INCREASING VOLUME OF VESTIBULAR SOFT TISSUES IN FLAPLESS IMPLANT SURGERY THROUGH A MODIFIED CONNECTIVE PUNCH TECHNIQUE: A CONTROLLED CLINICAL TRIAL

M. ANDREASI BASSI[1], C. ANDRISANI[2], S. LICO[3], F. SILVESTRE[4], M. GARGARI[5], C. ARCURI[6]

[1] *Private practice, Rome, Italy*

[2] *Private practice, Matera, Italy*

[3] *Private practice, Olevano Romano, (Rome), Italy*

[4] *Departimento de Estomatologia, University of Valencia, Valencia, Spain*

[5] *Department of Clinical Sciences and Translational Medicine, University of "Tor Vergata", Rome, Italy. Department of dentistry "Fra G.B. Orsenigo – Ospedale San Pietro F.B.F.", Rome, Italy*

[6] *Department of Clinical Sciences and Translational Medicine, University of "Tor Vergata", Rome, Italy*

SUMMARY

Purpose. The aim of this article is to make a comparative assessment between the modification of the soft-tissue profile, around the healing cap screws (HCSs), following both the traditional flapless surgery (TFS) and a new modified flapless surgery, named Modified Connective Tissue Punch (MCTP) technique.

Materials and methods. 8 patients (3M and 5F) (mean age 54.25±11.247years) were enrolled in this study. Sixteen two-piece implants were placed on upper jaws, 2 for each patient, 8 with TFS and 8 with MCTP technique. In each patient the implants were placed in edentulous areas, of 2 or 3 adjacent teeth long. MCTP technique was performed on the front implant site (FIS) while the TFS was performed on the rear implant site (RIS).

All implants were inserted and covered with healing cap screws (HCSs). Alginate impressions were carried out at the moment of the surgery, at 1 month and 4 months post-operative. Plaster models were poured and subsequently digitally scanned, in order to measure the distance between the gingival outline and the free margin of the HCS. The recorded values were analyzed with the ANOVA test.

Results. The use of MTCP technique, in comparison to TFS, showed a significative better outcome, in terms of vertical increments, of gingiva, on the VS toward the HCSs, during the entire observation period (p = 0.000 for all).

Conclusion. The Authors recommend the use of MCTP technique for a better vestibular soft tissue outcome in flapless implant surgery.

Key words: flapless surgery, soft-tissue profile, gingival thickness, gingival keratinized tissue, creeping attachment.

Introduction

Over the past decade in medicine it has been established the concept of minimally invasive surgery, consisting in taking advantage of advancements experienced in diagnostic techniques and specific surgical instruments, to perform surgical procedures infringing as less damage as possible to the patient (1).

The final goal of implant supported dental rehabilitation is achieving a soft and hard tissue integrity with optimal aesthetics through a minimally invasive surgery combined with an accurate soft-tissue treatment in order to facilitate peri-implant soft-tissue stability over time (2).

Flapless surgical approach was already introduced, in the 1977, by Ledermann. In this procedure, a motor-driven circular tissue punch or a circumferential incision utilizing a surgical blade was used to remove the soft tissue at the implant site without any surgical flap elevation (3). Another approach of flapless implant surgery is penetrating with a round bur directly through the mucosa into the alveolar bone (4).

Among the advantages of this surgery, there is the preservation of the circulation, soft tissue architecture and hard tissue volume at the site, accelerated recovery thus resulting in a better maintenance of the soft tissue profiles, including the gingival margins of adjacent teeth and the interdental papilla (4-7).

However this surgery inevitably entails the removal of the tissue punch at the implant site, often resulting in a significant reduction in width of the keratinized tissue (KT) around the implant.

The importance of a thick and wide keratinized peri-implant mucosa has been indicated for prevention of mucosal recession and maintenance of peri-implant health. Various techniques to augment keratinized tissue on implant sites have been described in the literature: roll flap; connective graft; epithelial and connective graft; coronally advanced flap (8).

The aim of this article is to make a comparative assessment between the modification of the soft-tissue profile, around the healing cap screws (HCSs), following both the traditional flapless surgery (TFS) and a new modified flapless surgery, named Modified Connective Tissue Punch (MCTP) technique (9).

Materials and methods

8 patients (3 men and 5 women) aged between 35 and 71 years (mean value 54.25±11.247 years) were enrolled in this case series. All patients were in good health condition and gave their informed consent.

Inclusion criteria were:

1. two or three adjacent edentulous sites on the latero-posterior region of the upper jaw;
2. adequate amount of bone volume at implant sites, allowing to perform the traditional flapless implant surgery procedure;
3. good general periodontal health and maintenance;
4. no smoking habitude;
5. absence of positive probing depth, bleeding on probing or plaque on teeth next to the implant sites, at the time of surgery;
6. at implant sites, the KT width (KTW), on the vestibular side (VS), should be at least the same than the selected implant diameter.

