

Minimally Invasive Tooth Extraction by the Benex System—Report of Three Cases

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Abstract

Atraumatic tooth extraction has been a topic of increased concern with respect to the bone preservation for the placement of osseous-integrated implants. Conventional tooth extraction method is associated with different degrees of alveolar bone destruction, which can be categorized as iatrogenic mechanisms. Different extraction methods have been reported to influence the extent of alveolar bone destruction; hence, one system to perform vertical extraction has been designed to avoid horizontal direct trauma to the socket wall. The Benex system consists of the Benex extractor itself, a set of self-tapping screws, a pull-string, and a sectional impression tray. Here, we present three cases of tooth extraction performed using this minimally invasive method (Benex system) to preserve the alveolar bone.

Key words: Tooth Extraction, Minimally Invasive Method, Socket Preservation.

Introduction

Atraumatic tooth extraction has been a topic of increased concern with respect to the bone preservation for placement of osseous-integrated implants. Conventional tooth extraction method is associated with different degrees of alveolar bone destruction, which can be categorized as iatrogenic mechanisms^{1, 2}, the conventional tooth extraction techniques involve the use of elevators, periotomes, luxators, and forceps to perform socket expansion; therefore, trauma to the alveolar bone is anticipated³.

Avoiding trauma to the alveolar bone is difficult by the traditional forceps extraction method, even a successful extraction using only luxators or periotomes could traumatize the alveolar bone to some extent. Furthermore, avoiding the horizontal direction movement is difficult, unless it is a perfectly circular root, rotation movement is anticipated, which minimizes the bone expansion.

The physiological loss of alveolar bone after extraction may compromise the functional and esthetic rehabilitation with fixed or removable prostheses⁴. Causes of the severity of bone

loss may include systemic causes, such as the patient's general behavior and health; local causes, such as the different tooth morphology in the maxilla and mandible; and the preoperative condition of the socket and many others⁵.

However, the different extraction methods influence the extent of alveolar bone destruction⁶. We used the Benex system, which consists of the Benex extractor, a set of self-tapping screws, a pull-string, and a sectional impression tray, which is designed to avoid horizontal direct trauma to the socket wall. (Figure 1.) The instruction from manufacture of applying Benex system extraction are to use a small lug to screwed into the root, a cable is attached to the lug and the other end of the cable is attached to the Benex. The tool is supported by the teeth on either side of the root, when the tool is attached, a small handle is rotated to increase pressure, therefore, the root may be extracted from the socket (Figure 2).

Here, we present three cases of tooth extraction performed using this minimally invasive method.

Case presentations

Case 1 was a 70-year-old woman who denied history of any systemic disease with the chief complaint of several missing teeth; future implant-supported hybrid dentures were considered. However, the atrophic alveolar ridge was noted because of a long duration of removable partial denture appliance wear and missing teeth. Therefore, the ridge and socket preservation were crucial for this strategic tooth extraction. A severely decayed maxillary left lateral incisor with remaining residual root was noted, and panoramic radiograph showed previous root canal treatment. The minimally invasive periosteal elevator for

periodontal ligament detachment was used. The pilot hole was prepared into the canal and screw appliance was placed into the root, a supported tray and an assembled vertical tooth extraction system was used to achieve axial alignment. The root was extracted completely with minimal alveolar bone destruction (Figure 3).

Case 2 was a 37-year-old woman who denied history of any systemic disease with the chief complaint of unsightly maxillary left first premolar. Panoramic radiograph showed severe decay of the maxillary left first premolar, clinical examination showed severe decay with possible extension beneath the alveolar ridge. The minimally invasive extraction appliance, the Benex system was considered for the socket wall preservation. The tooth was extracted completely with the socket wall and septal bone preservation (Figure 4).

Case 3 was a 40-year-old man who denied history of any systemic disease, he was referred from the Department of Endodontics for crack tooth because of fracture. Flap elevation was performed to identify the alveolar ridge, root separation was done with caution, minimally invasive periosteal elevator was used for luxation, and the root was extracted completely with minimal alveolar bone destruction (Figure 5).

Discussion

Our experience in performing complete extraction of the retained roots or severe carious teeth, using the Benex system, can be summarized as follows: A complete dental radiographic evaluation should be performed to examine the root morphology, and while extracting a multi-rooted tooth, the root separation should be performed with caution.

