Treatment Options of Untreatable Traumatized Anterior Maxillary Teeth for Future Use of Dental Implantation

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The anterior maxilla is the most traumatized region during childhood. Posttraumatic complications occasionally lead to tooth loss as well as the need for future implants. Unfortunately, it is contraindicated to place dental implants during childhood. A waiting period of approximately 8 to 10 years before completion of growth is required. For this patient to become a candidate for future dental implants, it is necessary to ensure the continuous growth and to preserve the dimensions of the alveolar process until growth has ceased from time of injury until joint maturation. To achieve these goals, it is essential to coordinate the treatment sequence at the time of trauma. After loss of a traumatized anterior permanent maxillary incisor in young adults, treatment options are limited: orthodontic closure of the gap and reshaping the adjacent teeth, or tooth extraction and maintaining the gap with a temporary restoration. Orthodontic space closure has limited indications and requires prosthetic restoration of at least 2 teeth. Extraction and temporary restoration will usually lead to bone augmentation before implantation. Other possible treatment options include orthodontic extrusion of the root remnant (in cases of untreatable root fracture or complicated crown-root fracture) and a temporary crown to serve the patient until the completion of growth and development, autogenous tooth transplantation, intentional extraction and immediate tooth replantation, distraction osteogenesis, and decoronation. Because general rules do not apply, individual treatment plans are necessary. (Implant Dent 2004;13: 120–128)

Key Words: orthodontic extrusion, replantation, decoronation, ankylosis

The anterior maxilla is the most traumatized region in the mouth during childhood.[1–5] The peak age for these injuries is 9 to 10 years.[4] For posttraumatic untreatable anterior maxillary teeth, the potential use of dental implants should be considered. Unfortunately, it is contraindicated to place dental implants during childhood.[6] A waiting period of approximately 8 to 10 years is necessary before growth and development are completed. This can be verified by examining joint maturation. For these patients to become candidates for future dental implants without additional augmentation procedures, it is necessary to ensure continuous growth of the alveolar process in its dimensions of height and width. It is essential to coordinate the treatment sequence at the time of trauma to achieve these goals. The facial cortical plate over the roots of the anterior maxillary teeth is thin and porous. After tooth loss, 40% to 60% of bone resorption occurs in the first year, mainly in the facial part of the alveolar ridge. This results in ridge migration to a more palatal position in relation to adjacent teeth and the opposite jaw.[7]

Periapical infections, as well as prolonged and stubborn surgical treatments (repeated root-end surgeries or crown-lengthening procedures) can cause resorption of the labial plate and could later require an augmentation procedure before implant placement. Prompt and appropriate management is necessary to significantly improve the prognosis for many dentoalveolar injuries, especially in a young patient. Unfortunately, much of this trauma remains untreated, mistreated, or overtreated,[8] leading to a more complicated treatment at the time of implantation.

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Posttraumatic Anterior Tooth Loss

Posttraumatic complications occasionally lead to tooth loss and the need for future implants. For example:

1. A maxillary incisor with severe crown-root fracture in which the fracture line is located deep under the gingival margin. Conventional recommended treatment options (removal of the coronal fragment and supragingival restoration, supplemented by gingivectomy and/or osteotomy if necessary)[8,9] are im-

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possible, eventually leading to tooth loss.

2. A permanent incisor with a root fracture line, which allows communication with the oral cavity. Microbial pulp contamination with subsequent pulpal necrosis is almost inevitable. The usual recommended treatment, reposition of the coronal fragment followed by tooth immobilization with a splint for several weeks,[8,9] is no longer possible and the tooth should be extracted.
3. Dentoalveolar ankylosis accompanied by replacement resorption is a serious complication after severe injury to the periodontal membrane. This complication develops mainly after avulsion and intrusion but also after lateral luxation and root fracture.[10–16] As a result of replacement resorption, the periodontal ligament is replaced by bone tissue causing ankylosis between bone and tooth. Following ankylosis, resorption of cementum and root dentin occurs. These processes eventually result in replacing the entire root with bone. In young children, it could arrest the growth of the alveolar process and create an infra-occluded tooth, resulting in a severe bony defect that is difficult to correct.[17] In addition, loss of the maxillary incisor leads to serious esthetic and restorative problems, particularly when trauma occurs at a very young age. This process can also lead to space closure in the anterior maxillary region, which will make future implantation even more difficult.

