

Postextraction Ridge Preservation Using an Artificial Collagen Sponge for Implant Site Development: a case report

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Abstract

Alveolar ridge resorption is frequently determined after tooth extraction, especially when severe periodontitis is involved. Prompt postextraction ridge preservation can create a good base for implant placement and provide more esthetic and functional demand in prosthesis. Various types of grafting materials and techniques have been recommended in alveolar ridge preservation. We report a postextraction case with large buccal bone defect of the left mandibular first molar. Socket preservation procedure was carried out by a collagen sponge insertion and a titanium membrane barrier. Six months later, a re-entry procedure was performed and the collagen had been completely substituted by new bone. A 4.5x10mm implant was placed and osseointegrated successfully during 3-year follow-up. This clinical funding may suggest that artificial collagen represents a useful adjunct in the postextraction ridge preservation.

Keywords : ridge preservation, bone graft, artificial collagen sponge

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Introduction

Bone loss can arise from periodontal disease, injuries, cysts, infections or postextraction. In addition, bone loss following tooth extraction often results in both functional and cosmetic defects, inasmuch as it often compromises the dentist's ability to adequately replace the missing tooth with a dental implant-supported restoration^(1,2). If the implant site does not have enough bone volume to support the appropriately sized implant, bone grafting will be needed. Therefore, replacing missing bone or adding to existing bone is essential to the success of a dental implant and the ensuing restoration⁽³⁾.

At this time, many types of bone grafts can be used such as autogenous bone, allograft, xenograft, and artificial synthetic substitute⁽⁴⁾. Moreover, collagen-based grafts have often been used as a component of artificial tissue substitutes⁽⁵⁾. This article presents a case of obvious bone loss arising from severe periodontitis, and a bovine-based collagen block was regarded as suitable bone graft material for the purpose of dental implant.

Case presentation

A 42-year old female presented with a chief complaint of gingival swelling in her left mandibular first molar, and an occasional bad taste in her mouth. There was an 8-month history of periodic discomfort when biting on the tooth. Clinical examination revealed mild pain to palpation, and there was a deep pocket formed on the buccal side of tooth. Radiography showed a distal cervical caries and a radiolucent appearance that extended into the mesial aspect of the mesial root and furcation (Figure 1). A fractured fragment of mesial root and severe buccal bone destruction were found after surgical exploration (Figure 2). Therefore, removal of the tooth was advised due to poor prognosis.

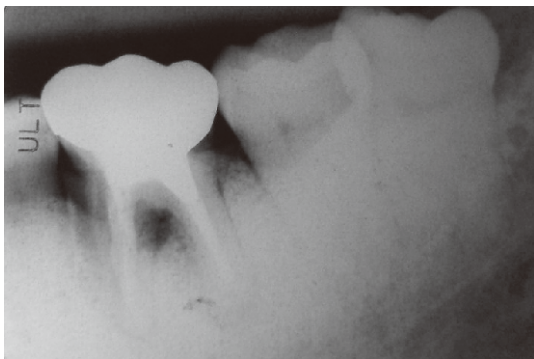


Figure 1. Periapical radiograph revealing a distal cervical caries and a radiolucent appearance that extended into mesial aspect of mesial root and the furcation.



Figure 2. Clinical photo showing a fractured fragment of mesial root and severe buccal bone destruction of left mandibular first molar.

Meanwhile, a Teruplug® (Bovine collagen Terumo Corporation, Japan. diameter 8 mm x length 25 mm) was inserted into the extraction wound for socket preservation (Figure 3). In order to prevent soft tissue invasion, a titanium FRIOS BoneShield® membrane (FRIADENT, Mannheim, Germany) was used as a barrier between the Teruplug® and oral mucosa (Figure 4).

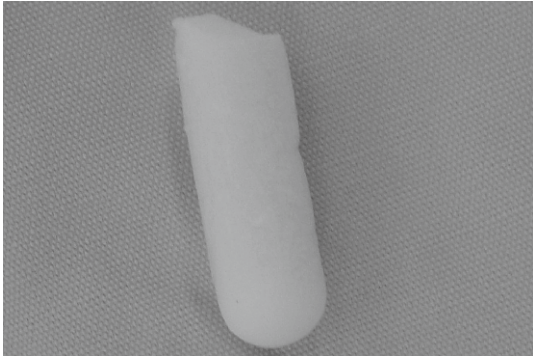


Figure 3. A Collagen-based sponge (Teruplug; Terumo Corporation, Japan. diameter 8 mm x length 25 mm).

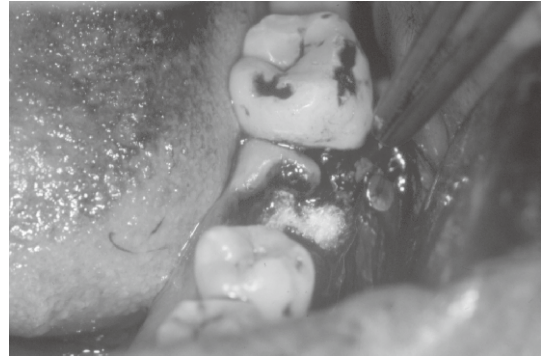


Figure 4. A titanium FRIOS BoneShield membrane (FRIADENT, Mannheim, Germany) was used as barrier between the Teruplug and oral mucosa.

