

Perio-prosthetic management in restoring teeth with reduced clinical crown in children

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Abstract

The purpose of this article is to underline the importance and to discuss the indications and techniques of crown lengthening procedures prior to prosthetic treatment of mutilated or undererupted permanent teeth of children.

The aim of surgical crown lengthening is the exposure of at least 3 to 4mm of healthy tooth structure coronally to the alveolar crest, length that will allow the formation of the new epithelial attachment and the existence of 1 to 2mm of tooth structure for the construction of a biologically acceptable crown margin. If the margin of the defect is inadequate distance from the alveolar crest the surgical procedure involves reduction of the attachment complex and is limited to the soft tissues only (a gingivectomy, apically repositioned full thickness flap, distal wedge). When the margin of the defect is close to the alveolar crest, less than 3mm, the surgery involves also modification of the hard tissues of the periodontium (apically repositioned full thickness flap with ostectomy-osteoplasty). Although cases of children generally call for a conservative approach, the necessity for harmony between restorative procedures and materials with the supporting structures make surgical intervention inevitable.

Introduction

On many occasions children are in need of prosthetic treatment. Extensive caries, fractures and loss of permanent teeth due to trauma as well as congenitally missing teeth are common reasons that young patients would require conventional crown and bridge therapy.

There is a general tendency advocating "conservatism" in restoring mutilated dentition in children. In order to avoid permanent full coverage before the age of eighteen, fractured or extensively decayed teeth, after endodontic therapy are often restored by means of prefabricated posts and composite resin built ups (Fig. 1a). Furthermore, if the placement of a full crown is decided upon the "conservative" approach would tend to avoid preprosthetic surgical procedures, even if the case involves defects that extend beyond the gingival attachment level (Fig. 1b,c). In both situations the biological response is not favorable.^{1,2}

The undisputed technical requirements for a successful fixed prosthesis are the adequate retention of the crown, as well as the proper fit that will assure peripheral seal on the prepared tooth. Furthermore, respect of the periodontium during construction is of paramount importance for the maintenance of gingival health and the longevity of the restoration. For the achievement of these objectives, adequate axial height of the preparation for retention as well as 1 to 2mm of healthy tooth structure coronal to the epithelial attachment for the crown margins must be ensured. If not, surgical crown lengthening procedures must be performed.^{3,4}

Unfortunately, many of the children's permanent teeth to be restored do not present adequate axial height of the clinical crown, from either mutilation or abnormal eruption. The purpose of this article is to underline the importance as well as to discuss the indications and techniques of crown lengthening procedures prior to prosthetic treatment in children.

Biological criteria and surgical techniques

Gingival attachment on the tooth is accomplished by the connective tissue fibers (supracrestal fibers) and the junctional epithelium and extends coronally from the alveolar crest to the base of the gingival crevice. The width of the combination of the above tissues varies from 1 to 3mm and has been termed the "biological width of the periodontium" (Fig. 2a). Respect of this width during construction is important for the protection of periodontal health. If for technical reasons the periodontal integrity is in danger, crown lengthening procedures should precede the prosthetic treatment.^{5,7}

It is evident however, that after flap procedures for crown lengthening when healing occurs, the epithelium migrates apically forming a long junctional epithelium (Fig. 2b). In this case the connective tissue fibers are absent and gingival attachment is accomplished strictly by junctional epithelium, which extends coronally from the alveolar crest to the base of the sulcus.^{8,12}

Therefore, the shift from a physiological connective tissue-junctional epithelium attachment complex to a purely long epithelial attachment could be considered a disadvantage, especially when it involves young individu-

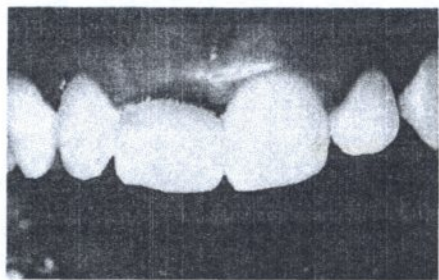


Fig. 1a

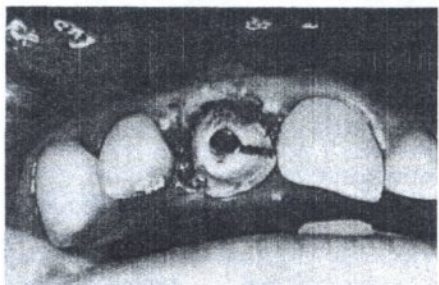


Fig. 1b



Fig. 1c

als. However, considering the long term benefits of a healthy periodontium, the treatment plan should be directed towards establishing a harmony between the restoration and the gingiva.