Radiographic exams (intra oral X-ray and panoramic X-ray) were initially performed to evaluate the height of available bone. Then the Cone Beam Computed Tomography (NewTom 5G®, QR, Verona, Italy) was then carried out on the selected patients, in order to assess the presence of adequate bone volume at the implant site, for flapless surgery.

The preliminary evaluations of the KTW were measured on the VS at the implant site, by means a periodontal probe, from the center of the ridge toward the vestibule. On the palatal side the presence of palatine fibromucosa made the KTW measurement not needed.

An alginate impression (Alginoplast, Heraeus Kulzer, Hanau, Germany) of the dental arch subjected to surgery was taken, with standard perforated trays, and subsequently the plaster model was poured using a type IV hard plaster (Zeus Stone, Zeus, Roccastrada, GR, Italy). In order to allow the highest precision both the alginate and the plaster were prepared according to manufacturer instructions.

All surgeries have been subject to the same procedural process. The surgery was performed under local anaesthesia (articaine 4% and adrenaline 1:100.000).

In both the TFS and MCTP technique, the only incision is made with a motor-driven circular tissue punch (FAL-31-006-010, FMD, Rome, Italy) of the same diameter of the prosthetic platform of the selected implants (i.e. 4mm). This first incision marked the profile of the connective punch (CP)(Figure 1b). For aesthetic requirements, in

each clinical case, the MCTP technique was performed on the front implant site (FIS) while the TFS was performed on the rear implant site (RIS). In the FISs the CPs were first de-epithelialized by means of a sharp Lucas bone curette (spoon 2.4 mm wide) and then on both front and rear implant sites the CPs were detached with the same instrument. The full thickness punches were elevated, keeping them stable with a small tissue tweezers in order to facilitate the graft dissection. While on the RISs not further procedures were executed, involving the soft tissues, in the FISs the same Lucas bone curette was instead used as a periosteal elevator to execute a full-split dissection, in order to create a deep pouch beyond the mucogingival junction on the VS (Figure 1d). This procedure ensured the creation of a recipient site, for the CP, on each FIS. Then, using a small angled dental tweez-

ers the CP, harvested from the FIS, was inserted in the deep portion of the pouch and left in this position during all the procedures of both implant tunnel preparation and implant placement (Figure 1e-f). The CP was completely submerged into the pouch, during the following implant surgery procedure, in order to avoid any undesired movement from its site.

Then the normal flapless surgical protocol was performed, two-piece implants were inserted [Stone, IDI Evolution, Concorezzo (MB), Italy], in both front and rear implant sites and covered with 4 mm high HCSs [Cone shaped -720403, IDI Evolution, Concorezzo (MB), Italy] (Figure 1h).

The punch was then, in each FIS, pushed along the pouch, from its deeper portion up to its more coronal one, delimited by the transgingival HCS, and stabilized in its position by means of a 2 minutes
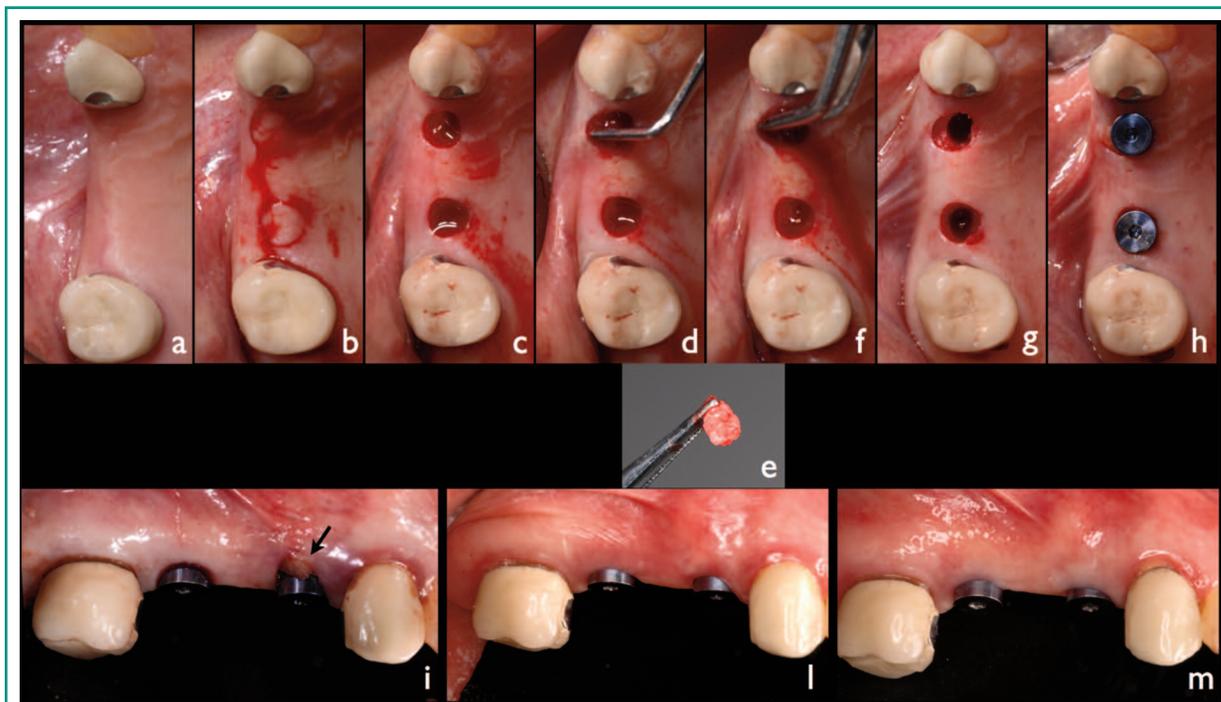
Figure 1
A clinical case describing the procedure: a) clinical situation immediately before surgery; b) punch incisions by means of a motor-driven circular tissue punch of the same diameter of the selected implants; c) the punch, on the front implant site (FIS), is primarily de-epithelialized with a Lucas curette, then both the punches are elevated; d) the same Lucas curette is used to create a recipient site, by means of a full-split dissection beyond the mucogingival junction, on the vestibular side of the FIS, while on the rear implant site (RIS) no further procedures were performed; e) the connective punch; f) punch inserted in the pouch by means of a small angled dental tweezers on the FIS; g) preparation of the implant tunnels; h) after the implant placement healing cap screws (HCS) are inserted in place; i) the punch is pushed, along the pouch, from its deeper portion up to its more coronal one, delimited by the transgingival HCS (arrow); l-m) clinical situation respectively at 1 month and 4 months post-operative.

