# Case Report

# Sequelae of latrogenic Periodontal Destruction Associated with Elastics and Permanent Incisors: Literature Review and Report of 3 Cases

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**Abstract:** The purpose of this paper was to report 3 cases of localized aggressive periodontal bone destruction related to improper use of orthodontic elastic bands to close diastemas in permanent anterior teeth and to compare the results to previous studies. Some common signs and symptoms of this particular destruction were observed with these patients that had been previously reported when the comparisons of these cases were made. The patients usually experienced a painful sensation, and an isolated pyogenic-like granuloma appeared at the interdental area. Radiographs revealed localized periodontal destruction, with tooth extrusion and clinical crown divergence and radiographic root convergence; the two involved teeth moved simultaneously during mobility testing. Surgical intervention and treatment of the cases was described. The prognosis is usually decided by the severity of the condition, and many factors may influence the healing of treated cases. (Pediatr Dent 2011;33:516-21) Received March 22, 2010 | Last Revision July 29, 2010 | Accepted August 2, 2010

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Flexible elastic bands have been widely employed to close interproximal spaces, realign tooth positions, and offer intermaxillary fixation for fractured jaws in orthodontic treatment. In the past, elastic bands have also been utilized for intentional exfoliations or bloodless extractions in hemophiliac patients<sup>1,2</sup> or in developmentally delayed or uncooperative patients who could not tolerate conventional tooth extractions.<sup>3</sup> This kind of treatment, however, is no longer an option for extracting a tooth.

Localized periodontal destruction induced by dislocated elastic bands was reported as early as 1870.4 It has been proposed that the localized periodontal destruction is associated with the elastic band's tendency to slip subgingivally toward the tooth's narrower portion and the tapered roots.5 Thus, the misplaced elastic bands may destroy periodontal tissues and eventually lead to tooth loss. Although it has been confirmed that applying elastic bands incorrectly to close a diastema would lead to localized periodontal damage, this kind of destruction can still be discovered occasionally; 3 cases were documented in our hospital in the last 12 years. When this uncommon destructive periodontitis occurred, a correct diagnosis was difficult, because the applied elastic bands were radiolucent and could not be easily detected by an explorer or probe.<sup>6</sup> In addition, the patients were usually unaware of the relationship between the injury and the elastic bands.

The purpose of this paper was to report 3 cases of localized aggressive periodontitis related to the improper use of elastic bands to close diastemas and compare the results to previous

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studies.<sup>5-11</sup> Some general signs and symptoms of this type of destruction were also discussed.

#### Case reports

Three young Asian patients with different severities of localized periodontal destruction around their permanent maxillary incisors were referred to the Periodontic Department at Chang Gung Memorial Hospital, Linkou, Taiwan, for periodontal treatment.

**Case 1.** An 8-year-old male in good general health was referred from the Orthodontic Department with a chief complaint that his permanent maxillary central incisors were extremely mobile and painful. The patient denied having any systemic disease related to periodontitis. He had been taken to a local dental clinic to close the space between his permanent maxillary central incisors 2 months previously. An orthodontic elastic band was applied around the maxillary central incisors to reduce the diastema. The patient's parents were instructed to replace the band daily. In the periodontic clinic, the family believed that all elastic bands had been removed.

An intraoral clinical examination revealed that the 2 permanent maxillary central incisors were not only extremely mobile (modified Miller index: Class III)<sup>12</sup> with severely inflamed gingiva (gingival index 3),<sup>13</sup> but were also extruded and significantly deviated. A digital examination of mobility of the incisors, indicated that the 2 involved incisors could be moved together. An isolated, pyogenic-like granuloma with a reversed pyramid shape appeared at the interdental area of the central incisors (Figure 1A-B). Pocket probing depth (PPD) disclosed (Table 1) that the buccal, lingual, and distal explorations around the involved central incisors presented a deeper PPD ( $\geq$ 5-mm) with a shallower PPD at the lesion's central aspect. There was prominent bleeding on probing (BOP).