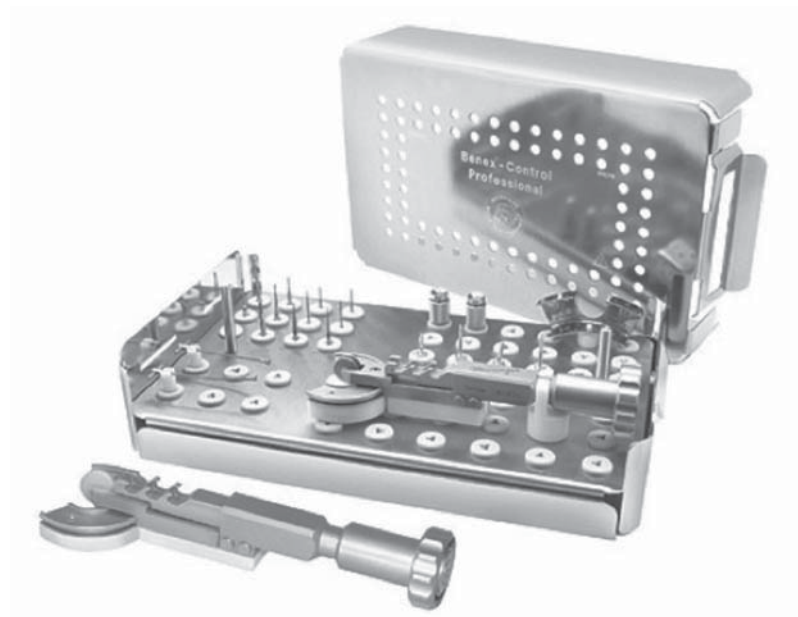


Fig. 1. (Kindly provided by Salvin Dental Specialties)

The basic Benex system consists of the Benex extractor itself, a set of self-tapping screws, a pull-string, and a sectional impression tray.

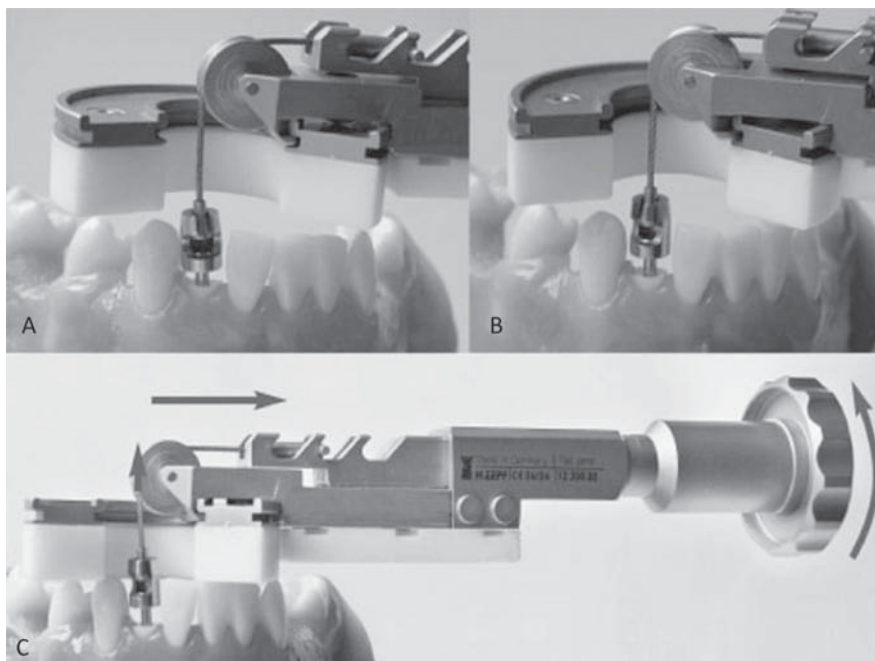


Fig. 2. (Kindly provided by Bite magazine)

A. A small lug is used to screw into the target root, and a cable is attached to the lug and the other end of the cable is attached to the handpiece. B. The handpiece is supported by the neighboring teeth on either side. C. Once the lug and the handpiece are applied, a small handle is rotated to increase pressure until the root is extracted.

