Oral Implantology

The impact of immediate implant placement on alveolar ridge preservation techniques: preliminary results of a volumetric and radiological randomized controlled clinical trial

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Aim: Following the loss of a single tooth, severe hard- and soft-tissue alterations may take place within the affected site, resulting in a subsequent reduction of both vertical and horizontal ridge dimensions. Alveolar ridge preservation (ARP) techniques have been introduced, aiming to maintain the existing soft and hard tissue envelope as well as a stable ridge volume, simplifying subsequent treatment procedures and optimizing functional and esthetic outcomes. After these procedures a minimum of four to six months must be awaited before implant insertion can be performed. This in turn brings the patient compromised comfort, function and aesthetics and needing of a second surgical procedure for the implant placement. A surgical method aimed to reduce the number of dental appointments and surgeries is the implant insertion at the time of tooth extraction (type I or immediate placement). Nevertheless this surgical protocol does not provide predictable outcomes, since it may contribute towards a more pronounced bone resorption during healing. It is unknown if immediate implant placement plus grafting materials and/or barrier membranes could influence post-extraction dimensional changes of alveolar ridges. No consensus exists on the need for bone augmentation simultaneously with immediate implant placement. Furthermore, no human study has yet compared dimensional changes of both hard and soft tissues after two different treatments: an alveolar ridge preservation technique for a subsequent implant placement and an alveolar ridge preservation technique with an immediate implant placement. Aim: To evaluate the volumetric and radiographic changes of the alveolar ridge 4 months after tooth extraction following three different surgical protocols: spontaneous healing, ridge preservation technique and immediate implant placement plus ridge preservation technique.
Methods: In each of 15 patients one single-rooted tooth was extracted and 3 treatment modalities were randomly assigned to the following groups (n = 5 each): a) immediate implant placement with demineralized bovine bone mineral with 10% collagen in the gap, covered with a collagen matrix (IMPL/DBBM-C/CM), b) demineralized bovine bone mineral with 10% collagen, covered with a collagen matrix (DBBM-C/CM), c) spontaneous healing (control)
Cone-beam computed tomography and impressions were obtained before extraction and 4 months later. Scans and digitalized casts were used to determine volumetric changes at the buccal hard and soft tissues.
Results: Four months after tooth extraction all groups revealed a vertical and horizontal changes of the buccal alveolar ridge and a horizontal volume change in the buccal soft tissue contour. IMPL/DBBM-C/CM group and DBBM-C/CM group reduced the amount of changes compared to spontaneous healing.
Conclusion: Both an alveolar ridge preservation technique and an immediate implant placement with simultaneous alveolar ridge preservation technique are able to reduce morphological changes after tooth extraction compared to spontaneous healing.

Conventional versus piezoelectric implant site preparation: resonance frequency analysis and torque insertion. A human cadaver study