finger pressure, to relocate the CP in the position where it's more needed (Figure 1i). This is essential in case there are specific areas where we aim to improve the soft-tissue profile.

Amoxicillin combined with clavulanic acid was administered, with a dose of 2 g preoperatively, followed by 1 g twice a day for 7 days. Ibuprofen 600mg was prescribed to be taken as needed. A soft diet was recommended for 2 weeks, together with appropriate oral hygiene. In each patient, in order to evaluate the healing of soft tissues around HCSs, further plaster models were created, from alginate impressions, taken immediately after the surgery (time 0), at 1 month and 4 months post-operative. The materials and the procedures used were the same of those described before.

The implants were finalized with cemented metal-ceramic bridges after 5 months from the surgery.

All the plaster models were then scanned, and acquired as STL files, with an optical 3D scanner (Easy, Open Technologies, Rezzato, BS, Italy) (Figure 2a, b, c). On each STL file the HCSs of both FIS and RIS were virtually sectioned, along their major diameter (4,75 mm) in a vestibular-palatal direction, by means a specific software (Netfabb Basic 6.4.0 252, Autodesk, Inc., San Rafael, USA) (Figure 2d). At this stage, the sections obtained were evaluated by means of an image analysis software (Image-Pro Plus 4.1, Media Cybernetics Inc., U.S.) and, in particular, the distance between the gingival outline and the free margin of the HCS was measured (Figure 2e, f). Then the differences (Δs), between these measurements at time 0 and both at 1 month and 4 months postoperative, were calculated.

VS and palatal side (PS) values, both on FISs and RISs, were statistically compared, within the groups, by means of analysis of variance (ANOVA), carried out with a confidence level of 95% ($\alpha = 0.05$) (Primer Biostatistics Ver. 4.02i; McGraw-
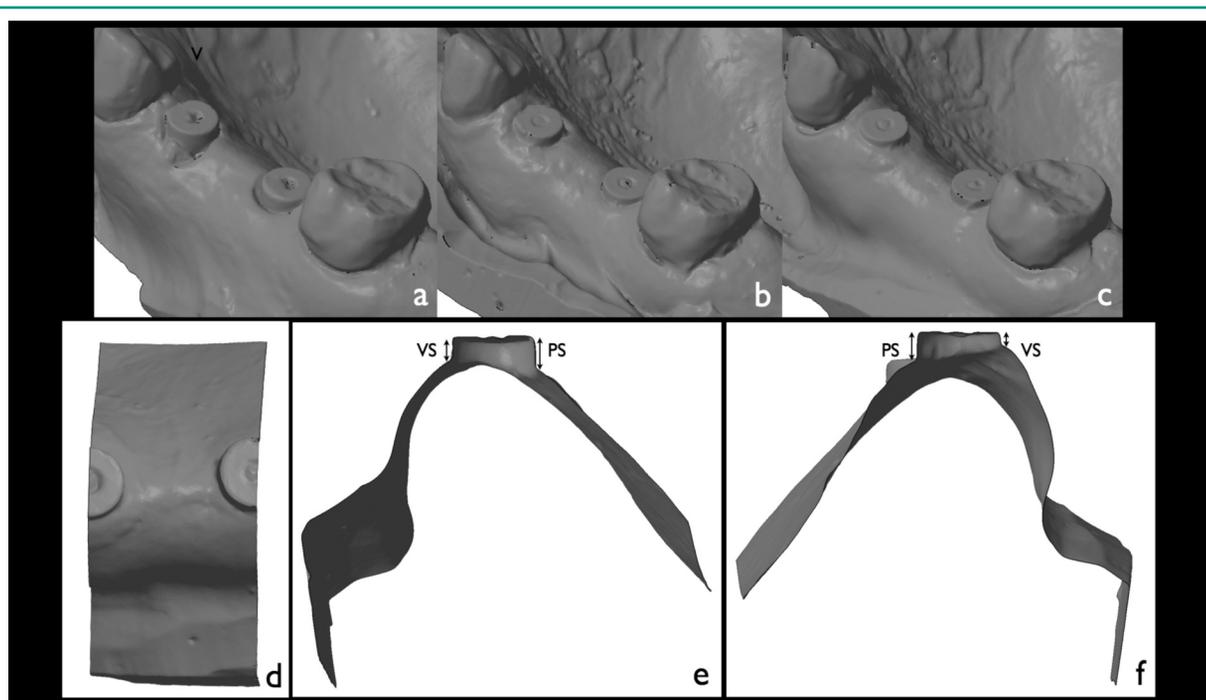
Figure 2
a-b-c) Three-dimensional scans of plaster models, respectively, in the immediate post-operative, 1 month and 4 months post-surgery; d) HCSs of both FIS and RIS were virtually sectioned, along their major diameter in a vestibulo-palatal direction; e-f) a lateral view respectively of the RIS and of the FIS, the distances among the gingival outlines and the free margin of the HCSs were measured both on vestibular side (VS) and palatal side (PS).