The degree of the arrested eruption and interruption of bone growth are positively correlated with patient growth after ankylosis and gender. Therefore, when ankylosis occurs at a young age, before the growth spurt, especially in boys, the damage to the alveolar bone will be extensive and there will be a remarkable lack of bone after extraction of the ankylosed tooth. Therefore, ankylosed teeth should be treated as soon as diagnosed. However, when ankylosis develops after or at growth completion, the esthetic damage is usually acceptable. The tooth should remain in place to preserve ridge dimensions and to avoid space closure in the anterior maxillary region.[18]

Treatment Options

After loss of a traumatized anterior permanent maxillary incisor in young adults, there are few treatment options: orthodontic closure of the gap and reshaping the adjacent teeth using resin restorations,[19] or maintaining the gap with a temporary (acrylic or resin) restoration for future bone augmentation and implant placement.[19] However, the former has limited indications and requires prosthetic restoration of at least 2 teeth and the latter can lead to bone augmentation before dental implantation, and therefore is not recommended.

This review focuses on the necessary treatment sequence for posttrauma untreatable anterior maxillary teeth in young adults for bone preservation and future dental implantation (Table 1).

Orthodontic Extrusion

Orthodontic extrusion can serve as a suitable method to preserve alveolar bone at the anterior maxillary area in young children after trauma. After complicated crown-root fracture or root fracture, when conventional treatment options are not applicable, the root remnant can be temporarily preserved by root canal treatment, orthodontic extrusion,[20] and preparation of a temporary crown or resin restoration. This will serve the patient until completion of growth and development (Fig. 1).

The goal is to leave the apical portion of the root in place to enable continuous ridge and bone development while providing the patient with a long-term nonremovable temporary restoration until maturation (usually 8–10 years). This option preserves the alveolar dimensions and facial cortical plate for later root extraction and immediate implantation after completion of growth and joint maturation, as indicated by palm radiography.

Autogenous Tooth Transplantation

Autotransplantation of the first mandibular premolar to the anterior region immediately after tooth extraction poses another good treatment option even as a temporary solution until growth and development are completed. This treatment was originally presented as a permanent solution to replace a missing tooth. Reported success rates of autogenous tooth transplantation are relatively high.[21–29]

Andreasen et al.[24] reported survival rates of more than 90% in a comprehensive study, but only a few of the transplants were observed more than 10 years. Schwartz et al.[21] presented a mean observation time of 10 years (range, 1–25 years) (one tooth) for transplanted teeth. Czochrowska et al.[23] reported a 79% to 90% success rate in 30 transplanted teeth 17 to 41 years posttreatment.

This option is suitable for selected patients when a first mandibular premolar can be spared.[22,23] For example, patients with an increased overjet, who are at risk for dental injuries and anterior tooth loss,[30] orthodontic treatment is sometimes associated with extraction of the mandibular premolars.[31] These patients are excellent candidates for autotransplantation of their extracted mandibular premolar replacing the lost maxillary incisor. The first mandibular premolar is preferred over other teeth because it has only one root and a small lingual cusp, which enables it to resemble an anterior maxillary incisor. Autogenous tooth transplantation requires orthodontic cooperation to close the gap after the first mandibular premolar extraction.

