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*Circumferential supracrestal fiberotomy - indications
and contraindications. Literature review*

Fiberotomy is the procedure in which the supracrestal periodontal fibers are cut around the crowns of teeth. In literature the name CSF is often used as an abbreviation of the full English name of this procedure – Circumferential Supracrestal Fiberotomy. The original technique described by Edwards (4) involved cutting the periodontal fibers around the whole crown of the tooth. This technique was modified by Boese (2), who recommended saving method omitting the cutting of periodontal fibers in the central part of labial surface of the tooth's crown. Such treatment with retaining part of the fibers decreased the risk of the gingival recession. Fiberotomy is recommended especially around severely rotated and malposed teeth. CSF allows for the release of soft tissue tension and reattachment of the fibers in a passive orientation after orthodontic teeth movements.

The aim of orthodontic treatment is the achievement of the possible the best and stable results. Stability of the results depends on many factors, of which the most important are: appropriate and complete diagnosis, logical and wise treatment plan, correct treatment, proper retention for proper limits of time.

Retention is the last phase of orthodontic treatment whose aim is holding the teeth in the new and right positions. Retention period should continue for at least 12 months to allows time for remodelling of all periodontal fibers (10). Orthodontics is constantly seeking new retention procedures for preventing dental relapse. By relapse we mean the state in which teeth partially or totally return to their original wrong positions. The directions of relapse is opposed to the directions of movements which teeth did during orthodontic treatment. In teenagers it is recommended that the orthodontically moved teeth be "overcorrected" to compensate for future malocclusion relapse. In adult patients such overcorrection is generally not advisable, especially in teeth with reduced periodontal support.

In the patients' opinions the treatment frequently ends with the removal of fixed appliances. On the other hand, orthodontist can find the treatment successful only after ending the retention phase. In the retention period the patients use a number of various removable or fixed retainers. Both of them have their certain indications as well as pros and cons. During the retention period aside different procedures enhancing stability of final results can be used. The examples of them are fiberotomy, frenulectomy or prophylactic removal of third molars. All these procedures decrease the risk and level of the malocclusion relapse. However, these are invasive methods involving surgical treatment which lead to the breaking of the tissues.

There is little doubt that relapse of malocclusions after orthodontic treatment is primarily due to the displacement of periodontal fibers (3, 9, 10, 13). During orthodontic tooth movement the remodelling

of the periodontal ligament fibers occurs as the result of the acting forces. Periodontal fibers networks undergo reorganisation and it is a process which lasts even several months after relieving the orthodontic forces. It means that remodelling of periodontal ligaments is continuing after the orthodontic appliance removal. In gingiva there are both collagenous and elastic fibers and their time of remodelling is different. The collagenous fibers undergo remodelling in the period of 4–6 months, whereas the remodelling of elastic fibers is much slower. These fibers require much more time, even up to a year after the ending of the forces delivery (10). This is the reason why every orthodontic patient needs the same type of retainer for appropriate time to allow for periodontal ligament reorganisation for stability of the final treatment results.

INDICATIONS FOR FIBEROTOMY

Indications for CSF occur in cases when during orthodontic treatment severe teeth movements took place. It means that in the case with originally severe malposed or rotated teeth the fiberotomy is indicated. Rotated teeth seem to be a special task for an orthodontist. This tooth movement is rather simple to be achieved but difficult to maintain. Special indications for fiberotomy also concern the extrusion of teeth to be later reconstructed. In these cases fiberotomy is done not in the retention phase but during the lengthening of the crown of damaged teeth. Apart from the retention period fiberotomy might also be done at the beginning of the orthodontic treatment. In that case its aim is not increasing the stability of final results but making the initial teeth movement easier. Originally, severe rotated and displaced frontal teeth are indications for such procedures. Fiberotomy can be done directly after orthodontic appliance removal (1). In the most serious malocclusion Proffit (10) suggests performing fiberotomy even several weeks before appliance removal.