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Aim: Implant stability is a primary objective to be achieved to get the implant clinical success. Primary stability depends of several factors like bone density, implant morphology, surgical procedures. The aim of this study is to analyze two different site preparation techniques (Conventional and Piezoelectric) on fresh anatomical specimens and compare the values of insertion torque and RFA.
Methods: In our study thirty-six tapered titanium implants (Neoss Ltd., Mölnlycke, Sweden) with a diameter of Ø 4.0 and a length of 11 mm were fixed in nine human fresh cadaver mandibles. All the skulls selected had a fully or partial edentulous mandible with a sufficient bone height and width to receive 4 Ø x 11mm tapered implants. The two implant site preparation techniques were performed into two consequent sites. The conventional technique was performed using a surgical motor drill (ChiroproL, Bien-Air Dental SA, Biel/Bienne, Switzerland) and conventional burs according to manufacturer surgical protocol.The piezoelectric technique was made using Piezosurgery®touch (Mectron, Carasco, Italy) with the implant preparation kit pro. Implants were inserted with the same surgery motor drill. Whenever implant placement stopped, the insertion torque was increased by 5Ncm until full placement of the implants and maximum insertion torque value was recorded. Both techniques were performed by the same surgeon and RFA values had been registered blindly by two independent residents. RFA values were measured with PenguinRFA (Integration Diagnostics Sweden AB, Göteborg, Sweden). Four measurements in four direction for each implant fixture were made. The average of this measurements was calculated for each implant and result was showed in ISQ. A descriptive analysis was performed including the mean and standard deviations for insertion torque and implant stability . The results obtained in prepared sites with ultrasonic tips and burs kit were analyzed using STATA software.
Results: A total of 36 implants were placed into 9 cadaver mandibles for this study. For the implants placed following conventional technique (n=18) the average torque value was 41.1±14.3 Ncm and the average RFA value was 76.4±5.9 ISQ, whereas for the implants placed following piezoelectric preparation (n=18) the average toque value was 47.2±11.53 Ncm and the average RFA value was 74.4±9.84 ISQ. Comparing the torque values between piezo and traditional preparations (Fisher exact test α=0,05) there was not a statistically significant difference between the two groups (p = 0.7). Same result was obtained analyzing and comparing RFA values between the two groups (p = 1). Comparing the torque insertion values and RFA a statistically significant difference was found only in the traditional site preparation group (α= 0.05, p=0,015).
Conclusion: Our ex vivo data suggest that there is no difference in torque insertion values and in primary stability when tapered implants are placed performing conventional technique or piezoelectric technique. In our experience we have not found a close correlation between torque and RFA value. Findings of this study must be evaluated with caution because of some limitations.

Health of peri-implant tissues and bone resorption in full-arch rehabilitations with immediate functional load

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Aim: The purpose of this cross-sectional study was to evaluate plaque accumulation, peri-implant soft tissue inflammation and bone resorption next to immediately loaded implants in fixed full-arch rehabilitations.
Methods: Between September 2015 and July 2016 a sample of 72 patients (35 males, 37 females) was selected for this study at the time of the follow-up appointment for professional oral hygiene. The mean age of patients was 62,5 years (range: 35-90 years) at the time of the follow-up appointment. All the patients were rehabilitated with fixed full-arch rehabilitations supported by 4 to 6 immediately loaded implants (length ≥ 10 mm) following the Columbus Bridge Protocol (Tealdo et al. 2014) at the Division of Implant and Prosthetic Dentistry of Genoa University. The time elapsed from surgery had to be at least 4 months: the patients already had their definitive prostheses at the time of the follow-up appointment. The fixed prostheses were unscrewed and the following parametres were recorded: bleeding on probing (BOP) in four points for each implant using a non-metallic probe (values from 0 to 4) and plaque index (PI) using an erythrosine gel. Peri-implant bone level was evaluated radiographically. The implant-abutment interface was used as the reference point and interproximal bone level was measured from this reference to the most coronal bone at the mesial and distal side of each implant. Data were analysed using a nonparametric test (Spearman's rank correlation). Correlation (rho) coefficients were defined as follows: 0.8 – 1.0 = very strong; 0.6– 0.79 = strong; 0.4–0.59 = moderate; 0.2–0.39 = weak; and <0.2 = very weak.
Results: The mean follow-up for patients included in

the present research was 5,8 years (range: 1-14 years). 58 patients were rehabilitated at the upper jaw, 6 at the lower jaw and 8 at both arches. 331 implants were analyzed. The mean PI was 2,30 (Std Dev: 1,54) with a percentage of 57,55% of implant surfaces presenting plaque accumulation. The mean BOP was 0,84 (Std Dev: 1,32) with a percentage of 21,07% of implant surfaces presenting bleeding on probing. The mean bone loss was 0,89 mm (Std Dev: 1,09). No correlation was found between PI and bone resorption (p = 0.08). A very weak correlation was found both between BOP and bone resorption (rho=0.18; p = 0.001), and between plaque index and BOP (rho = 0.13, p = 0.019).
Conclusion: In the present sample of patients rehabilitated with fixed full-arch prostheses, despite great amount of plaque accumulation, peri-implant tissue inflammation was limited. The majority of the patients did not present bleeding on probing. Bone resorption was also minimal at the majority of the implant sites. The present results suggest that plaque accumulation alone is not able to trigger peri-implant bone resorption.

