In their study in 1999 Foitzik & Staus demonstrated the application of synthetic reabsorbable pure (B)-tricalcum phosphate as an implant in a periodontal bone defect. Evaluation of the success of the treatment by the application of this material proved to be successful in the healing of bone defects in correctly indicated cases (6).

Freeze-dried bone implant and porous hydroxyapatite are two frequently jointly used osteoconductive materials (7).

The procedure for placement of the implant includes a mucoperiosteal incision, scaling and planing of the root surface and placement of the implant within the intrabony defect.

Apart from other materials synthetic materials are today frequently used as a substitute for bone, either as a single implant or in combination with other materials. An important precondition for the success of treatment is the correct indications for treatment (8). The type and extent of the defect plays an important role in the evaluation of indication for the procedure, success of therapy and disease prognosis. Consequently, the success of therapy and prognosis is satisfactory in three wall and unsatisfactory in one wall bone defects and extensive destruction of the alveolar bone. In the same way prognosis of the success of treatment is satisfactory in the case of an interradicular bone defect, grade I and II, and unsatisfactory for a grade III defect. Furthermore, success of bone regeneration depends on the phase of maintaining the anti-inflammatory condition of the periodontal tissue (9).

The aim of this study was to show the possibilities for application of the synthetic material, Fisiograft, as an implant in regenerative periodontal surgery. The material was used in two different clinical cases and the results of the success of the treatment are presented here.

Fisiograft (Ghimas S.p.A - Italy) material for the filling of bone is a synthetic co-polymer consisting of polyglycolic and polylactic acid which is biotolerant and biocompatible. It is permeable to blood and osteocytes like a space maintainer and stimulates bone regeneration. It is also radiolucent. Fisiograft is reabsorbed and degraded through the Krebbs cycle, i.e. through the biochemical physiological process (10). Possibilities of application are: substitution for alveolar bone in all types of bone defects, and in combination with reabsorbed

and non-reabsorbed membranes in implantology and periodontology.

Application of Fisiograft is recommended in the reconstruction of the alveolar ridge and for the filling of cysts and granulomas, and also in the fixing of bone fractures (11,12). Indications for application in periodontology are bone defects such as one wall, two wall or circumferential defects. General contraindications for its application are the same as for other surgical procedures, i.e. acute or chronic infections at the site of the surgical procedure, treatment with immunosuppressors and immunodepressive patients.

Clinical experience in the application of Fisiograft

Presentation of the first case

A female patient, aged 64 years, was referred to the Department of Periodontology, School of Dental Medicine, Zagreb because of a periodontal inflammatory process of the first and second lower right molars. A clinical examination revealed a periodontal abscess on tooth 47 and 46, and inflammatory changes on the gingiva of almost all the teeth, indicating a diagnosis of periodontitis. The aim of the treatment was to eliminate the inflammatory symptoms and to achieve a reduction in the depth of the periodontal pockets. Tooth 47 was extracted due to a deep intraosteal defect. There was a deep periodontal pocket of 8 mm on tooth 46, and loss of periodontal attachment of 10 mm distally and lingually, and damaged furcation class II. Reabsorption of the alveolar bone could be seen on the radiograph and radiolucency of the interradicular alveolar bone (Figure 1)

Initial treatment was performed of the I and II inflammatorily changed periodontium of all the teeth. After the initial phase of treatment the clinical symptoms of inflammation had visibly reduced and the oral hygiene was satisfactory. As the intraosteal furcation defect on tooth 46 presented a problem, because of the possibility of a recurrence, we decided to perform a surgical procedure with the aim of achieving maximal healing of the alveolar bone.

Polyglycolic-polylactic synthetic co-polymer - Fisiograft *(Ghimas, S.p.A 40033 Casalecchio - Italy)*

Fisiograft is applied in three forms: gel, powder or sponge, depending on the size of the defect, and can be applied in combination. For one wall bone defects the application of sponge is recommended, for two wall defects gel mixed with sponge and for three wall defects gel mixed with powder. Before applying Fisiograph the area should be well prepared, inflammatory granulation tissue eliminated and the site of the defect filled, taking care not to overfill. To facilitate the formation of new bone and for easier application the material can be mixed with the remains of autologous bone and blood. The site should be well covered by a mucoperiostal flap. Care should be taken not to overfill the bone defect.

The product is for a single application, sterilised with Gamma radiation (25 kGy) and should not be re-sterilised. The package can be stored at a temperature of 5-30°C, and if the package is undamaged and correctly stored the shelf life is 5 years.