The transplant can replace a missing tooth to preserve bone until completion of growth. Then, if necessary, the patient can become a candidate for dental implants.[29]

Intentional Tooth Implantation

Intentional extraction and immediate tooth replantation to its socket after embedding it and the socket in Emdogain® (Biora AB, Malmo, Sweden) is an alternative treatment for an ankylosed tooth.[16,32,33] Pohl et al.[32] reported a mean lifetime of the replanted tooth of 59.2 ± 42.5 months. Treatment of replacement resorption after light-to-moderate trauma with replantation and Emdogain can prevent or delay recurrence of ankylosis in many cases.[33]

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Table 1. Treatment Options for Posttrauma Untreatable Anterior Maxillary Teeth

Author	Treatment	Type of Work	Subjects	Results/Conclusions
Schwartz and Andreasen[21]	Autotransplantation vs. allotransplantation	Histologic	112 monkey incisors	Inflammatory resorption—4–8 weeks Replacement resorption—nearly absent
Clokei, et al.[22]	Autotransplantation	Review—3 case reports		Autotransplantation warrants more consideration; can replace missing teeth to ensure bone preservation
Czochrowska, et al.[23]	Autotransplantation	Clinical	30 transplanted teeth; 17–41 years posttreatment	Success rate 79–90%, transplant can replace missing teeth to ensure bone preservation until growth has ceased, then, if necessary, patient can become a candidate for implants
Andreasen, et al.[24]	Autotransplantation	Clinical	Long-term study (13 years)—370 premolars	95% and 98% long-term survival rate for incomplete and complete root formation
Lundberg and Isaksson[25]	Autotransplantation	Clinical	Follow up—278 teeth over 5 years	Success in 94% and 84% of cases for open and closed apices, respectively
Kugelberg, et al.[26]	Autotransplantation	Clinical	45 adolescent teeth over 4 years	Success rates of 96% and 82% for immature and mature teeth transplanted into the maxillary incisor region
Nethander[27]	Autotransplantation	Clinical	68 mature teeth transplanted with a 2-stage technique	5-year success rates of over 90%
Josefsson et al.[28]	Autotransplantation	Clinical	4-year evaluation of 80 patients	4-year success rate of 92% and 82% respectively, for premolars with incomplete and complete root formation
Moffat, et al.[16]	Intentional surgical repositioning	Case report		Intentional reposition, in the presence of an acceptable root length, could be a realistic treatment option in adolescence until osseointegrated implants can be considered
Pohl, et al.[32]	Intentional surgical repositioning	Clinical	40 teeth	Mean lifetime of the replanted teeth was 59.2 ± 42.5 months, 17 teeth (42.5%) classified as failures, mostly as a result of inflammatory resorption or periodontitis apicalis
Filippi, et al.[33]	Intentional surgical repositioning	Prospective clinical study	16 teeth, 4–14 months follow up	Mean survival time was 10.2 months, replacement resorption following light to moderate trauma with replantation and Emdogain prevents or delays recurrence of ankylosis in many cases
Brown and Welbury[45]	Orthodontic extrusion	Case report		Restoration of tooth with complicated incisor crown-root fracture extending below gingival cuff and alveolar crest by using remaining tooth tissue, restoration completed after root extrusion
Malmgren, et al.[46]	Orthodontic extrusion	Clinical	32 patients Cervical root fractures aged 10–20	Limited root resorption in 6 teeth, severe in one, 2 years follow up
Isaacson, et al.[40]	Orthodontic extrusion and distraction osteogenesis	Case report	Postavulsion 12-year-old patient with ankylosis	Orthodontic extrusion and distraction osteogenesis propose alternative treatment for ankylosed teeth
Small and Engel[39]	Distraction osteogenesis	Case report	Ankylosed tooth	Alveolar distraction osteogenesis can be considered to achieve optimal esthetics and a more ideal crown-to-root ratio
Filippi, et al.[41]	Decoronation	Case report	Postavulsion 12-year-old patient	Decoronation—a simple and safe procedure to preserve alveolar bone before implant placement
Malmgren[44]	Decoronation	Review		Decoronation preserves ridge width and vertical height