Exposure of Boneshield® membrane was measured in size (width 3mm x length 2 mm) at 6-week postoperatively. The reentry with the removal of the titanium membrane was carried out and the texture of bone was good at the postoperative 6-monthly period. Simultaneously, a FRIALIT implant (Diameter 4.5 mm x length 10 mm) was inserted. Six months later, the implant was osseointegrated successfully and implant-supported prosthesis was restored. After 3-year follow-up, this single dental implant showed acceptable aesthesis and function (Figure 5).

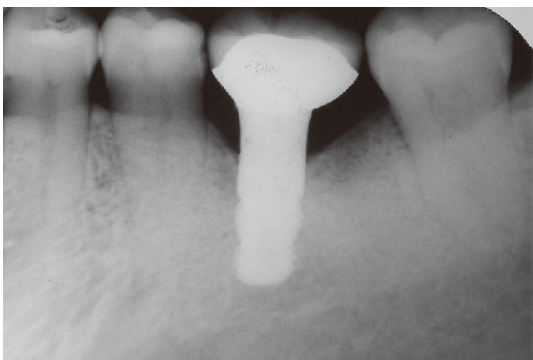


Figure 5. Radiograph showing a FRIALIT implant (Diameter 4.5 mm x length 10 mm) was inserted at left mandibular first molar after 3-year follow-up.

Discussion

From the time the tooth was extracted, significant degeneration of the surrounding alveolar bone began to occur. Bone loss occurred in both horizontal and vertical dimensions. The collapse of the bone surrounding the socket made the remaining ridge narrower and lower than when the tooth was present ⁽³⁾. In some cases, the bones may degenerate to a level where dental implants are unable to be inserted. Finally, more complex bone grafting procedures were needed to create the necessary bone support. Accordingly, socket preservation is much easier in preventing bone loss than creating the bone later ^(3,6).

As noted above, the four primary types of bone graft material are autogenous bone, allograft, xenograft, and synthetic bone materials ⁽⁴⁾. Autogenous bone has the only osteogenic, osteoinductive and osteoconductive potency among the bone graft materials ⁽⁴⁾. The main disadvantage associated with the use of autogenous bone is the need for a second operative site. Allograft, xenograft and synthetic bone materials have typically only osteoconductive properties ⁽⁴⁾. Various types of bone grafting materials ^(4,7,8,9,10) have been suggested for socket preservation. Most of them are made in compressed particle shapes or molds, therefore, complete coverage of the grafted site with local advancement flap was needed to avoid the washout of bone particles. Sometimes wound dehiscence may occur especially in the molar area due to the wider diameter of the socket. In English literature review, there is no report using only titanium mesh or resorbable collagen membrane without bone graft materials for ridge augmentation in the severe bony defect.

Teruplug® is made of atelo-collagen which is derived from bovine bone, and is an absorbable collagen sponge in root form ⁽¹¹⁾. Insertion of Teruplug® into the wound enables cells and capillaries to infiltrate from the surrounding tissue. In addition to stopping bleeding, it also promotes tissue regeneration. Furthermore, Teruplug® fibers are resorbed and replaced by surrounding tissue ⁽¹¹⁾. Therefore, Teruplug® can be used as a space maintainer to promote the natural bone growth. The benefit of using collagen fiber is that there is no need for primary closure in the exposed socket. On this account, it is an easier bone graft procedure compared to that using particulate bone graft material. In this patient, titanium mesh was used to enhance Teruplug stability and undisturbed wound healing process. In conclusion, Teruplug® was a useful bone grafting material for socket preservation, and provided a good base for implant-supported prosthesis. Further research is need for understanding the results of postextraction ridge preservation using Teruplug® with or without membrane barrier.

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應用人工膠原海綿作為拔牙後 植牙區之齒槽骨保存 ——病例報告

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摘要

當牙齒拔除之後常常會造成齒槽脊的吸收，特別是在有嚴重的牙周病情況下，齒槽脊的吸收更加明顯。因此及時的齒槽窩洞的維護，能夠創造出將來人工植牙良好的基礎，並且提供牙科補綴在美觀與功能上更多的需求。目前在齒槽窩洞維護的材料與技術上，有許多不同的方法。我們提出一位在左下顎第一大臼齒頰側有大量骨質破壞的病例，在牙齒拔除之後立即進行齒槽窩洞的維護，放入海綿狀人工膠原Teruplug® (Bovine collagen Terumo Corporation, Japan.)來促進骨頭生長，並且以鈦金屬膜作為軟組織的阻隔。在術後六個月，重新撥開原先的受植區，結果發現人工膠原已經由新生骨所取代，同時拿掉鈦金屬膜後立即植入4.5x10mm (FRIADENT, Mannheim, Germany)的人工植牙，經過三年的追蹤，發現骨整合的情況也相當成功。根據這樣臨床上的發現，人工膠原可能在齒槽窩洞拔牙後的維護上，扮演著一種有效的輔助方法。

關鍵詞：齒槽骨保存、骨移植、人工膠原海綿

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