The periapical radiograph (Figure 2A) revealed crown divergence and root convergence associated with the 2 central incisors

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Figure 1. Case 1 clinical photographs. (A-B) Labial and palatal views showing the permanent maxillary central incisors extruded and deviated coronally, and a pyogenic-like granuloma at the interdental area of the incisors. (C) 2 orthodontic elastic bands were discovered during exploratory surgery of the central incisors; one was removed before the photograph was taken. (D) Removal of foreign material and granulation tissue, exposed a 10-mm bone dehiscence facially and palatally on both incisors associated with a 1- to 2-wall infrabony defect located distally to the central incisors. (E-F) Orthodontic treatment intended to provide more predictable tooth alignment and better fixation. (G-H) Periodontal improvement 2-years postoperatively, including a 2- to 4-mm PPD, a gingival index of 1, and a Miller I mobility for the 2 central incisors. (I-J) A sinus track (arrow) and 9-mm PPD (distal side) on the right central incisor. Both central incisors were negative to electric pulp tests.

and a pattern of extensive bone destruction on the distal of the teeth. The bone loss was so critical that only limited radiopacity could be detected at the distal apices of the central incisors.

|         |          | HE MEAS                  | URED F  | PROBIN<br>L INCI | IG POCH<br>SORS IN | (ET DEPT<br>CASE 1 | ΓΗ AN[  |                                   | AL ATTA | ACHME               |    |  |  |
|---------|----------|--------------------------|---------|------------------|--------------------|--------------------|---------|-----------------------------------|---------|---------------------|----|--|--|
| Ini     | obing po | 2-year postoperative PPD |         |                  |                    |                    |         |                                   |         |                     |    |  |  |
| Right o | central  | incisor                  | Left c  | entral           | incisor            | Right              | central | incisor                           | Left c  | Left central inciso |    |  |  |
| DB      | В        | MB                       | MB      | В                | DB                 | MB                 | В       | DB                                | MB      | В                   | DB |  |  |
| 8       | 7        | 4                        | 4       | 6                | 9                  | 4                  | 2       | 2                                 | 3       | 2                   | 2  |  |  |
| DP      | Р        | MP                       | MP      | Р                | DP                 | MP                 | Р       | DP                                | MP      | Р                   | DP |  |  |
| 9       | 5        | 4                        | 3       | 5                | 9                  | 3                  | 1       | 2                                 | 2       | 1                   | 2  |  |  |
| Initi   | al clini | ical attac               | hment l | evel (C          | CAL)               |                    | 2-yea   | ar postop                         | erative | CAL                 |    |  |  |
| Right o | central  | incisor                  | Left c  | entral i         | ncisor             | Right o            | central | tral incisor Left central incisor |         |                     |    |  |  |
| DB      | В        | MB                       | MB      | В                | DB                 | MB                 | В       | DB                                | MB      | В                   | DB |  |  |
| 8       | 7        | 6                        | 6       | 6                | 9                  | 7                  | 4       | 2                                 | 3       | 3                   | 4  |  |  |
| DP      | Р        | MP                       | MP      | Р                | DP                 | MP                 | Р       | DP                                | MP      | Р                   | DP |  |  |
| 9       | 5        | 6                        | 5       | 5                | 9                  | 3                  | 1       | 2                                 | 2       | 1                   | 2  |  |  |

DB= distal buccal side. B=buccal side. DP=distal palatal side. P=palatal side. MP=mesial palatal side. Units of measurement=mm.



Figure 2. Case 1 radiographs. (A) Initial radiograph revealing crown divergence and root convergence for the 2 central incisors and severe bony destruction at the distal aspects of the central incisors. (B) 2-year postoperative periapical radiograph disclosing improved bone healing with the bone level on the distal sides at the middle third of the root. (C) Periapical radiograph showing a favorable outcome 1 to 2 months following endodontic root canal filling.

Additionally, a clear observation of the mesial sides of the roots was limited due to the root's proximity.

When a nonsurgical periodontal treatment including subgingival scaling, root planning, and curettage did not improve the inflammation of the involved central incisors, an exploratory operation was scheduled. The maxillary anterior teeth were splinted to prevent tooth exfoliation during the operation. Following local anesthetic with 1.8 ml of 2% lidocaine (Xylestesin) with 1:100,000 epinephrine, a trapezoidal full-thickness flap at the facial aspect was reflected with vertical releasing incisions distal to the central incisors. Palatally, sulcular incisions were made, and a full-thickness flap was raised, revealing 2 elastic bands at the apical area of the central incisors (Figure 1C). After removing the foreign material and granulation tissues, a 10-mm bone dehiscence was exposed facially and palatally on both incisors associated with a 1- to 2-wall infrabony defect distal to the central incisors (Figure 1D).