Hill Comp., US).

In case of flapless implant surgery local anesthesia can be performed to sampling patients but it may have relevant side effect (10-13) and severe complications (14).

This topic can be also potentially investigated with immunofluorescence techniques which are well known since the nineties (15, 16).

Results

Sixteen two-piece implants were placed. Fixtures replaced: 5 molars and 11 premolars. Ten Ø3,75 mm and 6 Ø4 mm implants were placed. Both the implant types had the same prosthetic platform (i.e. Ø 4mm).

The postoperative course was uneventful for all the patients in this study.

At vestibular/palatal sides of the HCSs, no dehiscence of the mucosa was observed.

On VS and PS of the HCSs, both on FISs and RISs, variations of the height of the gingiva were observed.

The average heights and correlated standard deviations were calculated as showed in Tables 1 and 2. The average Δ height and correlated standard deviations, at 1 month and 4 months postoperative, were calculated as showed in Tables 3 and 4.

Significant differences were found concerning:

- On the VS: RISs at time 0 *vs* 1 month (p = 0.003) and at time 0 *vs* 4 months (p = 0.002); FISs *vs* RIS, at time 0 (p = 0.037).
- On the PS: RISs at time 0 *vs* 4 months (p = 0,014); FISs at time 0 *vs* 4 months (p = 0.012).

Highly significant differences were found concerning:

Table 1 - Front implant sites, average height variations on both vestibular and palatal sides.

Rear Implant Sites		time 0 (mm)	1 month (mm)	4 months (mm)
Vestibular Side	Mean	1.306	1.095	0.732
	St. Dev.	0.079	0.082	0.094
Palatal Side	Mean	1.419	1.526	2.221
	St. Dev.	0.282	0.292	0.292

Table 2 - Rear implant sites, average height variations on both vestibular and palatal sides.

Front Implant Sites		time 0 (mm)	1 month (mm)	4 months (mm)
Vestibular Side	Mean	0.142	1.205	1.2
	St. Dev.	0.193	0.183	0.181
Palatal Side	Mean	1.509	1.656	1.746
	St. Dev.	0.279	0.252	0.230

Table 3 - Front implant sites, average Δ height on both vestibular and palatal sides.

Front Implant Sites Δ height		1 month (mm)	4 months (mm)
Vestibular Side	Mean	0.211	0.574
	St. Dev.	0.022	0.055
Palatal Side	Mean	-0.107	-0.191
.	St. Dev.	0.036	0.047

Table 4 - Rear implant sites, average Δ height on both vestibular and palatal sides.

Rear Implant Sites Δ height		1 month (mm)	4 months (mm)
Vestibular Side	Mean	0.266	0.264
	St. Dev.	0.184	0.185
Palatal Side	Mean	-0.155	-0.236
.	St. Dev.	0.062	0.092

- VS *vs* PS: both on RISs and on FISs, at 4 months (p = 0.000);
- Within the groups of FISs (time 0, 1 month, 4 months) on VS (p = 0.000 for all);
- FISs *vs* RISs on VS, at 4 months (p = 0.000).

