CASE REPORT

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The Treatment of an Ankylosed Canine : Luxation and Forced Eruption

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This paper outlines the case of a 56 year-old man undertaking treatment by means of luxation and forced eruption of an ankylosed canine. At the time of diagnosis, the ankylosis of the tooth was not suspected, because there were not signs of intrusive luxation nor horizontal diaplacement. Only after the application of a vertical elastic force failed to erupt the maxillary left canine, was the ankylosis of that tooth suspected. At the time of reevaluation, the maxillary left canine hads no physiologic tooth mobility and emitted a sharp, ringing sound upon percussion. Hence, the maxillary left canine was considered ankylosed. The treatment course then changed to the extrusion of the canine through the surgical luxation of the tooth and the prompt application of vertical extrusive forces.

The above outcome was successful for the patient not only in the orthodontic aspect, but also in terms of the periodontal considerations

Key words : Trauma, Ankylosis, Luxation, Forced eruption

The ankylosis of a tooth, the localized fusion of cementum and the alveolar bone,[1] presents the patient and the orthodontist with a difficult problem to solve. The most common cause of the ankylosis is generally believed to be trauma in a tooth.[2] Many reports have discussed the possible causative factors associated with ankylosis.[3,4]

These possible causative factors associated with ankylosis have been identified as mechanical, thermal, or metabolic trauma to the periodontal membrane during or after a tooth eruption.[5] In the permanent dentition, the treatment modality of an ankylosed tooth ankylosed tooth or teeth is surgical luxation, cortico-tomy, segmental osteotomy, and extraction followed by the placement of osseointegrated implants.

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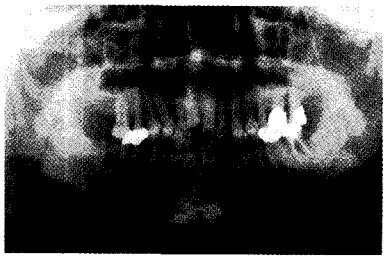

Fig. 1. Panoramic radiograph after the accident : Two maxillary central incisors and maxillary and mandibular left canines were fractured horizontally.

Fig. 2. A. Intraoral photograph showing the endodontic pin cemented on the fractured canine.

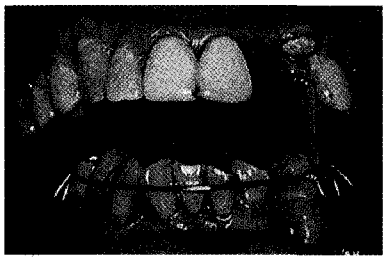

Fig. 2. B. Intraoral view shows function of elastic between the tooth and the removable appliance on the mandible.

This article presents a case of an ankylosed canine with a history of trauma that was brought into the arch by surgical luxation followed by orthodontic extrusion.

INTRODUCTION

The patient was 56 years old when he was referred from the department of endodontics and prosthodontics. He had a history of a traffic accident 5 months ago. His two maxillary central incisors and maxillary and mandibular left canines were horizontally fractured (Fig. 1). The prosthodontist decided to use the maxillary left canine as an abutment tooth for a fixed bridge and to extract the mandibular left canine because it was also fractured vertically. After the endodontic treatment of the maxillary left canine, he was referred to the department of orthodontics for the forced eruption of that tooth.

Diagnosis

The intraoral examination revealed inflammatory gingival tissue around the maxillary left canine, which was endodontically treated. The probing depth around that tooth was in the range of 5-6 mm. The fracture line was subgingival in the palatal area, so, forced eruption was scheduled to expose the fracture line supragingivally.

TREATMENT PROGRESS

As treatment, the use of a removable appliance with hooks at the left mandibular first premolar area was planned. An elastic module (3/ 16˝) was used to extrude the maxillary left canine through the hooks attached to the endodontic pin cemented in the root canal (Fig. 2, A).

During the 3 months after the application of the elastics, there was no movement of that tooth. Because the retention of the removable appliance was adequate not to require its removal during the wearing of the elastics (Fig. 2, B) and the cooperation of the patient was fairly good, the problem was thought to lie on the maxillary left canine. At the time of reevaluation, the maxillary left canine had no physiologic tooth mobility and has sharp, ringing sound upon percussion. Hence, the maxillary left canine was thought to be ankylosed. The treatment plan changed to the extrusion of the canine by surgical luxation of the tooth and the prompt application of vertical extrusive forces.