Demineralized freeze-dried bone allograft (DFDBA; Pacific Coast Tissue Bank, Los Angeles, Calif) was applied to fill the defects. The wound was secured with a 5.0 chromic-gut (Ethicon/Johnson and Johnson, Somerville, NJ) and protected by a periodontal dressing (Coe-Pak, GC America, Inc, Alsip, Ill). Medication prescribed included amoxicillin 250 mg qid, acetaminophen 250 mg qid for 7 days, 0.12% chlorohexidine mouth rinses twice daily for 2 weeks. The periodontal dressing was removed

1 week later, and sutures were removed 2 weeks after surgery.

The inflammation caused by the elastic bands improved postoperatively; however, a compromised wound healing could have been related to poor oral hygiene and/or a trauma from occlusion. Orthodontic treatment was introduced to offer a more predictable tooth alignment and fixation 4 months after the surgery (Figure 1E-F). The patient neither followed the supportive periodontal therapy nor practiced good oral hygiene; this resulted in a 3- to 6-mm PPD and a moderate to heavy plaque accumulation (the O'Leary plaque control record was 75%) with a plaque index<sup>14</sup> score of 2 to 3. Moreover, moderate gingival inflammation (gingival index 2) was noted during the 7-month postoperative recall. Therefore, scaling, root instrumentation, and oral hygiene reinforcement were carried out. Two years later, however, both periodontal and orthodontic

treatments were not completed since the patient was unable to cooperate with the offered schedule. There were several favorable periodontal improvements however, including a decrease to a 2- to 4-mm PPD (Table 1), a gingival index of 1, a modified Miller Class I mobility, and a bone height and density increase for the 2 central incisors (Figures 1G-H and 2B).

After a 3-year absence, a sports accident caused the patient to return. He had a fistula, a negative electric pulp vitality test EPT(-), a 6- to 9-mm PPD, a modified Miller Class II mobility, and a gingival index of 2 at the permanent maxillary central incisors (Figure 1I-J). Although a successful endodontic treatment was provided (Figure 2C), the uncooperative patient failed to return for follow-up.

**Case 2.** An 11-year-old male in good general health appeared with a chief complaint that his permanent maxillary left central and lateral incisors were quite mobile and painful. No systemic disease was found. A relevant dental history showed that he went to a local dental clinic to correct his malaligned maxillary anterior teeth approximately 2 months prior to his visit to the periodontal clinic. The dentist tried to utilize an elastic band to resolve this patient's problem. Later, the family assumed that the dentist had removed all elastic bands.

Clinically, the patient's permanent maxillary left central and lateral incisors displayed some similar signs and symptoms experienced in Case 1, such as very mobile (modified Miller index 3) and extruded and diverged teeth. The teeth could be moved simultaneously when tested for mobility. Facially and palatally, a pyogenic-like granuloma with a reversed pyramid shape was present at the interdental area of the maxillary left incisors (Figure 3A-B). Deep pocket probing depths were detected at the mesial, facial, palatal, and distal sides of the 2 incisors involved, and a normal PPD was observed on the lesion's central portion (Table 2). Substantial bleeding on probing and a gingival index of 3 indicated severe gingival inflammation.

The periapical radiograph (Figure 4A) showed the 2 incisors to be in close proximity and bone lose at the distal aspects of the lateral incisor and the mesial side of the central incisor. The degree of interdental bone loss was indistinct, because of the root proximity.

According to the patient's dental history, clinical findings, and treatment experiences, the diagnosis was localized periodontitis caused by an elastic band displacement. Explorative surgery using an operation, similar to Case 1 was performed, and 2 elastic bands at the apical third were found and removed (Figure 3C). The 2- to 3-wall, 6-mm depth infrabony defects on the mesial side of the central incisor and the distal side of the lateral incisor were grafted with an allograft (DFDBA). The wound was sutured with a 5-0 chromic gut (Ethicon/Johnson and Johnson) and protected by a periodontal dressing. Medication prescribed included amoxicillin 250 mg qid, acetaminophen 250 mg qid for 7 days, and 0.12% chlorohexidine mouth rinses twice daily for 2 weeks. The sutures were removed 7 days after surgery. An occlusal adjustment and wire splinting were executed to reduce occlusal trauma from the permanent maxillary and mandibular lateral incisors' crossbite (Figure 3D).