Not significant differences were found concerning:
- RISs at time 0 *vs* 1 month (p = 0.128) and at 1 month *vs* 4 months (p = 0.300);
- On Vestibular Side: RISs at 1 month *vs* 4 months (p = 0.939);
- VS *vs* PS: on FISs at time 0 (p = 0.133); on RISs at time 0 (p = 0.302);
- On Palatal Side: FISs *vs* RISs at time 0 (p = 0.371), at 1 month (p = 0.188) and at 4 months (p = 0.558); RISs at time 0 *vs* 1 month (p = 0.128) and at 1 month *vs* 4 months (p = 0.300); FISs at time 0 *vs* 1 month (p = 0.300) and at 1 month *vs* 4 months (p = 0.120).

Discussion

Healthy soft tissue surrounding dental implants is essential for health, function, and aesthetics (4). The presence of attached gingiva around implants is important to prevent recession of marginal tissue, to provide tight collar around implants, to prevent spread of peri-implant inflammation and also to enable patients to maintain good oral hygiene (4, 8, 17).

The MCTP technique, recently proposed, is simple, easy to perform and allows to satisfy all the above requirements (9). As confirmed by previous clinical results, the augmentation of gingival thickness is always present and seems to be stable at 1 year follow-up (9). Regarding the changes of KTW, they appear to be minimal but always favourable. In the Authors experience, the critic factor that leads towards KT augmentation it's the depth of the recipient site where the graft is placed: when the connective punch results to be enough superficial, it seems to be able to induce a transformation of the external connective tissue into KT, thus augmenting the peri-implant KT (9). In the present study the use of MTCP technique, in comparison to TFS, shows a significative better outcome, in terms of gingival vertical increment, on the VS toward the HCSs, during the entire observation period (i.e. time 0, 1 month, 4 months) (p = 0.000 for all). This phenomenon can be easily explained as, in the FISs, a CP is placed as graft, into the vestibular pouch. The CP increases the thickness of soft tissues, immediately after the surgery and also at 1 month and 4 months post-operative, due to its maturation. This "creeping attachment" has been mainly reported surrounding teeth (18-22), and few papers only reported it surrounding implants (23, 24). This phenomenon already described in TFS (25) seems to be more evident when the MTCP technique is used.

On the other hand both MTCP technique and TFS show a worse outcome on the PS probably due to the three-dimensional placement of the implant that is usually placed more palatally than vestibularly in order to prevent vestibular gingival recession (26). Not significative differences were found on PS between FISs and RISs at time 0 (p = 0.371), at 1 month (p = 0.188) and 4 months (p = 0.558). This outcome is mainly due to the fact that MTCP technique involves the VS only.

On RISs the VS showed a better outcome than PS at 4 months follow up (p = 0.000) more likely due to the three-dimensional placement (26).

The results obtained with this technique confirmed that the use of CP at implant placement is effective in increasing soft tissue thickness and improving aesthetics, as declared with other techniques in literature (17).

The success of both dental implant and prosthetic treatment is dependent on the establishment of a stable soft-tissue barrier that is able to shelter the underlying osseous structures and to guarantee a peri-implant gingival aesthetics over time.

Different approaches have been used to augment keratinized tissue on implant sites (e.g. Roll flap, connective graft, epithelial and connective graft, coronally advanced flap) (8).

Although it has been shown that it is possible to improve the soft tissue profile with all these techniques, we found this procedure the most simple to execute when flapless implant surgery is performed.

Other techniques often require longer surgical-time and dedicated instruments, present more difficulties in the surgical steps and have a higher morbidity rate (8, 24).

The Authors recommend the use of the MCTP technique to reduce the number of aesthetic complications and soft tissue defects in flapless implant surgery. Further studies are needed to evaluate the extent of soft tissue thickness increment on the vestibular side achievable with this technique both on upper and lower sites of the dental arches.

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Correspondence to:
Prof. Claudio Arcuri
Department of Clinical Sciences and Translational Medicine
University of "Tor Vergata"
Rome, Italy
Tel: +39 06 68371
E-mail: arcuri@med.uniroma2.it

DIFFERENCES BETWEEN WARFARIN AND NEW ORAL ANTICOAGULANTS IN DENTAL CLINICAL PRACTICE

M. MIRANDA[1], L.S. MARTINEZ[1], R. FRANCO[1], V. FORTE[1], A. BARLATTANI Jr.[2], P. BOLLERO[1]

[1] *Department of Systems Medicine, Medical School, University of "Tor Vergata", Rome, Italy*
[2] *Department of Clinical Sciences and Translational Medicine, University of "Tor Vergata", Rome, Italy*

SUMMARY

The oral anticoagulant therapy is used for the cure and the prevention of thromboembolic diseases. In the last fifty years the warfarin has been considered the oral anticoagulant of choice. However, its use is limited by a narrow therapeutic index and by a complex pharmacodynamics, which requires regular adjustments and monitoring of the dose. Recently, three new oral anticoagulant – dabigatran etexilato (direct thrombin inhibitor), rivaroxaban and apixaban (Xa factor direct inhibitor) – have been approved for use in Europe. Increasing the number of patients taking these drugs, it is important that the dentist knows these new oral anticoagulants, their indications and methods of action, in particular for the management of patients, who require invasive treatments. With regard to the management of the patient threated with the new oral anticoagulants (NAO), there have been new significant changes in the procedure compared to the one followed by patients treated with warfarin. This led to the development of new guidelines that the dentist has to follow in order to ensure a safe and appropriate dental treatment and reduce any postoperative complications. The aim of this work is to evaluate the effectiveness of the new oral anticoagulants compared to warfarin, especially in terms of risks of bleeding events and intra and postoperative complications, in patients requiring multiple dental extractions.