The aim of surgical crown lengthening is the exposure of at least 3 to 4mm of healthy tooth structure coronally to the alveolar crest, which will be distributed as follows: 1) 2mm for the epithelial attachment and 2) 1 to 2mm for the crown margins.

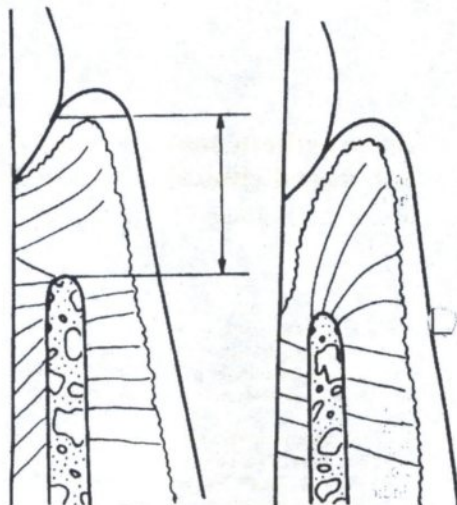


Fig. 2a

Fig. 2b

When the cervical margin of the defect is inadequate distance from the alveolar crest (more than 3mm), crown lengthening is achieved by surgical reduction of the width of the attachment complex. In this case, the surgery is limited to the soft tissues exclusively (gingivectomy, apically positioned full thickness flap, distal wedge).^{4,13,14}

When the cervical margin of the defect is close to the alveolar crest (less than 3mm), the surgery should also involve modification of the hard tissues of the periodontium (apically positioned full thickness flap with ostectomy-osteoplasty).

Gingivectomy requires the existence of an adequate width of attached gingiva.¹⁵ Therefore, the clinical application is limited in cases where a healthy and sound clinical crown is covered by soft tissue. This occurs because of fibrous hyperplasia or abnormal eruption.

Distal wedge flap is indicated in cases where the surgical crown lengthening must involve the distal side of the last tooth. During surgery, a wedge removal of soft-tissues is performed and is usually combined with a flap in the rest of the teeth. The buccolingual width of the flap is increased according to the required crown lengthening. It is usually performed in cases of distal cervical caries.

Apically repositioned full thickness flap is most frequently used. The main advantages of this technique are: 1) maintenance of the width of the zone of the attached gingiva, and 2) direct observation of the relationship between the bone and the defect that permits correct evaluation and allows reduction of alveolar bone by ostectomy-osteoplasty if necessary.

If **ostectomy** is necessary, considerations must be taken to the following: 1) reverse architecture of the bone must be avoided (In these cases osteoplasty must follow ostectomy.¹⁵), 2) do not expose the furcation entrance in multirrooted teeth, 3) do not damage the bone support of the tooth in which the crown is lengthened or adjacent teeth (Extraction of the tooth and use of the adjacent teeth as abutments for a bridge may be the treatment of choice in some cases.), and 4) possible esthetic problems when the ostectomy involves the buccal alveolar plate of the anterior upper teeth (Orthodontic movement of the tooth may be an alternative solution to these problems^{16,18}).

Indications and perio-prosthetic management

The indications for crown lengthening procedures in children and adolescents include teeth that present fractures (horizontal or vertical), subgingival caries or healthy teeth with inadequate axial height of clinical crown due to abnormal eruption.

Horizontal tooth fractures usually occur near the epithelial attachment. If an adequate width of attached gingiva exists modifications of the soft tissues by gingivectomy may be sufficient. The use of electrosurgery is also indicated in such instances. However, care must be taken not to touch the alveolar bone with the electrode since extensive damage may occur¹⁹ (Fig. 3a, b, c).