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Fig. 1. (**A**) Periapical view of anterior maxillary incisors of an 8-year-old patient after trauma. Fracture lines in both incisors can be seen. Root fracture in the left central incisor is unrestorable. (**B**) The fractured coronal fragment was extracted; root canal treatment was performed in the apical section before orthodontic extrusion of the root. (**C**) A temporary crown was made to serve the patient until completion of growth and development.

when the ankylosis (replacement resorption) is diagnosed at an early stage or has affected only a small area of the root. There is limited experience using this method and, like the previous option, it can serve as a temporary solution to preserve ridge dimension until growth and development are completed.[33–35]

Distraction Osteogenesis

The concept of distraction osteogenesis started behind the Iron Curtain in 1951 by a physician named Gavriil Ilizarov.[36] Chin and Toth[37] custom-fabricated distraction devices to successfully treat pediatric maxillofacial deformities. Chin is also credited with the fabrication of intraoral distractors and has pioneered the research in alveolar segment distraction.

This is a relatively new surgical procedure, with many applications to restore esthetic defects, ridge augmentation, and large craniofacial abnormalities. Movement of osseous sections can be made in a vertical, labial, or lingual direction. With vertical hard and soft tissue deficiencies, alveolar distraction osteogenesis achieves optimal esthetics and a more ideal crown-to-root ratio.[38] When growth is completed, the tooth is replaced to the occlusal plane using a combination of orthodontics, surgical block osteotomy, and distraction osteogenesis to reposition the tooth at the proper vertical position in the arch. The use of distraction osteogenesis proposes an alternative treatment for ankylosed teeth.[39]

Decoronation

Decoronation is a simple, easy-to-perform, and safe surgical procedure to preserve alveolar bone before implant placement,[40] and should be considered as a treatment option for teeth affected by replacement resorption. During decoronation, the crown and root filling are removed, leaving the root *in situ* to be continuously resorbed. The root is covered with a mucoperiosteal flap to enable continuous vertical growth of the associated alveolar bone.

After crown removal, a drill is used through the root canal to remove gutta–percha remnants and infected agents, and to allow blood and osteoclasts into the root. This promotes additional internal replacement resorption of the root by the development of alveolar bone inside the root canal while the external replacement resorption continues without interruption. Moreover, extraction of the crown is necessary for the vertical continuous growth of the alveolar bone coronal to the root remnant. Data from the literature, as well as our observations, show no complications after decoronation of an ankylosed tooth. The decoronated root is gradually resorbed by external replacement resorption and internal root resorption.[40–43] Furthermore, vertical growth of the alveolar bone occurs coronal to the root remnant preserving the vertical dimension of the alveolar process at the traumatized area.[42] These advantages make this method suitable for preservation of ridge dimensions for future dental implantation.

It is noteworthy, however, that even after decoronation, although the vertical dimension is preserved, horizontal bone augmentation could still be indicated before implant placement, because the remnant root is translocated with time to a more apical position (Fig. 2).

The alternative treatment of surgical extraction of an ankylosed tooth often leads to considerable bone loss and reduced bone volume in the orofacial dimension. This could later necessitate an extensive augmentation procedure.

Discussion

Treatment of an anterior maxillary tooth after trauma requires fastidious diagnosis and coordination between all treating physicians from the moment of injury. Cooperation is required from several specialties, including pedodontics, endodontics, surgery, orthodontics, restorative den-

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Fig. 2. (**A**) Labial view of an 11-year-old boy 3 years posttrauma to the anterior maxillary region. The right central incisor is ankylosed and infraoccluded. There is also a partial space closure. (**B**) Decoronation was performed. (**C**) Periapical view 3 years after decoronation shows that there is remarkable vertical bone growth coronal to the ankylosed root remnant preserving the vertical dimension of the alveolar process at the traumatized area. (**D**) Although the vertical dimension was preserved, the root remnant was proportionally moved apically. This occlusal view demonstrates horizontal bone defect, which will be corrected later by bone grafting before implant placement.

tistry, and prosthodontics. In the dental literature, there are many treatment options to preserve the injured tooth.[8,9,44] However, when the traumatized tooth is unrestorable as a result of trauma or its complications (ankylosis or infection), alternative treatments should be considered.