Key words: new oral anticoagulants, oral surgery.

Introduction

The oral anticoagulant therapy finds its application in various pathological conditions and for different indications: pulmonary embolism, atrial fibrillation, venous thrombosis cardiac and rheumatic valve, myocardial infarction, transient ischemic attacks and strokes. For over fifty years the vitamin K antagonists, such as warfarin have been considered the treatment of choice for the prevention and the treatment of the thromboembolic diseases. This drug, however, having a narrow therapeutic index, poses different problems, such as the necessity to frequently change the dose, continuously monitor the coagulation status of the patients, as well as multiple drugs and foods interac-

tions. Patients who use it, are, therefore, forced to frequent laboratory controls, to dietary restrictions and to risks when they are subjected to other drug treatments. Recently three new oral anticoagulants have been approved in North America and Europe: dabigatran etexilato (direct thrombin inhibitor), rivaroxaban e apixaban (direct Xa factor inhibitor). In Europe, they are used for the primary and short-term prevention of venous thromboembolic events in adult patients who have undergone elective surgery of the hip or the knee; for the prevention of stroke and of systemic embolism in adult patients with non-valvular atrial fibrillation with one or more additional risk factors.

These new molecules are capable of acting selectively and specifically on the individual components of the coagulative cascade, in

particular the dabigran directly inhibits thrombin, while apixaban and rivaroxaban directly inhibit the Xa factor, thereby providing a more predictable coagulating effect. The new oral anticoagulant drugs, due to their short biological half-life and to their rapid anticoagulant effect have several advantages compared to the AVK: they are characterized by the predictability of response, they do not require a constant monitoring of the coagulation, they are administered at fixed doses-facilitating adherence to therapy, they show minimal drugs interactions, they are characterized by the absence of food interactions and a wide therapeutic margin.

However, together with the enormous benefits described above, the new oral anticoagulant limits should also be emphasized: the double daily dosing of certain medicines, the high costs and the fact that there is no antidote for overdose or bleeding.

Since the use of the new anticoagulants will increase over time, it is important for the dentist to understand the mechanisms of actions, the reversal strategies and the management guidelines for patients taking oral anticoagulants.

This led to new guidelines that the dentist together with the specialist – who follows the patients' hemodynamic activity – should follow in order to ensure a safe appropriate dental treatment and reduce, in this way, any postoperative complications.

The present work has the objective to evaluate the effectiveness of the new oral anticoagulants compared to warfarin, especially in terms of the risks of bleeding events and intra and postoperative complications in patients requiring multiple dental extractions.

Materials and methods

For this study 50 patients treated with oral anticoagulants at the Department of Special Oral Pathology of the "Policlinico Tor Vergata", requiring multiple dental extractions were selected.

They were divided into two groups.

Group A consisted of 12 patients treated with the new oral anticoagulants (7 males and 5 females) with an average age of 69.41years (DS 3.98 years), while the Group B consisted of 38 patients treated with Warfarin replaced by LWMH (22 males and 16 females), with an average age of 72.31 (DS=5.32 years). The study inclusion criteria were: taking direct and indirect anticoagulants, hearth disease (atrial fibrillation) or vascular disease (pulmonary embolism and deep vein thrombosis); over 65 years of age; multiple dental extractions.

Patients were excluded from the study because of one of the following conditions: liver disease, severe renal failure, disorders of haemostasis and coagulation, patients having valvular prosthesis, history of prolonged bleeding events, teeth with mobility grade 3 and impacted teeth.

In the patients of Group B the INR and the PT has been measured 7 days before and the morning of surgery. All the patients, at the first inspection, had a INR >3; being the bleeding risk high and the thromboembolic moderate, in agreement with the medical specialist, it has been decided to interrupt the therapy with warfarin and replace it with the bridging therapy, in the perioperative, i.e. with more manageable anticoagulant drugs, such as low molecular weight heparins (LMWH).

Therefore, during this period, the thromboembolic prophylaxis was obtained with the LMWH, administered subcutaneously once or twice a day depending on the patient body weight and with due consideration for the risk of developing thromboembolic complications.

The patients started the bridging therapy the day after having interrupted the TAO. The above mentioned therapy with LMWH was discontinued 12 hours before the surgery.

The morning of the surgery the patients had INR < 1.5.

