

Onplants and its clinical application in children and adolescents.- An overview

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Abstract

Of the many extraoral anchorage and intraoral anchorage proposed and currently available in the market, Onplants are a latest development. The clinician need to have a thorough knowledge of the usage, advantages and disadvantages of onplants. But there is very little literature that has emphasis on onplants and even fewer on application of onplants in pediatric and adolescent patients. Therefore this article enumerates the implementation of onplants in case of pediatrics and adolescents.

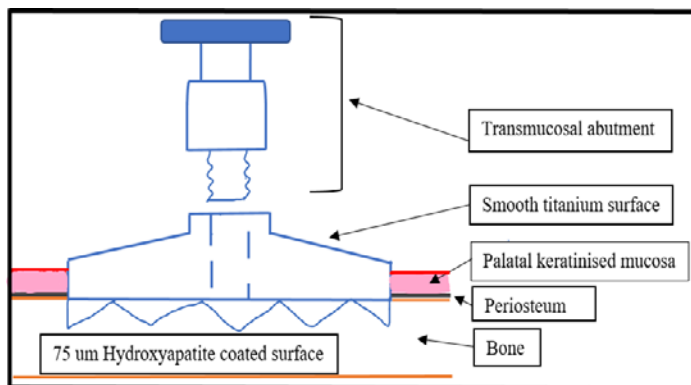
Keywords: Onplants, anchorage, Osseointegration, intraoral, extraoral, subperiosteal disc.

Introduction

Orthodontic anchorage is desired to prevent unwanted tooth movement. Traditionally this used to be provided by intraoral anchorage (anchor sites from within the mouth) and extra oral anchorage (anchor sites from the outside of the mouth).¹ Many intraoral and extraoral anchorage methods have been proposed and accepted. The use of metallic screws was proposed to be used as anchorage.² Then came the use of miniscrews designed for orthodontic purpose.³ Many other anchorage sites and materials were

proposed and accepted subsequently. But they all came with their share of disadvantages and shortcomings. Firstly, they all need strong firm teeth to completely erupt and provide sufficient anchorage. Secondly, if not teeth then they require surgical bone drilling to provide sufficient anchorage. Hence they cannot be used in case of pediatric and adolescent patients. Also the same shortcomings prevent them from using in cases like hypodontia, oligodontia. In addition, they are contraindicated in even adult patients with periodontal diseases. Therefore to overcome all the above mentioned shortcoming, the successful use of an onplant which is a subperiosteal disc as an orthodontic anchorage was described by Block and Hoffman

Design of the onplant⁵



The onplant was designed as a thin titanium alloy disc of 8 – 10 mm in diameter and approximately 3 mm in thickness with a coating of bioactive hydroxyapatite crystals on the surface designated for biointegration with the bone and a threaded hole on the opposite surface to facilitate the transmucosal abutment. After 6 years of testing of onplants as anchorage in orthodontic tooth movements in monkeys and dogs, the authors published their work. They proposed that the novel device could resist continuous force of 3N. The advantage with the onplant that it requires no bone drilling so it can be placed in pediatric patients, as well as adolescents. The placement of the onplant requires a simple surgical procedure.

Onplants are made to osseointegrate on a flat bony surface. For example if the onplant has to placed on the palatal surface, the following steps have to be taken

1. A surgical incision is given on the palatal surface over the mid palatine raphe from the premolar region to the molar area.
2. The surgical area is cleaned off.
3. The onplant is placed in such a fashion that the broad surface gets passively attached to the palatal bone.
4. The flap is then sutured with the onplant in position.
5. Then the patient is asked to wear a stent for approximately a week.
6. Then after a healing period of 3 to 4 weeks, the cover screw is removed and the abutment is fixed with the help of an abutment screw.
7. This can now be used as an anchorage.