CONTRAINDICATIONS FOR FIBEROTOMY

Similarly to the case of any other surgical technique the successful result depends on the right and proper prevention for contamination. For this reason CSF should not be done in patients with improper oral hygiene and wrong plaque control. Moreover, patients with active periodontal disease should also be excluded. The small teeth movement during orthodontic treatment are also the contraindication for fiberotomy. Along with the local contraindications mentioned above the general contraindications should be considered. If the patient suffers from any general disease, the contraindications for fiberotomy should be considered carefully taking into account the disease itself and applied pharmacology (1).

LITERATURE REVIEW

The first remarkable histological reports concerning the remodelling of periodontal fibers after fiberotomy were published by Boese (2) and Wiser (15) in the 1960s. Boese conducted his experiments on monkeys *Macaca nemestrina*, whereas Wiser on dogs. The results of these works proved encouraging and the fiberotomy started to be performed more frequently in orthodontic patients in the cases of severely rotated and malposed teeth. In literature the subject concerning fiberotomy was highly popular in 1970s. Many reports on fiberotomy were published at that time. The majority of those data and evidence are still clinically valid and useful.

In 1976 Kaplan (6) conducted a questionnaire survey among American orthodontists concerning their opinion about fiberotomy. The study was carried out on a survey of 1000 randomly selected orthodontists in the United States to ascertain the incidence of using the CSF as the technique minimising

the rotational relapse. In his work he showed tremendously varied orthodontist attitudes towards this procedure. Some orthodontists practised it in many of their patients in the finishing treatment phase, doing it on their own or sending the patients to the periodontist or dental surgeon. However, some other orthodontists considered fiberotomy as an invasive method and they did not recommend it. The results of this study tend to indicate that fiberotomy is a reasonable solution and its use probably will be increasing in the future.

In 1979 Rinaldi (11) conducted a retrospective study in the patients who underwent fiberotomy. The purpose of his investigation was to determine the periodontal condition after CSF. Rinaldi prepared a special device for precise measurements of changes in free gingival height, epithelial attachment and pocket depth. All of measurements were made 4 months after fiberotomy. The study revealed that pocket depth was maintained at a physiologic level with no clinically significant deepening.

In 1988 Edwards (5) published the results of his study concerning fiberotomy. He found that fiberotomy reduced the tendency of dental relapse by 30%. In the relapse assessment of dental crowding he used Little's irregularity index. Edwards proved the advantages of fiberotomy, underlining greater stability of the teeth position after fiberotomy in the frontal part of the upper arch compared with the frontal part of the lower arch. Like Rinaldi (11) he did not find the deepening of the periodontal pocket after 1–6 months from fiberotomy. No significant loss of attachment or other periodontal abnormalities were reported.

Another study worth mentioning which concerns fiberotomy was published by Kozłowski et al. (7). In the report they presented a new approach to clinical crown lengthening by controlled eruptive tooth movement and incision of the supracrestal gingival attachment. Such treatment was performed in adults with severe destruction of tooth crown and in whom clinical lengthening procedures were needed before the tooth could be properly restored. According to the authors the procedure should be done repeatedly during the tooth extrusion, which allows for the proper contouring of gingiva around the involved tooth, preventing coronal displacement of the gingiva and the attachment apparatus during orthodontic extrusion. Such treatment decreased the need for further surgical recontouring of gingiva around the teeth after orthodontic and before prosthetic treatment.

Currently, fiberotomy has become a returning subject in dental periodicals. The reason for that fact might be changes that take place in modern orthodontics. The number of adult patients who undergo orthodontic treatment is growing. A typical adult patient seeking orthodontic treatment usually presents with the maxillary labial teeth showing proclination, irregular spacing, rotation and overeruption of teeth. The treatment planning for adults must involve determining the type and sequence of all teeth movements. This could be either adjunctive orthodontic treatment or comprehensive treatment. The adjunctive treatment allows for tooth movement to improve a particular aspect of the malocclusion in order to allow other dental treatment needed to control disease and restore lost teeth. Comprehensive treatment usually combines the orthodontic, prosthetic, periodontic and sometimes surgical treatment. For assuring the best and stable treatment results apart from long-term retention additionally fiberotomy is recommended.

