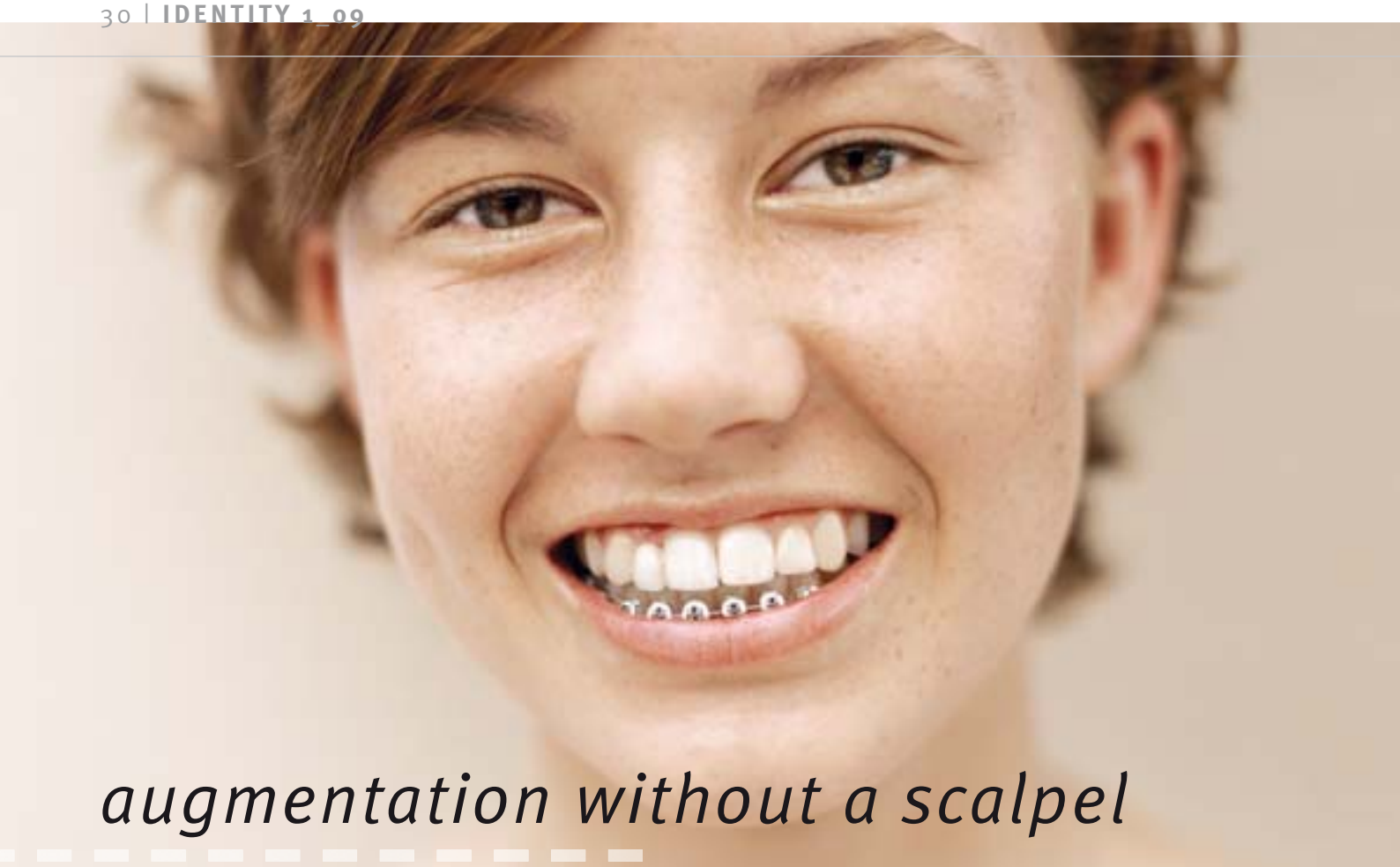


augmentation without a scalpel

Xive 3.0 to replace the lower incisors

| Dr. John Orloff

INTRODUCTION

Replacement of teeth in the visible sector is always a challenge and this is particularly the case for the lower incisors. The conventional fixed restoration in this region with a cosmetically attractive and functionally acceptable bridge usually fails due to a lack of dental substance. Implants are unquestionably the better solution in this region. But there are also a series of difficulties as indicated by Figures 1, 2, 9 and 10. The alveolar ridge is thin towards the vestibulo-oral. The bone and therefore the mucosa show greater or lesser retractions. The gingiva is thin and more or less transparent. The bone thickness, the interdental space available and the condition of the gingiva (including the location of the frenum) have to be considered in implant restoration planning. Bone of at least 1 mm thickness must be present around the implant shoulder in order to achieve good red-white esthetics. The papilla develops best if the separation between the implant and the adjacent tooth is 1.5 to 2 mm. To be able to achieve this requirement in the lower anterior region, implants with a small diameter and high esthetic flexibility are required – such as Xive 3.0.