Orthodontic gap closure and autotransplantation are widely reported[19,21–23] as alternative treatment options after anterior maxillary tooth loss. After root fracture, when the tooth is unrestorable but a root remnant can be preserved, root canal treatment followed by orthodontic extrusion of the apical part and temporary restoration until completion of growth and development should be considered to preserve ridge dimensions for future dental implantation and to reduce the need for bone augmentation.[45,46] This alternative method requires multidisciplinary treatment and long-term follow up.

Ankylosed teeth should be treated as soon as diagnosed to avoid irreversible alveolar bone loss.[18,43] Autotransplantation of a mandibular premolar is a treatment option in extraction of an ankylosed anterior maxillary incisor. This option, however, is suitable only in selected patients when a first mandibular premolar can be spared[22,23] and requires orthodontic treatment to close the gap after the first mandibular premolar extraction, as well as reshaping the implanted tooth by composite or by prosthetic restoration. Intentional extraction and immediate replantation of the tooth is another option, indicated only when ankylosis is diagnosed at an early stage or has affected only a small area of the root. However, there is limited experience using this method.

Autotransplantation and intentional replantation can both serve as temporary solutions to preserve ridge dimension until growth completion. The use of distraction osteogenesis proposes an alternative treatment for ankylosed teeth. Because this approach treats the symptoms of ankylosis and does not correct it, further vertical growth of the alveolar process will naturally produce further vertical deficiency. This method could also endanger the vitality of the resected surgical block, resulting in its complete loss.[39] Distraction osteogenesis does not stop the ongoing tooth replacement resorption, especially in young patients with ankylosed infraoccluded teeth, in which root resorption is usually aggressive (the entire root is resorbed within 1–2 years). Future tooth extraction, bone grafting, and implantation could still be needed.

Distraction osteogenesis, as a treatment option for tooth ankylosis, is indicative only for adult patients in whom replacement resorption takes a protracted course and the alveolar process is fully developed.

Decoronation should be considered for dental ankylosis when autotransplantation or intentional implantation are not possible. This method is easy to perform and has proved to promote vertical bone growth coronal to the root remnant. It is suitable for preservation of ridge dimensions to enable future dental implantation.[43] It could be postulated that when decoronation is performed at an early stage, a substantial amount of dentin should not be removed from the internal root surface to postpone complete root resorption, thus maintaining the horizontal dimension of the alveolar ridge for a longer period. In contrast, when decoronation is performed later, close to joint maturation, considering that complete root resorption of the ankylosed root is desired in a relatively short period, a substantial amount can be removed from the internal root surface to achieve complete root resorption before placing the root implant. Although the root remnant will eventually "migrate" to an apical position and might not interfere with future dental implantation, there is still a lack of knowledge about future consequences of the dentin remnants that remain in the bone.

It is noteworthy that the age of the patient at the time of trauma, and gender, are important factors in treatment planning, because it depends on completion of growth and development.

Conclusions

The suggested treatment options to preserve ridge dimensions after dental trauma in the anterior maxilla for future dental implantation in the young patient are orthodontic extru-

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sion of the root and temporary restoration, autogenous tooth transplantation, intentional extraction and immediate replantation of the tooth, distraction osteogenesis, and decoronation. An individual treatment plan for each patient is necessary. General rules do not apply.

Disclosure

The authors claim to have no financial interest in any company or any of the products mentioned in this article.