The splinting wire had to be removed because of the eruption of the permanent maxillary left canine 2 months postoperatively. The family declined further orthodontic treatment

|         | 8 P       |         | /  | - / I I                  |        |         |                              |         |         |          |        |  |
|---------|-----------|---------|--|--------------------------|--------|---------|------------------------------|---------|---------|----------|--------|--|
| Left ce | entral i  | incisor | ncisor Left lateral incisor Left central |                          |        |         | incisor Left lateral incisor |         |         |          |        |  |
| MB      | В         | DB      | MB                                       | В                        | DB     | DB      | В                            | MB      | MB      | В        | DB     |  |
| 8       | 6         | 6       | 5  | 7                        | 8      | 4       | 5                            | 4       | 3       | 7        | 7      |  |
| MP      | Р         | DP      | MP                                       | Р                        | DP     | DP      | Р                            | MP      | MP      | Р        | DP     |  |
| 8       | 4         | 4       | 4  | 4                        | 8      | 5       | 3                            | 4       | 4       | 4        | 7      |  |
| Initia  | cal attac | chment  | (CAL)                                    | 4-year postoperative CAL |        |         |                              |         |         |          |        |  |
| Left ce | entral    | incisor | Left la                                  | ateral i                 | ncisor | Left co | entral                       | incisor | Left la | iteral i | ncisor |  |
| MB      | В         | DB      | MB                                       | В                        | DB     | DB      | В                            | MB      | MB      | В        | DB     |  |
| 8       | 6         | 5       | 5  | 5                        | 8      | 4       | 6                            | 6       | 5       | 9        | 9      |  |
| MP      | Р         | DP      | MP                                       | Р                        | DP     | DP      | Р                            | MP      | MP      | Р        | DP     |  |
| 8       | 3         | 2       | 3  | 4                        | 8      | 5       | 4                            | 6       | 6       | 5        | 9      |  |

DB= distal buccal side. B=buccal side. DP=distal palatal side. P=palatal side. MP= mesial palatal side. Units of measurement=mm.



Figure 3. Case 2 clinical photographs. (A-B) Isolated, pyogenic-like granuloma at the labially and palatally aspect of the interdental area of the permanent maxillary left incisors. (C) Two elastic bands found during exploratory surgery at the apical third of the permanent maxillary left incisors. (D) Occlusal adjustment and splinting were performed to reduce occlusal trauma on the maxillary and mandibular left lateral incisors' crossbite. (E-F) Unsatisfactory healing 4 years postoperatively with moderate gingival inflammation and a 3- to 7-mm pocket probing depth.



Figure 4. Case 2 radiographs. (A) Initial radiograph of the permanent maxillary left incisors indicating widespread bone destruction of the lateral incisor's distal aspect and the central incisor's mesial aspect. (B) Widening periodontal ligament and more than 50% alveolar bone loss observed on the periapical radiograph 4 years post-operatively.



Figure 5. Case 3 clinical photographs. (A-B) Extruded permanent maxillary central incisors demonstrating a pyogenic-like granuloma facially and palatally at the interdental area. (C) One orthodontic elastic band at the middle third of the incisor's roots after flap reflection and degranulation. (D) Two 2-wall, 3-mm infrabony defects on the distal sides. (E-F) Protruding incisors persisted, with periodontal healing observed at the 8-month post-operative follow-up.



Figure 6. Case 3 radiographs. (A) Gap (arrow) between the lamina dura and the roots on the initial radiograph indicated a pattern of extrusion of the central incisors. Extensive bone destruction of the distal aspects of 2 central incisors and a mild crown convergence were noted. (B) Completed apexogenesis, normal periodontal ligament space, and root development; mild alveolar bone loss on the distal aspects of the central incisors remained 8 months postoperatively.