Tooth loss is always accompanied by reduced bone volume, irrespective of whether the teeth were not formed or were lost as a result of the trauma or extraction. This has a particularly dramatic effect in the lower anterior sector with a view to implant restoration (Fig. 2 and 10). Augmentation in this region with autogenous bone or bone regeneration material is often impossible. The space available for augmentation is low and it is difficult to cover the surgical site with gingiva. There is the risk that no blood supply for the augmented tissue can be achieved. Integration of the augmentation demands the body's full regenerative capabilities. If any conditions are left unfulfilled, partial or total failure of this measure is inevitable. This prognosis is not always favorable, especially in the anterior sector. Then there are the risks associated with every invasive procedure. In addition, many patients are not prepared to undergo all these procedures. In many cases, especially for the lower anterior sector, there is a bloodless and yet tissue-preserving alternative.

BIOLOGICAL AUGMENTATION

With the aid of fixed orthodontic appliances, teeth can be moved by several millimeters in the jaw (Fig. 4 and 12). This also applies for the lower incisors. If the teeth are slowly moved with precisely regulated force, they can be "pushed" into sites with little bone. As a consequence of the pressure or tension applied by the active orthodontic elements (brace, springs, elastic chains), bone is reduced, reformed and built up. The visible success of these active and very complex procedures is the change in the tooth position. Bone remains in the "slipstream" of this tooth movement. This bone volume is generally sufficient for inserting an implant of small diameter, such as Xive 3.0 (Fig. 5 and 16). With the aid of orthodontic measures, bone augmentation (including soft tissue) takes place in a completely bloodless and "natural" way. This is why this process is also known as biological augmentation. Synonyms are "bio-grafting" or "ortho-grafting".

Depending on the tooth, type and extent, orthodontic pretreatment is only completed after several months. This would appear to be a disadvantage at first glance. However, considering the long wait after bone grafting before inserting the implant, this is put into perspective. Another advantage of biological augmentation is that no rejection reactions, healing problems or subsequent resorption are anticipated. Bone of class D III is generally expected following classical augmentation. In the case of biological augmentation, it is likely that the bone quality generated is same as that previously existing at this site. This is therefore D I or D II in the lower anterior sector. However, no relevant studies are known from literature searches.

There are other reasons that speak in favor of biological augmentation in the lower anterior segment. There is no cosmetic problem on account of the almost identical shape and size of these teeth (Fig. 6 and 14). The gap-filling teeth can be changed in their setting (torque, angulation, rotation) at the same time. The risks of biological augmentation are analogous to those of every other orthodontic tooth movement, such as root resorption or fenestration of the vestibular bone wall. The approach is presented here on the basis of two case studies.

CASE 1

In a 39-year-old woman the first two lower incisors were not formed. Orthodontic gap closure had been proposed to the patient many years previously, which she declined. She now wanted a prosthetic solution to close the gap.

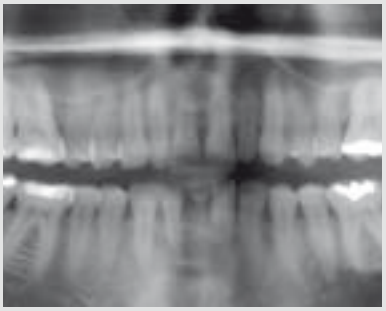
The collapse of bone and gingiva in the region of the first lower incisors became apparent in the planning phase (Fig. 1-3). Classical augmentation showed little prospect of success, because bone splitting with concomitant insertion of an implant was not indicated on account of the severe bone loss and the absence of spongiosa. The root position of 42 had to be corrected (Fig. 3). The patient was advised to have biological augmentation, which she accepted. As part of the orthodontic pretreatment, tooth 32 was to be moved mesial to the midline and root 42 straightened.

The patient had never worn a spacer in the past for the two non-formed lower incisors. There was therefore insufficient space for two incisors. It was decided to close the gap with an implant-supported crown. Tooth 32 was pushed towards

case 1

1_The two incisors were not formed in the 39-year-old female patient

2_Bone decay and the retracted gingiva are apparent in occlusal view, as well as vestibular



3_The X-ray confirms the bone decay and also the change in position of the gap-filling teeth