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Behandlungsmöglichkeiten bei unheilbar traumatisiertem Gebiss im vorderen Oberkiefer: Herstellung einer Basis für spätere Zahnimplantation

ZUSAMMENFASSUNG: Beim heranwachsenden Menschen ist der vordere Oberkiefer die am weitesten von Traumatisierungserscheinungen betroffene Region. Posttraumatische Komplikationen können zu Zahnverlust führen und somit auch zur späteren Behandlungsnotwendigkeit mit Zahnimplantaten. Leider ist ein Einsatz von Zahnimplantaten während der Kindheit ausgeschlossen. Um eine Implantation durchführen zu können, muss der Mensch komplett ausgewachsen sein, was eine Wartezeit von ungefähr 8 bis 10 Jahren bedingt. Damit sich diese Patienten die spätere Implantierungsoption erhalten, müssen das kontinuierliche Wachstum und die angemessene Größenentwicklung des Alveolarfortsatzes unbedingt über den gesamten Zeitraum von der Verletzung bis zum Erreichen der Komplettausreifung sichergestellt sein. Die perfekte Abstimmung der Behandlungsfolge zum Zeitpunkt der Traumatisierung ist daher für eine erfolgversprechende Folgebehandlung unerlässlich. Verliert ein Heranwachsender einen traumatisierten vorderen bleibenden Schneidezahn, gibt es nur wenige Behandlungsoptionen: entweder der kieferorthopädische Verschluss der Lücke zusammen mit einer Neuausrichtung der benachbarten Zähne oder ein Erhalten der Zahnlücke mit provisorischer Wiederherstellung nach erfolgter Zahnextraktion. Soll der Spalt kieferorthopädisch geschlossen werden, muss eine der wenigen akzeptierten Indikationen vorliegen. Die Behandlung erfordert die prothetische Wiederherstellung von mindestens zwei Zähnen, die Extraktion sowie die vorläufige Wiederherstellung. Im Normalfall wird vor Implantierung ein Knochenaufbau erforderlich sein. Weitere Behandlungsmöglichkeiten sehen die kieferchirurgische Expulsion des Wurzelrestes (sollten eine nicht behandelbare Wurzelfraktur oder eine komplizierte Fraktur der anatomischen Zahnkronenwurzel vorliegen) und den Einsatz einer provisorischen Überkronung bis zur Entwicklungsreife und zum Erreichen des Erwachsenenalters, autogene Zahntransplantationen, geplante Extraktionen und sofortige Zahnreplantationen, Osteogenesedistraktionen sowie Dekoronationen vor. Da keinerlei allgemeingültige Regeln greifen, sind individuelle Behandlungspläne unerlässlich.

SCHLÜSSELWÖRTER: kieferchirurgische Expulsion, Replantation, Dekoronation, Ankylose

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Opciones de tratamiento de dientes anteriores traumatizados no tratables para uso futuro de implantes dentales

ABSTRACTO: El maxilar anterior es la región más traumatizada durante la niñez. Las complicaciones postraumáticas ocasionalmente llevan a la pérdida de dientes, así como a la necesidad de implantes futuros. Desdichadamente, la colocación de implantes dentales está contraindicada durante la niñez. Se requiere un período de espera de aproximadamente 8 a 10 años antes de completar el crecimiento. Para que este paciente se convierta en un candidato para implantes dentales futuros, es necesario asegurar el crecimiento continuo y preservar las dimensiones del proceso alveolar hasta que haya terminado el crecimiento desde el momento de la lesión hasta la madurez de la articulación. Para lograr estas metas, es esencial coordinar la secuencia del tratamiento en el momento del trauma. Después de la pérdida de un incisor maxilar anterior permanente traumatizada en un adulto joven, las opciones de tratamiento son limitadas: cierre ortodóntico del espacio y redefinición de los dientes adyacentes o extracción del diente y mantenimiento del espacio con una restauración temporaria. El cierre del espacio ortodóntico tiene indicaciones limitadas y requiere la restauración prostética de por lo menos dos dientes, extracción y restauración temporal, que generalmente llevará a un aumento del hueso antes de la colocación. Otras opciones posibles de tratamiento incluyen la extrusión ortodóntica del resto de la raíz (en casos de fractura de la raíz no tratable o fractura complicada de la raíz y la corona) y una corona temporaria para atender al paciente hasta que termine el crecimiento y desarrollo, transplante autógeno del diente, extracción intencional y recolocación inmediata del diente, osteogénesis de distracción y decoronación. Debido a que las normas generales no se aplican, son necesarios planes de tratamiento individualizados.