| Table 3. | THE MEASURED PROBING POCKET DEPTH AND CLINICAL ATTACHMENT |
|----------|---|
|          | LEVEL OF CENTRAL INCISORS IN CASE 3                       |

| Ini                       | tial pro     | bing po                  | cket dep                 | oth (PP                 | 8-month postoperative PPD |                        |                        |                          |                          |                         |                         |  |  |
|---------------------------|--------------|--------------------------|--------------------------|-------------------------|---------------------------|------------------------|------------------------|--------------------------|--------------------------|-------------------------|-------------------------|--|--|
| Right o                   | central      | incisor                  | Left c                   | entral                  | incisor                   | Right                  | central                | incisor                  | Left central incisor     |                         |                         |  |  |
| MB                        | В            | DB                       | MB                       | B DB                    |                           | DB                     | В                      | MB                       | MB                       | В                       | DB                      |  |  |
| 6                         | 3            | 4                        | 3                        | 3                       | 5                         | 3                      | 2                      | 3                        | 3                        | 2                       | 3                       |  |  |
| MP                        | Р            | DP                       | MP                       | Р                       | DP                        | DP                     | Р                      | MP                       | MP                       | Р                       | DP                      |  |  |
| 6                         | 4            | 4                        | 4                        | 2                       | 6                         | 3                      | 2                      | 3                        | 3                        | 2                       | 3                       |  |  |
| Initi                     | al clini     | cal attac                | hment l                  | evel (C                 | 8-month postoperative CAL |                        |                        |                          |                          |                         |                         |  |  |
|                           |              |                          |                          |                         |                           |                        |                        | 1                        | *                        |                         |                         |  |  |
| Right o                   | central      | incisor                  | Left c                   | entral i                | ncisor                    | Right                  | central                | incisor                  | Left co                  | entral i                | ncisor                  |  |  |
| Right of MB               | central<br>B | <b>incisor</b><br>DB     | Left co<br>MB            | entral i<br>B           | ncisor<br>DB              | <b>Right</b><br>DB     | central<br>B           | incisor<br>MB            | Left co<br>MB            | entral i<br>B           | ncisor<br>DB            |  |  |
| Right of MB               | B<br>3       | incisor<br>DB<br>4       | Left co<br>MB<br>3       | entral i<br>B<br>3      | ncisor<br>DB<br>5         | Right<br>DB<br>3       | central<br>B<br>2      | incisor<br>MB<br>3       | Left co<br>MB<br>3       | entral i<br>B<br>2      | ncisor<br>DB<br>3       |  |  |
| Right of<br>MB<br>6<br>MP | B<br>3<br>P  | incisor<br>DB<br>4<br>DP | Left co<br>MB<br>3<br>MP | entral i<br>B<br>3<br>P | DB<br>5<br>DP             | Right<br>DB<br>3<br>DP | central<br>B<br>2<br>P | incisor<br>MB<br>3<br>MP | Left co<br>MB<br>3<br>MP | entral i<br>B<br>2<br>P | ncisor<br>DB<br>3<br>DP |  |  |

DB= distal buccal side. B=buccal side. DP=distal palatal side. P=palatal side. MP=mesial palatal side. Units of measurement=mm.

for tooth fixation and realignment. Four years after the surgery, healing was unsatisfactory, as observed by a 3- to 7-mm PPD (Table 2), a modified Miller Class II mobility with a gingival index of 2 (Figure 3E-F), a widened periodontal ligament, and more than 50% alveolar bone loss radiographically (Figure 4B). Poor oral hygiene, malocclusion, and a lack of follow-up with periodontal therapy resulted in a poor to questionable prognosis.<sup>15</sup>

**Case 3.** An 8-year-old male in good general health appeared with a chief complaint that his permanent maxillary central incisors were mobile and painful. Medical history was noncontributory. He had been taken to a local dental clinic to treat the space between his permanent maxillary central incisors 1 month earlier, where the dentist employed an elastic band to satisfy the patient's request. The family insisted that he had removed all elastic bands.

The clinical and radiographic findings in this case were consistent with those that had been found in the analogous cases. The signs and symptoms shown at the maxillary central incisors of this case included the following: the teeth were extruded and significantly deviated; the mobile incisors (modified Miller Class III mobility) were displaced together during mobility testing; gingiva was inflamed (prominent BOP and gingival index 3) and a pyogenic-like granuloma with a reversed pyramid shape appeared at the interdental area of the central incisors facially and palatally (Figure 5A-B); there were deeper PPD ( $\geq$ 5-mm) around the involved central incisors, and normal PPD at the mesial aspects of the incisors were identified (Table 3). A periapical radiograph (Figure 6A) demonstrated tooth extrusion and severe bone destruction at the distal aspects at the 2 central incisors.