Vertical fractures very often extend subgingivally in close proximity to the alveolar crest. In such instances as well as in cases of deep horizontal fractures, the procedure of choice is the apically repositioned full thickness flap. The radiograph rarely gives the real extent of the problem, especially when the line of the fracture extends only on the surface of the root. In this case, the fractured piece may give some information as to which treatment can be planned. Care must be taken also in these cases to preserve the normal architecture of soft and hard tissues during the surgical procedure (Fig. 4a, b).

When the injury is concerning subgingival caries the periapical radiograph often gives information about the height of healthy tooth structure, which remains coronally to the alveolar crest (Fig. 5a, b). In addition better clinical evaluation is possible upon removal of the carious tooth structure (Fig. 5c). In order to fabricate cast post and cores a primary modification of the soft tissues is required (Fig. 5c, d). This is best accomplished by the use of electrosurgery. The construction of temporary crowns is then possible resulting in better soft tissue healing after surgery (Fig. 5e). Apically repositioned flap with or with-

out ostectomy usually is the treatment of choice in this case (Fig. 5f, g, h).

On many occasions, the remaining healthy tooth structure of the root after caries removal presents a funnel-type morphology. This is due to the fact that the carious lesion proliferates into the central area of the non-vital root rather than the peripheral dentin and cementum, which is protected from the periodontal fibers. It must be taken into consideration, that the thin peripheral walls will be removed during the final margin placement of the preparation. Therefore, the length of surgically exposed root must be increased considering that 2mm of healthy tooth structure must remain after removal of these thin walls.

Reduced axial height of intact clinical crown is a common situation in children and young adults after orthodontic treatment especially in cases of impacted teeth and congenital partial anodontia. Crown lengthening is necessary in such cases to ensure adequate retention for the crown without violation of the attachment complex as well as to improve esthetics. The correction usually is limited to the soft tissues and can be achieved with gingivectomy or apically repositioned flap (Fig. 6a, b, c).

Healing and completion

Before proceeding to the final steps of the prosthodontic treatment, i.e., final preparation and impression, stability of health of the periodontium should be established. This stability involves completion of healing by the epithelialization of the gingiva and creation of a new epithelial attachment. Ideally, a period of at least 6 weeks is needed for the tissues to reach complete clinical healing.^{20,22} However, practical reasons usually oblige the restorative treatment to start earlier and this period to be reduced to four weeks without any serious problems. During that time, other clinical steps such as endodontic therapy, placing of a cast post and core and construction of a temporary crown can possibly take place.

On many occasions, if the cervical area of the tooth does not have a normal anatomy because of extended damage of the crown, it is possible that granular tissue hyperplasias will be formed during healing. These hyperplasias should be removed again by gingivoplasty. The use of the electrosurgery unit is also possible. On the other hand, the placement of a temporary crown with the best possible marginal fit would restore the proper cervical anatomy and promote proper healing and eventually prevent the tissue overgrowth.