Brackets (.022 slot) were bonded passively to insert the .019 x .025 stainless steel arch wire. After the luxation of the maxillary left canine, the button was bonded to that tooth. Through the use of a .016 NiTi as an overlay arch wire, immediate and continuous force was delivered (Fig. 3, A).

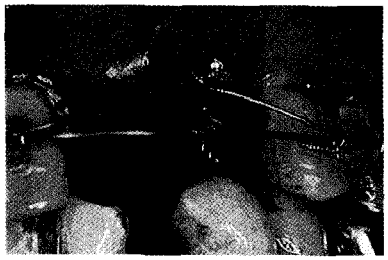

Fig. 3. A. After the luxation of the canine, immediate and continuous force was delivered.

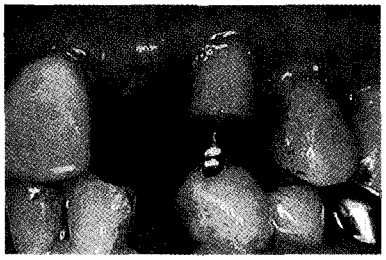

Fig. 3. B. After 14 weeks of treatment, orthodontic appliances were removed.

Fig. 3. C. Temporary fixed bridge was placed.

Fig. 4. A. Periapical radiograph of the canine before the accident. (taken at the routine checkup, 10 months before the accident)

Fig. 4. B. Periapical radiograph after the surgical luxation of the canine and bonding of the appliances.

Fig. 3. C. After debonding

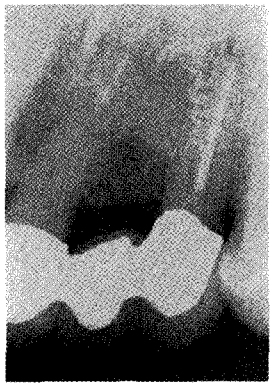

Fig. 3. D. 27 months after debonding

After the application of extrusive orthodontic forces for two weeks, the fracture line was exposed and a sufficient eruption had been accomplished to enable prosthodontic therapy.

RESULTS

After 3 months of retention, all the brackets were removed and a temporary fixed bridge was placed (Fig. 3, B, C). Radiographically, radiolucency around the apex was visible (Fig. 4, C). At the 27-month recall, clinical and radiographic examinations showed that the tooth was clinically symptomless, the periodontal tissues were healthy and the periapical radiolucency observed after surgical luxation and extrusion was resolved (Fig. 4, D).

DISCUSSION

An ankylosed tooth, one in which the cementum may be ever so slightly fused to the alveolar bone, is

incapable of movement, and has no response to orthodontic force.[6] Ankylosis can sometimes be detected from radiographic evidence of the periodontal membrane obliteration. The obliterated area, however, is sometimes small and therefore may not be evident on a radiograph.[7] A diagnosis of ankylosis is usually based on the clinical finding of a sharp or ringing sound upon percussion and by the lack of tooth mobility or soreness, even when manipulated with a heavy, continuous orthodontic forces.[5]

There are several treatment protocols for an ankylosed tooth.

Corticotomy is a surgical technique in which the intact ankylosed tooth, inclusive of the surrounding cortical bone and enough soft tissue to maintain blood supply, is isolated as a block in one or two stages. The isolated tooth can be repositioned during surgery, or it can be moved orthodontically through less-dense medullary bone to the intended site. This technique does not correct the ankylosis, but it does permit the optimal repositioning of the tooth.[8]

Localized ostectomy is another conservative approach that preserves the tooth and restores its mobility. However, this approach works only if the ankylosis is in the crestal area. Ankylosis elsewhere on the root surface is not readily accessible to this method.[5]

Segmental osteotomy is a feasible procedure for upper ankylosed teeth because of the favorable vascularity of the maxilla. In the mandible, revascularization after any individual osteotomy is very poor. If segmental osteotomy for an ankylosed tooth is to be undertaken, it is important to keep the soft tissue pedicle attached to the cortices, especially the labial pedicle.[9] The best time to perform this type of osteotomy would be after the facial growth has been completed.[10]

The extraction of an ankylosed tooth is recommended when the ankylosis occurs at an early stage. Retaining an ankylosed tooth in a young patient is complicated by the arrested development of the attendant alveolar ridge and ensuing defects that develops in that site as the jaw adjacent to the tooth continues to grow and the adjacent teeth continue to erupt. The severity of the resulting ridge defect depends on the amount of facial growth after ankylosis. Timing the removal of an ankylosed tooth just at the start of the rapid phase of adolescent growth may achieve the treatment objective of maintaining the height of the alveolar ridge while allowing the tooth to remain long enough to act as a space maintainer.[11] However, the extraction of an ankylosed tooth may be the last choice of treatment if other treatment protocols fail.