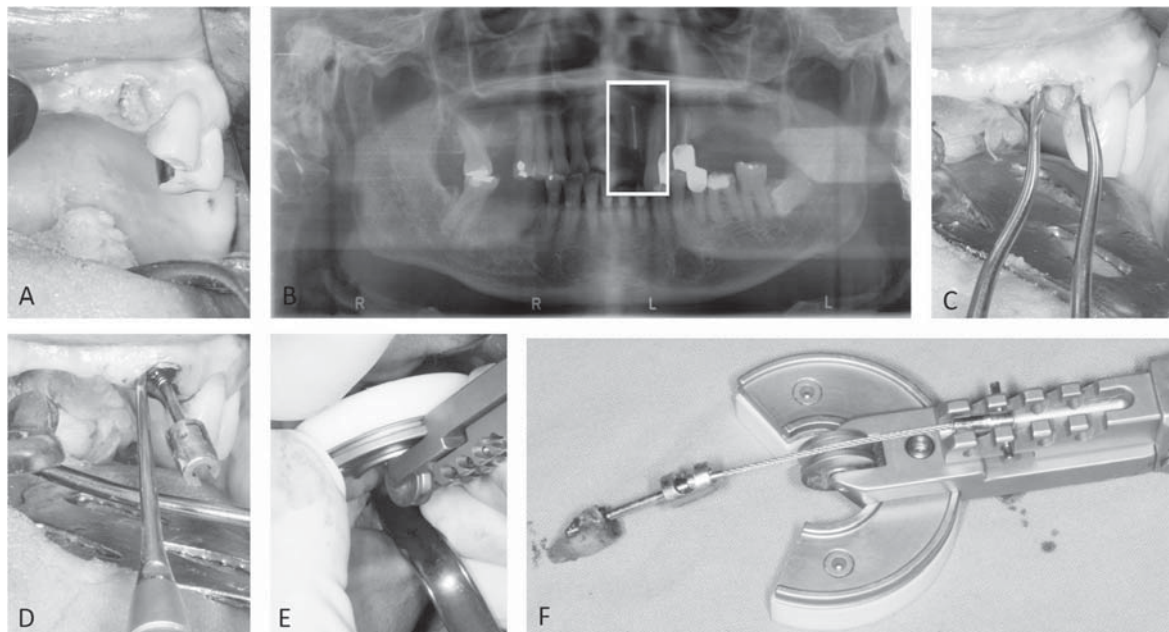


Fig. 3. A. A decayed maxillary left lateral incisor with remaining residual root. B. Panoramic radiograph shows previous root canal treatment. C. Minimal invasive periosteal elevator for periodontal ligament detachment. D. Pilot hole preparation into the canal and placement of screw into the root. E. Support tray and assembled vertical tooth extraction system to achieve axial alignment. F. Extracted root.

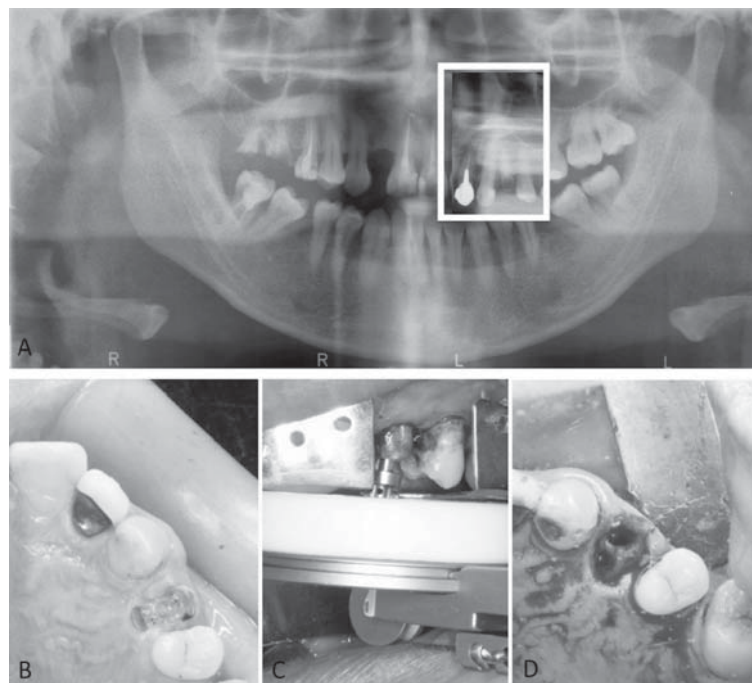


Fig. 4. A. Panoramic radiograph shows severe decay of the left maxillary first premolar. B. The clinical picture of the severely decayed left maxillary first premolar. C. Support tray and assembled vertical tooth extraction system to achieve axial alignment. D. Extracted dental socket.