4_Xive 3.0 was inserted once tooth 32 attained the desired position

the midline using a straight wire appliance. After twelve months the tooth was in the desired position (Fig. 4 and 5). In the now edentulous region 32 there was now sufficient bone and soft tissue available for the insertion of a small-diameter implant. Despite the successful biological augmentation, the bone availability was only very limited. This is why a Xive 3.0 was chosen and implanted. The gingiva former was inserted after three months of submerged healing (Fig. 4 and 5). A temporary crown was planned for the final formation of the marginal gingiva and the papilla prior to final restoration. A temporary solution is not only easy to fabricate with the aid of a TempBase cap, but also remains very stable atop the TempBase abutment. The patient wore the temporary solution for three months. A veneer metal crown was then integrated (Fig. 6 to 8). Thanks to its correct implant position, the shape and setting of this crown is hardly recognizable as a synthetic tooth. For example, note the shape of the incisal edge adapted to the adjacent teeth. The cosmetically and functionally convincing final outcome is based on a detailed quantitative and qualitative diagnosis of the gingiva type and bone.
In order that the natural incisors remain in their new position, the patient has to wear a wire retainer on the lingual side for a prolonged period (Fig. 8). Like the implant itself, this requires intensive domestic care supported by professional cleaning.

CASE 2

A 26-year-old woman had to have tooth 41 extracted after an accident (Fig. 9 and 10). For cosmetic reasons, she wished for a dental prosthesis. A bridge was out of the question owing to the size, state and setting of the adjacent teeth. The local gingivitis on 31 was treated. A Maryland bridge anchored on 31 and 42 served to close the gap temporarily.
As in Case 1, there was also a collapse of bone and gingiva in the 41 region.The vertical bone loss was 2 mm and the horizontal loss was 2.3 and 6 mm at a height of 1.3 and 5 mm. A bone graft, bone splitting or biological augmentation were considered to build up the missing bone. The decision was made in favor of the latter treatment option. Besides the reasons mentioned previously, the fact that the gap between teeth 43 and 44 arising through the loss of tooth 41 could be closed in the course of orthodontic pretreatement spoke in favor of biological augmentation (compare Figures 10 and 15 in this regard).
The straight wire appliance and a compressing spring were used to move tooth 42 to position 41. The compressing spring not only affected tooth 42, but reciprocally also tooth 43, which therefore moved distally (Fig.12). The orthodontic treatment was concluded after twelve months (Fig. 13). There was now sufficient bone available in the 42 region for the insertion of a Xive 3.4 implant. Following incision of the mucosa on the alveolar ridge, the bone was prepared and the implant inserted epicrestal. Healing was open with the gingiva former. After three months the permanent crown was integrated. Five years later the restoration is functionally convincing, however not from an esthetic perspective (Fig. 14 and 15). The patient did not strictly adhere to the hygiene program. Probably for this reason, inflammation occurred and recession of the gingiva on tooth 31 and buccal bone loss on the

5_The gingiva former was inserted three weeks after insertion and closed healing

6_The finished crown on 32

7_The crown blends well into the dental arch in shape and shade

8_Occlusal view of the finished crown. A wire retainer is bonded to the natural incisors to consolidate the result of orthodontic treatment

implant (Fig. 16). The marginal gingiva on 42 is well developed, but thin (Fig. 15). This is why the neck of the implant shows through in gray. This cosmetic defect on 41 and 42 could be covered using free gingival grafting.

SUMMARY

Biological augmentation is an especially promising technique for the lower anterior segment as a means of non-invasively creating sufficient bone quantity and quality. Xive 3.0 is the ideal implant to ensure the esthetic outcome for this treatment. However, this not only depends on the implant itself, but also on the biotype and the health status of the gingiva, on conscientious planning, as well as professional treatment. ■

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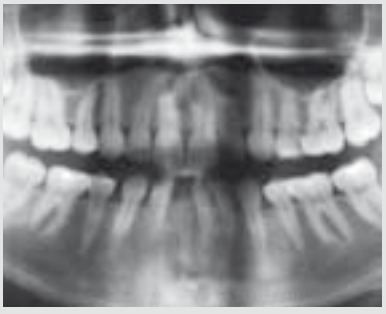
Dr. Harry Fjellvang *(Hausergaarden, Copenhagen, Denmark) conducted the orthodontic treatment.*

The crowns were fabricated by the **dental technician Vivi Thomsen** *(Lab Hausergaarden, Copenhagen, Denmark).*

case 2

9_Tooth 41 had to be extracted as a result of an accident

10_Bone and gingiva are severely retracted in the region of the gap



11_The X-ray shows the bone loss and the mesial drift of teeth 42 and 43

12_Tooth 42 is moved into position 41 and supported in its mesial drift

13_The orthodontic treatment and therefore the biological augmentation are almost complete

14_Situation five years after integration of the crown. The inflammation of the gingiva and recession on 41 are clearly identifiable

15_The decay of the vestibular bone wall is also apparent in the occlusal view

16_Slight crestal bone decay due to inadequate hygiene. The implant is stably anchored in the bone, however