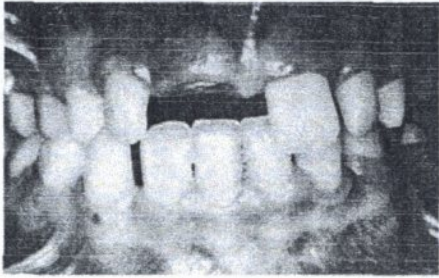


Fig. 3a

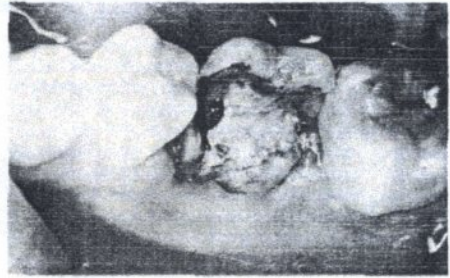


Fig. 4a

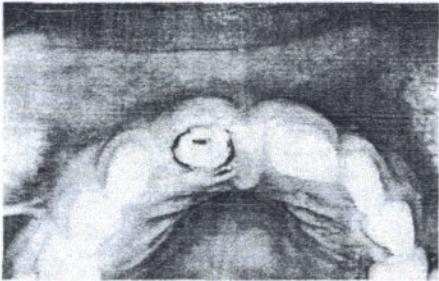


Fig. 3b

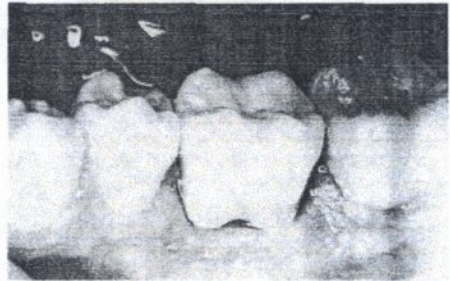


Fig. 4b

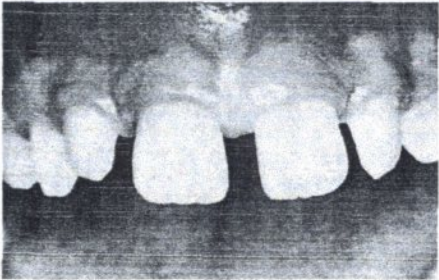


Fig. 3c

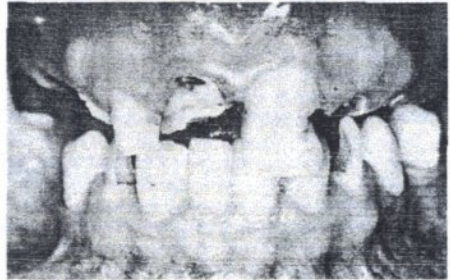


Fig. 5a

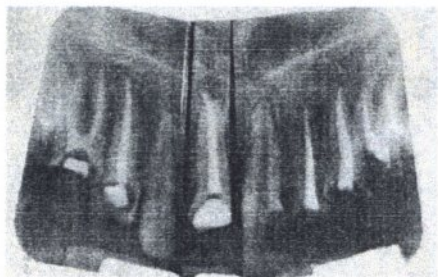


Fig. 5b



Fig. 5e



Fig. 5c

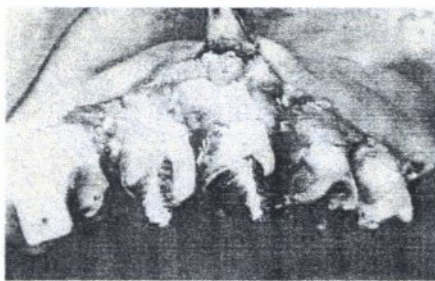


Fig. 5f



Fig. 5d



Fig. 5g

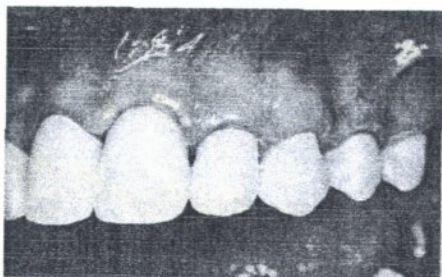


Fig. 5h

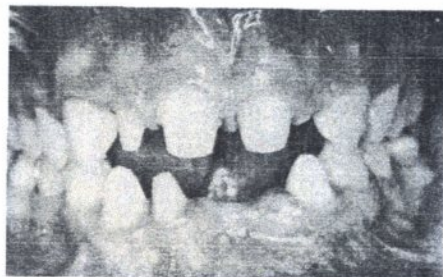


Fig. 6b

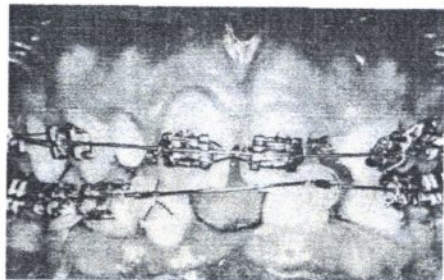


Fig. 6a



Fig. 6c

Conclusions

The approach of treatment in order to restore permanent teeth of children that present reduced clinical crown should involve proper perioprosthodontic management. The aim is: 1) to preserve the remaining tooth structure and maintain the teeth, and 2) to respect the periodontal health and provide harmony between the restoration and the soft tissues.

It is very important for the maintenance of periodontal health, not to exert any violence on the epithelial attachment and preserve the integrity of the biological width of the periodontium. Although, restorative treatment in children generally needs a conservative approach, the necessity for a healthy periodontium, which is of paramount importance often requires the surgical intervention. If the clinical situation indicates that there is not adequate amount of sound tooth structure coronally to the attachment level for technical requirements of the restoration to be met, surgical crown lengthening must be performed.