A localized periodontitis induced by an elastic band displacement was diagnosed, and an exploratory surgery was scheduled. When an operation similar to case 1 was performed, 1 elastic band was discovered one-third of the way down the roots and removed (Figure 5C). The 2-wall, 3-mm depth infrabony defects on the distal sides (Figure 5D) were grafted with a hydroxylapatite material (OsteoGen, Impladent Ltd, Hollywood, NY). The wound was sutured with a 4.0 vicryl (Ethicon). Medication prescribed included amoxicillin 250 mg qid, acetaminophen 250 mg qid for 7 days, and 0.12% chlorohexidine mouth rinses twice daily for 2 weeks. The sutures were removed 7 days after surgery.

> Eight months postoperatively, a satisfactory periodontal healing was achieved with a healthy PPD (Table 3). No tooth mobility was noted, and a gingival index of 1 was noted clinically (Figure 5E-F). A radiograph revealed mild alveolar bone loss and completed apexogenesis (Figure 6B) of both teeth. Good oral hygiene and a reversible level of periodontal destruction may explain such satisfying results.

## Discussion

In the transitional dentition, a diastema between the permanent maxillary central incisors is normal for most children.<sup>16</sup> This midline diastema tends to close spontaneously when the permanent lateral incisors and canines erupt. This space may persist, however, if patients lose their primary canines prematurely or have impacted canines or labially flared maxillary incisors. A maxillary midline diastema that is less than 2.0 mm may close spontaneously,<sup>17</sup> whereas total closure of a diastema greater than 2.0 mm will not likely happen.

| PERMANENT MAXILL  | ARY INC | ISORS |   |    |   |   |   |   |    |    |        |          | 17.165 |       |
|---|---------|-------|---|----|---|---|---|---|----|----|--------|----------|--------|-------|
| Reference no.*  |         | 5     |   | 6  | 7 | 5 | 8 | 9 | 10 | 11 | С      | ase repo | rts    | Total |
| Case nos. included                                      | 1       | 2     | 3 |    |   | 1 | 2 |   |    |    | Case 1 | Case 2   | Case 3 |       |
| Pain  | +       | -     | - | No | + | - | + | - | +  | +  | +      | +        | +      | 8/13  |
| Pyogenic-like granulation                               | *       | *     | * | *  | + | + | + | + | +  | *  | *      | *        | *      | 13/13 |
| Bleeding on probing                                     | -       | -     | - | -  | + | + | + | + | +  | -  | +      | +        | +      | 8/13  |
| Deep PPD along rubber band                              | +       | +     | + | +  | + | + | + | + | +  | -  | +      | +        | +      | 12/13 |
| Vertical or arc-like bony defects along rubber band     | *       | *     | * | *  | * | * | * | + | *  | *  | *      | *        | *      | 13/13 |
| Interdental bone intact                                 | *       | *     | * | *  | * | * | * | * | *  | *  | -      | *        | *      | 12/13 |
| Tooth extrusion   | *       | *     | * | *  | * | * | * | * | *  | *  | *      | *        | *      | 13/13 |
| Crown divergence  | *       | *     | * | No | * | * | * | * | *  | *  | *      | *        | *      | 12/13 |
| Root convergence  | *       | *     | * | No | * | * | * | * | *  | *  | *      | *        | no     | 11/13 |
| Both teeth moved synchronously during the mobility test | -       | -     | - | -  | - | - | - | - | ~  | -  | +      | +        | +      | 3/13  |

\* All teeth involved were maxillary right and left central incisors.

Cases 1 and 3 = maxillary right and left central incisors; Case 2 = maxillary left central and lateral incisors.

+ = this sign/symptom was mentioned in the text. No=this sign/symptom was not mentioned in the text.

\* = this sign/symptom was not mentioned in the text, but but shown in the pictures.

- = this sign/symptom was not mentioned in the text nor shown in the pictures.