About 12 hours after the surgery, the heparin was administered and the following day the patients were able to take the TAO. After having achieved the therapeutic range of INR, the heparin therapy was discontinued. Patients of group A were made not to interrupt the therapy, but since the multiple extractions, up to three dental extractions, are

among the low risk interventions, the time phase of minimum action of the drug was exploited, i.e. 12-24 hours after the last assumption, if the drug is dual (dabigran and apixaban) or a single (rivaroxaban) daily administration. The anticoagulant was re-introduced the day after the surgery. Both groups followed the operators procedures currently established.

Before the extraction the patients were made to rinse 60 seconds with 10 ml of (based chlorhexidine 0,2% pure product), in order to reduce the bacterial charge of the treated site and, therefore, promote healing of the surgical wound; for the treated patients, the penicillins (amoxicillin + clavulanic acid) have been the primary choice of antibiotic prophylaxis, because of their minimal interactions with the oral anticoagulants.

These procedures were performed under local anaestethic containing a vasoconstrictor, articaine with epinephrine 1:200.000, with a technique using infiltration, an atraumatic surgical technique was used and, after the surgery, an accurate alveolar bone cleaning was performed, removing any easy bleeding granulation tissue, often responsible for postoperative bleeding; then the irrigation of the alveoli by anfibrinolitic agents such us tranaxemic acid was performed together with the application of emostatic materials, such as a based haemostatic gelatine sponge (SPONGOSTAN™). As a result, the wound was sutured with a non absorbable 3-0 floss and at the end was compressed using gauze soaked in tranexamic acid for about 15 minutes.

In the post-operative the patients were recommended to apply an ice bag for 3-4 hours and they were suggested to follow a liquid and cold diet for three days after the surgery and a soft and lukewarm diet for the following 7 days. In any case, patients were asked to avoid substances causing hyperaemia (alcohol, tobacco, hot foods).

Patients were also recommended to make mouth rinses with a 10 ml of 5% tranexamic acid aqueous solution for 2 minutes, repeated 4 times daily for 7 days. On the second postoperative day, however, patients had to make mouth rinse with a 0.12% chlorhexidine digluconate solution 3 times a day. Patients followed the prescribed antibiotic

therapy and they were allowed to take analgesics, such as paracetamol, at normal doses.

Patients were observed for 60 minutes until the cessation of bleeding linked to the procedure.

The postoperative bleeding has been evaluated and recorded by a monitoring follow-up: immediately after the extraction, after 24 hours, after 72 hours and after 7 days. On the seventh day the sutures were removed and the status of healing was checked.

Results

The results associated with the management of oral surgery have showed a good reliability with respect to intra and post-operative complications, especially in patients of Group A.

27% cases of Group B showed an increased intra-operative bleeding; that fact has resulted in a reduction of the visibility of the operative field and greater difficulty in operating procedures, event not occurred in Group A.

In Group B postoperative complications were:
- in 3 patients (7.89%) formation of extra-alveolar clots (Figure 1) and bleeding >24 hours, which required a reoperation by the clinician;
- in 4 patients (10:52%) bleeding <24 hours, controlled by a suitable pressure on the wound with a gauze pad moistened with tranexamic acid, which did not require reoperation by the clinician;
- in 3 patients (7.89%) uncontrollable bleeding after 24 hours, which required reoperation by the clinician;
- in 2 patients (5,26%) haematomas on their face; however, they did not show any bleeding after 24 hours.

In 15.78% of cases of Group B, widespread bleeding episodes required reoperation by the clinician, which consisted of changing the systemic therapy with heparins and applying additional sutures at the surgical site. In cases of extra - alveolar clots the clot responsible for the bleeding has been removed; the site has been buffered with gauze soaked in hydrogen peroxide and, finally, addi-

tional sutures to reduce the bleeding risk have been applied.

In the Group A a good haemostasis management has been obtained, without bleeding complications intra and post-operative: only in two patients (16.66%) a delayed healing has been seen. After the extractions, in fact, no cases of severe bleeding needing a hospital management have been detected, local hemostatic measures were enough.

Furthermore, no thromboembolic complications have been detected within the subsequent 30 days after surgery.

Discussion

The management of anticoagulated patients, who have to undergo dental oral surgery, is very delicate and can lead to serious consequences if appropriate protocols for the control of hemostasis and thromboembolic risk are not applied.

In patients taking warfarin who require oral surgery, the standard is to monitor the anticoagulant activity through PT (Prothrombin Time), and INR (International Normalized Ratio).

As said by Abdullah WA et al., the INR is not the only factor that estimates the risk of bleeding; other factors related to the patient or the procedure may affect it.

Currently, most of the guidelines indicate that the optimum value of INR for dental surgeries is 2.5, because it minimizes the risk of bleeding or of thromboembolic events.

In patients with an INR >3.5 that must undergo complex surgeries (i.e. multiple extractions) it is necessary, to rely on the experts advice of those who follow the patient's hemodynamic capacity (to change the medication), in order to properly assess the thromboembolic risk and the bleeding risk.

In the opinion of several experts, such patients should suspend warfarin 5 days before any surgical intervention and replace it temporarily with the bridging therapy using low molecular weight heparin.