PALABRAS CLAVES: extrusión ortodóntica, recolocación, decoronación, anquilosis

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Opções de Tratamento de Dentes Maxilares Anteriores Traumatizados Intratáveis para Uso Futuro de Implantação Dentária

RESUMO: A maxila anterior é a região mais traumatizada durante a infância. Complicações pós-traumáticas ocasionalmente levam a perda de dentes, bem como à necessidade de implantes futuros. Infelizmente, é contra-indicado colocar implantes dentários durante a infância. Exige-se um período de espera de aproximadamente 8 a 10 anos antes de se completar o crescimento. Para esse paciente tornar-se candidato a futuros implantes dentários, é necessário assegurar o crescimento contínuo e preservar as dimensões do processo alveolar até que o crescimento tenha cessado, do momento do dano até a maturação conjunta. Para alcançar essa meta, é essencial coordenar a seqüência de tratamento no momento do trauma. Após a perda de um incisivo maxilar permanente anterior traumatizado em adultos jovens, as opções de tratamento são limitadas: fechamento ortodôntico do vazio e remodelação dos dentes adjacentes, ou extração do dente e manutenção do vazio com uma restauração temporária. O fechamento do espaço ortodôntico tem indicações limitadas e exige restauração protética de pelo menos dois dentes, a extração e restauração temporária normalmente levarão ao aumento do osso antes da implantação. Outras opções de tratamento possíveis incluem extrusão ortodôntica da raiz remanescente (em casos de fratura de raiz intratável ou fratura de coroa-raiz complicada) e uma coroa temporária para servir o paciente até que se complete o crescimento e desenvolvimento, transplantação de dente autógeno, extração intencional e replantação de dente imediata, osteogênese de distração e descoroação . Já que as regras gerais não se aplicam, são necessários planos de tratamento individuais.

PALAVRAS-CHAVE: extrusão ortodôntica, replantação, descoroação, ancilose.

治療不可能な損傷前部上顎歯の将来のデンタル・インプラントのための再使用に向けた処置法

著者：デボラ・シュワルツ-アラド、DMD、PhD*、ライラン・レビン、DMD**、マルカ・アシュケナージ、DMD***

要約：上顎前部は小児期にもっとも損傷を受けやすい部分である。損傷後の合併症は時に歯の損失をもたらすとともに、将来のインプラントの必要を招くことがある。しかし小児へのデンタル・インプラント適用は残念ながら禁忌とされている。成長完了までの待ち時間は約8年～10年が要請される。このような患者が将来インプラント治療の候補となるためには、成長過程が継続されるだけでなく、損傷時から成人に到り成長が止まるまでのあいだの成長過程において歯槽部が十分な寸法を保つことが必要である。この目標達成のために、損傷時に始まる治療順位には正しい配慮を配る必要がある。損傷を受けた上顎前部永久切歯を若年成人期に失った患者の場合、治療法は限定される。それには隙間を矯正によって閉じて隣接歯の形状を変更する方法、抜歯後一時的修復により隙間を維持する方法がある。隙間の矯正による閉鎖は適用例が限られるとともに、最低2本の歯の補綴修復を必要とする。抜歯後一時修復の方法では、インプラント前の骨増大が通常必要となる。治療法には他に、残存歯根の矯正抜去（治療不可能な歯根破損または複雑な歯冠根破損の場合）、成長完了時までのテンポラリークラウンによる維持、自家歯移植、意図的抜歯と即時歯再移植、distraction osteogenesis、decoronationがある。治療法の選択にあたっては一般的法則が適用できないため、個別的な判断が重要となる。

キーワード：矯正抜去、再移植、decoronation、強直

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