Littlewood et al. (8) in 2004 published the results of the study in which they compared the efficiency of the different types of retainers both fixed and removable. Statistically important increase of the stability treatment results in upper and lower frontal region was found only in the patients who underwent additional fiberotomy. They stated that, there is an urgent need for high quality study in this crucial area of orthodontic speciality. Taner et al. (13) performed fiberotomy in period from 1–11 weeks before the fixed appliance removal. In that study they compared the stability of the treatment results 6 months and one year after the treatment. In the control group in which the fiberotomy was not done they noticed a significant increase in dental crowding in frontal part of upper and lower dental arch. In

the CSF group minimal changes of the irregularity index were observed after the removal of fixed appliances during the retention phase, with the end results being stable. Wang et al. (14) analysed occlusion after 28 months of retention. They compared the control with the studied groups in which fiberotomy was performed. The data showed a much lower level of rotational relapse and/or crowding of the frontal teeth in the patients where the fiberotomy was done. The conclusion was that the modified supracrestal fiberotomy can effectively alleviate relapse after orthodontic treatment of the crowding and/or rotation of anterior teeth. Shi et al. (12) described using fiberotomy in treatment of patients with compromised periodontium. They used periodontal indices and periapical dental x-ray for investigating the changes of alveolar bone height and periodontal tissues health by orthodontic treatment following supracrestal fiberotomy of anterior displaced teeth in periodontal adult patients. Results showed that alveolar bone height was increase by 1.2 mm in patients who underwent fiberotomy.

CONCLUSIONS

It should be stressed that all the authors who studied the influence of the fiberotomy on dentition reported that this procedure decreases the risk of the relapse of the rotation and / or crowding of the anterior teeth. The properly performed fiberotomy, keeping in mind all indications and contraindications, increases the stability of the orthodontic treatment results. It should be considered in the planning of the complex treatment of adult patients taking into account both local and general conditions. It seems that along with the growing number of adult orthodontic patients the interest in fiberotomy will also grow as a supportive treatment procedure.

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SUMMARY

Fiberotomy is the procedure consisting of round cutting of periodontal fibres. In foreign literature, the term CSF is often used, which is an abbreviation of the English name of the treatment, namely circumferential supracrestal fiberotomy. The initial original technique described by Edwards involves cutting the periodontal fibres around the whole crown of the tooth. The method was modified by Boese, who recommended a saving treatment, which avoided cutting the periodontal fibres in the central part of the labial surface of the crown of the tooth from the labial side. Fiberotomy is recommended in cases of rotated or malposed teeth. CSF makes it possible to reconstruct the fibres in a passive position, which releases the soft tissue tension after orthodontic treatment.

Fiberotomia – wskazania i przeciwwskazania. Przegląd piśmiennictwa

Fiberotomia jest to zabieg polegający na okrężnym podcinaniu włókien nadgrzebieniowych więzadła ozębnej. W piśmiennictwie obcojęzycznym często używane jest określenie CSF – jest to skrót angielskiej pełnej nazwy tego zabiegu – *circumferential supracrestal fiberotomy*. Początkowa oryginalna technika opisana przez Edwardsa polegała na podcinaniu włókien ozębnej dokoła całego zęba. Metoda ta została zmodyfikowana przez Boesego, który polecał zabieg oszczędzający, unikający przecinania włókien ozębnej w środkowej części korony zębów przednich od strony wargowej. Takie postępowanie z zachowaniem części włókien zmniejsza ewentualne ryzyko recesji dziąsła. Wykonywanie fiberotomii zalecane jest w przypadkach znacznie zrotowanych lub przemieszczonych zębów. CSF pozwala na odtworzenie przebiegu włókien ozębnej w nowych biernych pozycjach, przez co znosi napięcie tkanek miękkich wokół zębów po leczeniu ortodontycznym.