Literature in support of onplants

The original study done by the pioneers of implants were animal studies which according to the authors were successful studies. However there have been very few human studies with implants. To begin stating the trails, Block and Hoffmann⁴ carried out a study to study the effect of molars stabilization while retraction of the incisors. In the study they used 4 dogs and 5 monkeys. Onplants were placed in all the dogs' palatal surface and in the palatal surface of 4 monkeys. One monkey served as control. They concluded that the onplant was so much anchored to the underlying bone that 11 ounces of continuous force and 160 pounds of shear force. Feldmann and Bondemark⁶ in 2008 conducted a study in which a total of 120 patients were randomly divided in 4 groups; the groups being Onplant group, Headgear group, Transpalatal bar group and Orthosystem implant group. The parameters on which the measurements were to be taken were the movement and position of maxillary first molars and incisors, the sagittal position of the maxilla

and the time taken for the treatment of the space closure or the alignment or leveling of teeth. The final result of the study was that the Onplant and the Orthosystem Implant fared better than the headgear and transpalatal bar but when compared to each other, the Orthosystem Implant had better review than the Onplant system. This is probably due to the fact that onplants require a second minor surgery to remove the anchorage. Another study was conducted by the same authors⁷ in which they again used the same set of instruments (Onplants, Orthosystem Implant, headgear and transpalatal bar) but this time they considered the patients' view in terms intensity of pain, consumption of analgesics, discomfort felt by the patients and jaw function impairment (if any). They concluded that there was very slight significant difference between patients' perceptions of skeletal and conventional anchorage systems during orthodontic treatment which implied that the new appliances were well accepted by the patients in the long run and thus can be recommended. Hong H⁸ *et al* published a case report in which a hexagonal onplant of approximately 7.7 mm in diameter was osseointegrated on the palatal aspect of an 11 year 5 month old female patient who had mid face deficiency with Class III malocclusion. 400 gm per side of elastic traction was applied onto the implant from the facemask directed at 30° to the occlusal plane for 12 hours per day for an year. It was concluded that the onplants can be used as an extremely stable anchorage for orthopedic treatment with facemask on the maxilla as the results were that there was a forward and downward displacement found in the maxilla by 2.9 mm which eventually led to the downward and backward rotation of the mandible. Also, an increase in the lower face height and a 3° increase in mandibular plane angle were observed. Clinically, mid facial esthetics was significantly improved, the skeletal discrepancy between the mandibular and maxillary jaw

relationship were seen to be corrected and increased fullness of the infraorbital region was observed. In addition, there were minimal extrusions but no forward movement of the maxillary molars proving onplants to be an anchorage of reliance for the patient as well as the clinician. Another case report was published by Janssens⁹ *et al* wherein they used an onplant as a palatal anchorage for the extrusion of bilaterally unerupted maxillary first molars in a 12 year old child with conditions like secondary cleft palate and tooth aplasia. Results showed that the onplant remained stable while facilitating successful extrusion of the both the intended maxillary first molars. An approximate range of the orthodontic force applied was from 50 to 80g via elastics. They finally concluded that a stable anchorage was provided by the osseointegrated onplant and is thus a promising treatment option for patients with teeth aplasia who lack teeth for anchorage.

Commercial availability of onplants

Onplants in commercially manufactured by Nobel BiocareTM.

Drawbacks of the onplant system

There is no such product in the market which is completely bereft of disadvantages or drawbacks. The Onplant system too has its own share of disadvantages. Firstly, the removal of the onplant requires a surgical procedure. As the implant is osseointegrated to the palatal surface, osteotomes are required for the removal of the onplant which might cause post operative discomfort to the patient. This is in accordance to the study done by Feldmann and Bondemark⁶ as mentioned previously in this article. Secondly, onplants need a flat bony surface over which the osseointegration can take place. Hence the only area where the onplant can be used is the palatal surface and therefore cannot be used in the mandible.

Conclusion

The onplant is a promising substitute for extraoral and intraoral anchorage for the maxillary area but as only few case studies and reports have been carried out and published, more studies and research should be done.

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