Therefore, if the diastema is less than 2-mm, attempts to intervene orthodontically to close the space should be anticipated and postponed until the permanent canine erupts. When orthodontic elastic bands are chosen to assist tooth movements, some supporting removable or fixed appliances are required to regulate the function of the applied elastic bands. The use of orthodontic rubber bands to close a maxillary anterior diastema is contraindicated without associated appliances.<sup>18</sup>

The pyogenic granuloma of the oral cavity is not an uncommon tumor-like overgrowth. Local irritation or trauma may trigger such an exuberant tissue response. The clinical presentation of a pyogenic granuloma is a smooth or lobulated mass manifesting small erythematous papules on a pedunculated or sometimes sessile base.<sup>19</sup> The severity of clinical signs and symptoms determines how a pyogenic granuloma should be treated. If the lesion is small, painless, and free from bleeding, it is advised to remove any possible irritants, provide oral hygiene instructions, and perform clinical observations with follow-ups.<sup>20</sup> Conversely, once a surgical intervention is planned, the excision is usually extended to the periosteum, and the adjacent teeth should be thoroughly scaled to remove any source of irritation.<sup>19</sup>

The 3 cases presented shared a common feature. An isolated pyogenic-like granuloma with a reversed pyramid shape appeared at the interdental area without an obvious pedunculated structure. Eradicating a pyogenic-like granuloma caused by an elastic band may not only create a severe interdental defect, but also may compromise the wound closure and healing. In addition, healing with inadequate keratinized attached gingiva can occur. Hence, a conservative treatment without biopsying the lesion is preferred.

The differential diagnosis of pyogenic granuloma includes peripheral giant cell granuloma, peripheral ossifying fibroma, metastatic cancer, hemangioma, conventional granulation tissue, hyperplastic gingival inflammation, Kaposi's sarcoma, bacillary angiomatosis, angiosarcoma, and Non-Hodgkin's lymphoma.<sup>21</sup> Distinguishing the inflammation induced by elastic bands from the other pathological lesions previously mentioned depends on the patient's dental history, clinical and radiographic findings, histological examinations, and the clinician's experience. Making a correct diagnosis and removing the irritants, instead of extracting the compromised teeth based on a questionable prognosis or excising the tumor-like lesion for biopsy related to the elastic band, are the advised treatments.

The signs and symptoms of localized periodontal destruction caused by inappropriate elastic band use on maxillary anterior teeth are organized and presented in Table 4. Some general symptoms and signs of this particular destruction include the following: patients usually experienced a painful sensation; an isolated, pyogenic-like granuloma appeared at the interdental area of the involved teeth; localized, aggressive periodontal destruction with worse probing pocket depths along the pathway of the slipped elastic band in the interproximal area of the offended teeth occured; a vertical or arc-like bony destruction along the elastic band was present; notable prominent tooth extrusion of the involved teeth was present; clinical crown divergence and a radiographic root convergence and crown divergence may be observed; the two involved teeth may move simultaneously when tested for mobility.

The essential treatment for this iatrogenic trauma includes the removal of the implicated elastic bands surgically or nonsurgically as soon as possible. However, root planing may not serve the purpose of eliminating the etiology as seen in the recorded cases. Employing a nonsurgical periodontal approach to identify and/or locate the elastic bands was ineffective in these 3 reported cases and resulted from the elastic quality, the infrabony location, and the radiolucent characteristic of orthodontic elastic bands. The exploratory periodontal surgeries were necessary, and following flap elevation, the orthodontic elastic bands and associated granulation tissues were removed and the bone substitutes were grafted. The primary healing of these 3 cases occurred without severe complications; the pocket probing depths and mobility of the involved teeth decreased; and clinical inflammation improved.

The subsequent healing of the 3 cases, however, evolved variously. Learning from the experiences of Cases 1 and 2, the clinicians developed their diagnostic and treatment skills; a better treatment result, therefore, was achieved for Case 3. Most importantly, the patient recognized the lesion at an early stage of damage and had the etiology defined and removed before it developed into an advanced periodontal destruction. Although Case 1 had the worst periodontal destruction at the beginning of the therapy, the proper periodontal and orthodontic treatments and acceptable oral hygiene resulted in a better clinical result than for Case 2. The original periodontal injury was not as critical in Case 2 as Case 1, in which poor oral hygiene and occlusal trauma from the crossbite at the permanent maxillary lateral incisor resulted in an unsatisfactory outcome.

Within the limitations of these cases, the prognosis of the involved teeth with a localized aggressive periodontal destruction, caused by dislocated elastic bands, may be affected by the: duration of the displaced elastic bands in the subgingival locations; extension and severity of the periodontal destruction; precision of the diagnosis and aptness of the periodontal treatment; status of oral hygiene and the frequency of supportive periodontal therapy; adjustment of trauma from occlusion; appropriateness of an orthodontic intervention; and number and the strength of elastic bands.

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