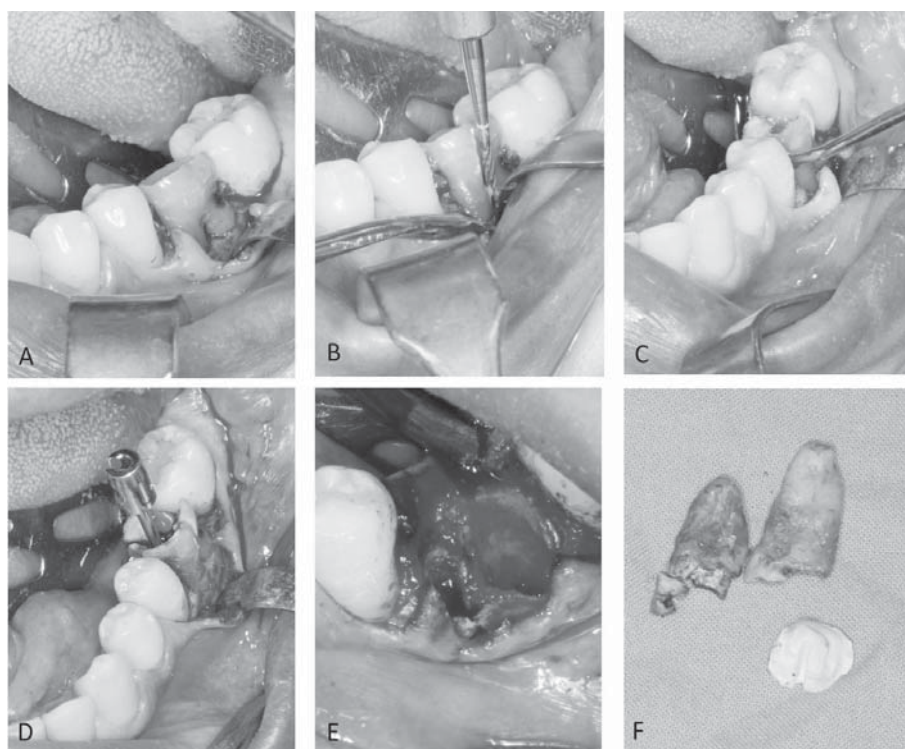


Fig. 5. A. A poor prognosis mandibular left first molar, flap elevation shows the furcation. B. A surgical fissure bur is used to perform root separation. C. Minimal invasive periosteal elevator to perform luxation. D. Pilot hole preparation into the canal and placement of screw into the root. E. Extraction socket with bone integrity is seen. F. Extracted roots.

However, a previous study suggested that the slender roots cause difficulty in placing the screw, such as the roots of mandibular molars³.

A comprehensive study was performed at the Birmingham Dental Hospital, which used the Benex system for extractions of teeth deemed unsuitable for forceps extraction. The purpose of this study was to examine the limitation of Benex system⁷. The study included 111 roots in 72 patients. Overall, 83% of teeth were successfully extracted, and the success rate was higher in the single-rooted teeth (89%) than that in the multi-rooted teeth (43%). Among all, only 7% of teeth required surgical removal following the failure of the Benex system, although the surgeons estimated that 44% were initially

indicated for surgical extraction. This suggests that a significant proportion of teeth that could otherwise require a surgical approach can be successfully extracted with the Benex system.

Tooth extraction is followed by both vertical and horizontal dimensional resorption of the alveolar bone^{1, 8}. The resorption of buccal and lingual walls occurs in two phases. First, the resorbed bundle bone is replaced with the woven bone, following the second phase of outer surface resorption⁹. For the first 1 to 3 months, the woven bone is found mainly in the extraction socket, and after 6 months the woven bone is stabilized and replaced with the lamellar bone and bone marrow¹⁰. Therefore, severe bone resorption usually occurs in the post-extraction wounds in

traumatic extraction techniques, especially in the anterior region.

The decrease in the size of the alveolar ridge because of the loss of teeth may be observed in the affected site of the alveolar ridge^{1, 11}, the amount of horizontal bone loss is pronounced on the buccal/facial aspect; hence, different surgical procedures have been described for future regenerative or socket preservation¹². Thus, the preservation of the socket wall is crucial while performing tooth extraction, which is also beneficial for the placement of graft material in future. Studies have been reported for this effort, including the use of autografts, allografts, xenografts, and synthetic materials with or without different kind of collagen materials¹³. Atraumatic tooth extraction with or without flap elevation is performed, and placement of properly positioned bone grafts in the residual fresh extraction socket is done. These techniques are considered to be helpful in the management of the preservation of the integrity of the alveolar socket walls¹⁴⁻¹⁶.

Our experience of using a minimally invasive technique to perform atraumatic extraction shows that the socket wall destruction is minimized in comparison with the traditional forceps extraction method; we have learned that a conical shape root can be effectively managed by this technique. For a multi-rooted tooth, root separation should be performed prior to the application of the Benex system, and the root separation in a multi-rooted tooth should be closely evaluated.

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班納式微創拔牙手術—三病例報告

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摘 要

口腔功能重建使用人工植牙的需求日增，因疾病拔牙後拔牙窩洞的完整性有利於骨粉填補之齒槽骨保存術，傳統的拔牙方式常造成嚴重的齒槽骨周圍的破壞，所以微創拔牙的術式在現今也更加重要。不同的拔牙方法皆會影響齒槽骨的破壞程度，而其中一種進行垂直拔牙的系統(班納式拔牙系統包含一組班那式拔牙器、一組自攻螺絲、一組懸吊式牙托)旨在避免牙根挺水平方向直接損傷齒槽壁。在此篇報告我們分享三個病例使用這種微創方法進行拔牙的經驗。

關鍵詞：拔牙，微創性拔牙手術，齒槽骨保存術。

Received: June 20, 2020

Accepted: September 05, 2020

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