The luxation technique, first proposed by Hemley[12], is identical with the preliminary steps of tooth extraction. The important objective is to break the bony bridge of ankylosis without injury to the nutrient vessels at the apices.[3] Because this method requires the significant loosening of the tooth within the alveolus, the potential risk of devitalization, root fracture or the failure to achieve tooth movement should be carefully reviewed with the patient. It should be mentioned that the existing cortical bone around the tooth should be preserved if at all possible, and that the orthodontic force must be applied immediately after the luxation, as it is only a matter of time until the tooth reankylosis.[13,14]

The treatment designed for this patient focused on the forced eruption of the maxillary left canine. At the time of diagnosis, the ankylosis of the relevant tooth was not suspected, because as there was neither a sign of intrusive luxation nor a horizontal displacement of that tooth in the comparisons of the periapical X-ray film of that tooth just after the accident and that of 1 year before the accident (At that time, he visited the department of periodontics for his periodontal check-up. Fig. 4, A). The ankylosis of the tooth was suspected only after the application of vertical elastic force failed to erupt maxillary left canine. The periodontal ligament might be disrupted, even though the area was too small to be detected. Because the treatment objective was to extrude the injured tooth to lengthen the crown, the segmented osteotomy was discarded as a treatment option. And the possible extraction of the left canine would have made the bridge span so long that it also could not be considered the treatment of choice. The

luxation technique was chosen to break the bony bridge between the cementum and alveolar bone. Oral surgeon performed the luxation of the maxillary left canine, immediately after which orthodontic force was applied. A .016 NiTi arch wire, rather than vertical elastics, was used to erupt the canine because such memory arch wire is capable of producing a more steady and continuous force. After 14 weeks of treatment, the canine was extruded properly for prosthesis.

Clinical evidence of the crestal bone apposition following the extrusion of a tooth is well documented in the literature. Reitan[15] presented a case of an adult where 2-3 mm of active eruption produced a clear radiographic crestal bone apposition. In research conducted on animals study, Van Venrooy and Yukna[16] extruded teeth a distance of 3-4 mm and observed that at these teeth, compared to non-extruded controls, the inflammation of the gingival tissue was less pronounced, the periodontal pockets less deep, and the extrusion resulted in the apposition of crestal bone. Comparing the serial periapical X-ray films, it was discovered that the canine erupted approximately 5 mm and the alveolar crestal bone height around the canine followed the eruption. The alveolar bone crest between the canine and the first premolar before treatment was 4 mm below the cervical area of the first premolar (Fig. 4, B). After the forced eruption followed by the luxation, the crest was just below the cervical area of the first premolar (Fig. 4, C) and that remained at the same level at the 27-month recall (Fig. 4, D). The probing depth around that tooth was in the range of 2-3 mm.

CONCLUSIONS

An ankylosed tooth may erupt if such a tooth has been luxated and has received a vertical extrusive force. This can be considered as the treatment of choice if an ankylosed tooth is essential to the occlusion. However, the luxation technique should be performed carefully not to provide unfavorable sequelae such as devitalization, root fracture and the possibility of reankylosis, and the patient should be informed of this possibility.

The above outcome was successful for the patient not only in the orthodontic aspect, but also in terms of the periodontal considerations.

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국문초록

골유착된 견치의 교정적 치험례 :탈구 및 인위적 맹출

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본 증례는 외상으로 골유착된 견치를 탈구와 인위적 맹출 유도로 치료한 환자에 대한 것이다. 초진시에는 견치가 골유착되었다는 어떠한 증거도 발견되지 않아 하악에 가철식 장치와 악간 고무줄을 이용하여 인위적 맹출을 시도하였으나 3개월후에도 전혀 움직임을 보이지 않았다. 이 시기에 견치는 생리적인 움직임을 전혀 보이지 않았고 타진시 날카로운 울림소리가 나는 것으로 골유착되었음을 확인하였다. 이에 골유착된 견치를 탈구시키고 인위적 맹출을 즉시 도모하여 교정적, 치주적으로 양호한 결과를 얻었기에 이에 보고하는 바이다.

주요 단어 : 외상, 골유착, 탈구, 인위적 맹출