Surgical procedure

The patient was prepared for the operation by the initial phase of treatment I and II and the condition of the oral hygiene was normal. After performing anaesthesia of the nervus mandibularis with 2% Xylocain Adrenalin anaesthetic (ESPE, Seefeld, Germany) a buccal and lingual mucoperiosteal flap was raised at the site of the lower right molar and neighbouring premolar. After scaling and planing the tooth root and carefully eliminating the inflamed granulation tissue the Fisiograft implant was placed at the site of the interradicular and distal bone defect. The implant, in the form of gel and powder, was moistened with blood from the operated site and gently pressed into the defect. The flap was moved and sutured 2 mm coronally.

The patient was advised to rinse her mouth with 0.2% chlorhexidine digluconate solution. Plaque control was performed twice monthly during the first three months after the operation and thereafter once monthly.

Six months after the procedure clinical and radiographic examinations were performed. Probing of the periodontal pocket six months after the procedure at the site where the implant had been inserted showed a reduction in the depth of the pocket from 8 to 4 mm. Clinical attachment level gain was 5mm and that is 50% of the original defect, and probing of the interradicular site was reduced from class II to class I. Six months after the procedure the radiograph showed that the alveolar bone was approximally and interradicularly less radiolucent. This finding indicated new bone formation at the site of the defect (Figure 1a)

Presentation of the second case

A male patient, aged 19 years, was referred to the Department of Periodontology, School of Dental Medicine, Zagreb by an oral surgeon because of a fistule in the area of the upper left lateral incisor. A clinical examination established that the finding was more complex than previously realised. Probing of the periodontal pocket revealed the depth of a periodontal pocket and loss of the level of the attachment palatinally 9 mm and mesially, distally and vestibulary 5 mm. At the time the patient was in the course of orthodontic therapy. The radiograph showed a marked defect on the mesial wall of the aveolar bone and a slight defect on the distal wall (Fig. 2) As a consequence of this serpiginous bone defect a fistule had developed on the gingiva, distal from the tooth. Following initial treatment the patient was prepared for surgical procedure. Due to a marked suppurative discharge and activity of the periodontal pocket we recommended that 500 mg Amoxicilin should be taken three times daily for five days.

After raising the mucoperiosteal flap, including one tooth mesially and distally, an extensive defect of the alveolar bone could be seen on the mesial side of the left upper lateral incisor, extending toward the distal side. The bone defect was entirely filled with Fisiograft in the form of powder and gel, moistened with blood from the operated site. Postoperatively the sutures were removed and the patient was advised to rinse his mouth with a local antiseptic, 0.2% chlorhexidine digluconate solution.

Control examinations were carried out one, three and six months after the procedure. Postoperative examination showed no swelling of the gingiva. However, there was an occasional discharge from the periodontal pocket, and the patient used 0.2% chlorhexidine digluconate solution as a local antiseptic on several occasions. Six months after the procedure the clinical finding indicated a reduction in the depth of the periodontal pocket and attechment level gain of 4 mm. Six months after the procedure the radiograph showed a positive finding, indicating the formation of bone around the tooth (Fig. 2a).

Discussion

The future objective of periodontal treatment is the achievement of complete regeneration of the supporting structures of teeth, destroyed by an inflammatory process, at the majority of sites of periodontal destruction. For the successful achievement of this objective maximal conditions must be ensured by thorough elimination of the consequences of the inflammatory process of the periodontium by scaling and planing the root and application of appropriate medication.

Various methods in reconstructive periodontal surgery offer great possibilities for regeneration of tissue, destroyed during a periodontal process. Of particular interest is the application of various implants, either bone or synthetic, with which attempts are made to form new alveolar bone in intraosteal defects.

In 1991 Melloning (13) applied an implant of freeze-dried bone in a periodontal defect, and achieved around 50% or more alveolar bone in 60-64% of periodontal defects. The results of the therapeutic success in his study can be compared with the results obtained in our study. In the two cases presented here, following the application of implants of polyglycol-polyactic co-polymer a reduction in the depth of the periodontal pockets was established and attachment level gain of around 50% of the original defect. The radiograph finding showed significantly reduced radiolucency of the bone, which indicated regeneration of the alveolar bones. In 1991 Bower et al (14) treated intraosteal defects by implanting collagenous matrix and demineralized freeze-dried bones with or without bony morphogenic proteins.

It was found that the collagenous matrix was insufficient for the formation of new bones, cement and connective attachment. However, the demineralized freeze-dried bone was successful, and most success was achieved by a combination of that material and bony morphogenic proteins in the formation of connective attachment, cement and new alveolar bones.

In 1999 Lundgren et al applied bioresorbable membrane and denatured bovine bone (Bio-Oss) in complicated periodontal defects. They presented their treatment results in clinical and radiographic evaluations of the formation of connective tissue attachment and new alveolar bone (15).

Finally, it can be said that treatment of periodontal intraosteal defects does not always have a successful therapeutic effect. Therefore, application of some materials, such as synthetic polyglycolic--polylactic co-polymer Fisiograft, has a significant role in the corrective phase of periodontal therapy.