The surgical technique with or without ostectomy

must always be performed with the final goal of the existence of at least 3 to 4mm of healthy tooth structure coronally to the alveolar crest. This width will permit the formation of a normal dentogingival junction as well as the existence of 1 to 2mm of teeth structure coronally to the epithelial attachment for the construction of a biologically acceptable crown margin. Thus, teeth with horizontal or vertical fractures, subgingival caries or with inadequate axial height of intact clinical crown can be used as abutments for fixed prosthesis successfully harmonizing the restorative procedures and materials with the supporting biological environment.

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References

1. Dragoo, M., Williams, G. Periodontal tissue reactions to restorative procedures. Part I. *Int J Periodont Res Dent* 1:9, 1981.
2. Dragoo, M., Williams, G. Periodontal tissue reactions to restorative procedures. Part II. *Int J Periodont Res Dent* 2:45, 1982.
3. Block, P.C. Restorative margins and periodontal health: A new look at an old perspective. *J Prosthet Dent* 57:683, 1987.
4. Kaldahl, W.B., Becker, C.M., Wertz, F.M. Periodontal surgical preparation for specific problems in restorative dentistry. *J Prosthet Dent* 51:36, 1984.
5. Gargiulo, A.W., Wentz, F.M., Orban, B. Dimensions of the dentogingival junction in humans. *J Periodont* 32:261, 1961.
6. Nevins, M., Shurow, H. M. The intracervical restorative margin. The biologic width and the maintenance of the gingival margin. *Int J Periodont Rest Dent* 4:50, 1984.
7. Stanley, H.R. The cyclic phenomenon of periodontitis. *Oral Surg Oral Med Oral Path* 8:598, 1955.
8. Caton, J., Nyman, S. Histometric evaluation of periodontal surgery. The modified Widman flap procedure. *J Clin Periodontol* 7:212, 1980.
9. Listgarten, M.A., Roseberg, H.M. Histological study of repair following new attachment procedures in human periodontal lesions. *J Periodontol* 50:333, 1979.
10. Nyman, S., Lindhe, J., Karring, T. Healing following surgical treatment and root demineralization in monkeys with periodontal disease. *J Clin Periodontol* 8:249, 1981.
11. Stahl, S.S., Froun, S.T., Kushner, L. Periodontal healing following open debridement flap procedures. II Histologic observations. *J Periodontol* 53:15, 1982.
12. Stahl, S.S. Speculations on periodontal attachment loss. *J Clin Periodontol* 13:1, 1986.
13. Kohavi, D., Stern, N. Crown lengthening procedure. Part I Clinical Aspects. *Compend Cont Educ Dent* 4:413, 1983.
14. Sivers, J., Johnson, G.K. Periodontal and restorative considerations for crown lengthening. *Quintessence Int* 16:833, 1985.
15. Ochsenbein, C., Ross, S.E. A reevaluation of osseous surgery. *Dent Clin N Am* 13:87, 1969.
16. Delivannis, P., Delivannis, H., Kuffinec, M. Endodontic-orthodontic management of fractured anterior teeth. *JADA* 97:483, 1978.
17. Ingber, J. S. Forced eruption. Part II A method of treating non-restorable teeth - periodontal and restorative considerations. *J Periodontol* 47:203, 1976.
18. Johnson, G.K. Forced eruption in crown-lengthening procedures. *J Prosthet Dent* 56:36, 1986.
19. Glickman, L., Imber, L. Comparison of gingival surgery with electrosurgery and periodontal knives. *J Periodontol* 41:142, 1970.
20. Maynard, J.G., Wilson, R.D. Physiologic dimensions of the periodontium fundamental to successful restorative dentistry. *J Periodontol* 50:170, 1979.
21. Wilson, R.D., Maynard, J.G. Intracervical restorative dentistry. *Int J Periodont Res Dent* 1:34, 1981.
22. Parasbis, A., Tripodakis, A.P. Surgical crown lengthening procedures. Preparatory step for fixed prosthesis. *Odontol Progress* 44:125, 1990.