In cases where the bridging therapy is required, a correct dosage of the therapy with LMWH is fundamental to obtain adequate anticoagulation therapy.

Treatment guidelines recommend treatment with full-dose LMWH for patients at high thromboembolic risk; in patients with an intermediate thromboembolic risk, however, prophylactic doses of LMWH are used.

LMWH provide an adequate prophylaxis in patients who stopped anticoagulation after oral surgery procedures.

The primary therapeutic objective of the bridging therapy is to reduce to the lowest level the risk of thromboembolism during the period in which the TAO, routine conduct, is not recommended or contraindicated. An equally important objective of the bridging therapy is to minimize the risk of perioperative bleeding.

While the management of patients on warfarin who require invasive dental procedures is well documented in literature, the limited randomized clinical studies for patients treated with NAO conducted till now, do not allow to establish a specific management protocol. However, the results based on the evidence related to the classical anticoagulants and existing reviews on new drugs allow us to establish some guidelines.

In patients treated with the new oral anticoagulants, who require interventions at low risk of bleeding (e.g. extraction up to 3 dental elements), where a good local haemostasis can be reached, experts EHRA (European Heart Rhythm Association) suggest not to interrupt therapy with NAO, using, for the operation, the minimum time step of the medicine (12 h after the last dose of dabigatran and apixaban, 24 h after the last dose of rivaroxaban). Instead, in the case of complex oral surgery (extraction >4 dental elements) suspension of the NAO has to take into consideration: the risk of bleeding, renal function, the anticoagulant used (Table 1).

Even in the absence of controlled studies, it is likely that, given the reduced half-life of these drugs, discontinuation of therapy can be practiced 24 hours before surgery, ensuring perfect haemostasis; re-initiation on the same day of the intervention would result in exposure to thromboem-

Table 1 - Interruption of NAO therapy before surgery

	Dabigatran		Rivaroxaban		Apixaban	
Renal function	Low risk	High risk	Low risk	High risk	Low risk	High risk
ClCr 80ml/min	24h	48h	24h	48h	24h	48h
ClCr 50-80ml/min	36	72	24h	48h	24h	48h
ClCr 30-49ml/min	48	96	24h	48h	24h	48h
ClCr 15-30ml/min	Not indicated	Not indicated	36h	48h	36	48h
ClCr <15ml/min						
no official data are available						

bolic risk reduced to 24-48 hours compared to 6-7 days of traditional TAO.

It is therefore necessary to agree with the specialist who follows the hemodynamic activity of the patient about the type of dental surgery to be performed, so that, if appropriate, he can decide to affect anticoagulant therapy.

The NAO, thanks both to their short half-life and their rapid anticoagulant effect, theoretically show numerous advantages compared to the AVK: it can be supposed that a brief suspension on intervention occasion will be sufficient, without carrying out the "bridging therapy".

The data supporting this behaviour are still very limited, both regards the supporting evidence and clinical experience. Most of current guidelines are derived from expert opinion and the pharmacological properties of the new oral anticoagulants, it is essential, therefore, that each local situation closely cooperates with prescribers centers and that a careful monitoring of clinical effects is implemented.

In performed multiple extractions, the protracted bleeding was more common in sites with a greater degree of local inflammation. However, in most cases, the intra- and postoperative bleeding has been controlled through the use of local haemostatic. Proceeding to a review of the literature, we found that more commonly used medical devices are: mouthwash and administration of tranexamic acid, the fibriniche pastes, gelatin sponges, collagen and resorbable oxycellulose.

It should be noted that even the most common maneuvers for obtaining effective haemostasis (tamponade with sterile gauze and sutures) are fundamental in these patients. Only 15% of treated patients, Group B, required reoperation by the clinician; in any case it has always been a manageable bleeding, in the clinic itself, using local hemostatic. No severe bleedings that required hospitalization, were found.

Conclusion

In conclusion, from the study we conducted, we could assess that the risk of intra- and postoperative bleeding after multiple dental extractions in patients treated with the new oral anticoagulants, was low.

Since the use of these new anticoagulants is likely to increase over time, it is important for the dentist to know the management guidelines for patients taking these medicine.

Most dentists, fearing the possible complications intra and post-operative, prefer to delegate to hospitals anticoagulated patients. In our view the NAO are safe and effective medications, which allow an easier patient management also in the dental practice, without there being a need for treatment in dental clinic. However, it remains essential to communicate with the medical specialist in order to ensure safe and appropriate dental treat-

ment.

The limits of this study are the following: 1) the relatively small sample size; and 2) our findings may not be generalizable to other preparations of LMWH because all patients in Group B had made the bridging therapy with enoxaparin.

In any case, the results obtained are encouraging and this encourages us to go into that with further study on the matter.

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Correspondence to:
Dr. Rocco Franco
University of Rome "Tor Vergata"
Rome, Italy
Tel: +39 06 20900691
E-mail: roccofr91@gmail.com