All-on-4 rehabilitation of atrophic jaws by a new conical connection implant: a perspective longitudinal study

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Aim: Patients with total edentulism may present a low quality atrophic bone which makes full arch rehabilitations difficult to perform without using cantilevers, which can determine the failure of distal implants. Without undergoing invasive procedures of bone augmentation, this problem can be avoided using the All-on-4 technique, in which mesial implants are axial and distal implants are tilted of 30° to 45° to minimize cantilevers. The aim of this study is to evaluate if a new conical connection implant system (CSR-DAT) is suitable for full arch rehabilitations performed according to the All-on-4 technique by assessing their success rate at 12-months follow-up.
Methods: A total of 32 patients were treated to obtain an immediate loading implant-prosthetic full arch All-on-4 rehabilitation on one or both edentulous jaws. Exclusion criteria were: the absence of any active infection or severe inflammation in the areas where implants were meant to be placed, presence of any chronic systemic disease, smoking more than 15 cigarettes per day, a bruxism habit and poor oral hygiene. A total of 128 implants were placed: 15 rehabilitations were performed in the mandible and 17 in the maxilla. CSR implants are characterized by a hybrid design which goes from cylindrical to conical with a tapered apex which presents 4 flute shapes, and their ZirTi (zirconium oxide sandblasting and acid-etching with mineral acids) surface is full threated. These implants are platform switching and their DAT connection (Double Action Tight) is characterized by an internal hexagon and a double conical interface, which makes this connection highly able to prevent bacterial microleakage. Implants were loaded with high-density acrylic resin provisionals. The follow-up was at 12-months from implant placement. An evaluation of radiographs to assess Marginal Bone Level changes (MBLc) was performed. Furthermore perimplant soft tissues were evaluated by assessing the Probing Depth (PD), the Modified Bleeding Index (mBI), the Modified Plaque Index (mPI) and Gingival Recession (REC). All these evaluations were performed at 1, 3, 6 and 12 months from placement.
Results: At 12-months from implant placement no significant complications were observed: of 128 implants placed, only one of the axial implants failed after one month from placement, therefore the overall survival rate of these implants proved to be 99.61%. Due to an adequate primary stability reached by these implants after surgery, they could all be immediately loaded, as the All-on-4 protocol demands. Occlusion was checked over time and no worsening was highlighted from the initial situation. The analysis of patients' radiographs revealed a mean marginal bone loss of 0.11 ± 0.08 mm. The evaluation of perimplant soft tissues showed a PD of 2.41 ± 1.00 mm, a Mbi of 0.32 ± 0.65 mm, a Mpi of 0.33 ± 0.20 mm and REC of 0.06 ± 0.10 mm.
Conclusion: CSR-DAT implants showed, at 12-months follow-up, a high success rate in All-on-4 rehabilitations. Moreover, stable bone levels and perimplant parameters were measured. Due to the limits of the present study, further research is needed to assess the mid and long-term follow-up of CSR-DAT implants.

Accuracy of prosthetic interfaces of prototypical universal abutments: SEM analysis

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Aim: The aim of this in vitro study is to assess the mechanical precision of a prototypical Universal

Abutment (UA) we explicitly designed and customized to work on different dental implants in cases of implant prosthetic retreatment. Under SEM observation, we measured the accuracy of our prototypes in connection with the fixtures, then we compared the results with Original Abutments (OA).
Methods: 10 implant fixtures specimens, coming from some international dental implant industries and each with its specific prosthetic platform, have been connected with 5 UA and 5 OA using a dynamometer at recommended torque values (25-30 N). All the specimens have been embodied in self-curing resin cylinders and then cut to create longitudinal sections and reveal the prosthetic connection. After polishing, all 20 sections were eligible for the comparative evaluation. Images and measurements have been taken using an environmental scanning electron microscope (ESEM Quanta 200, Fei, Italy). We identified 10 unvariable spots for each specimen to measure, and the operator ignored which abutment was under investigation during the entire procedure.
Results: The microgaps between UA and the fixtures ranged from 2 to 47 µm, with the highest values in the coronal/conometric area of the prosthetic connection. The average gap resulted 21.1 µm. The microgaps between OA and the fixtures ranged from 3 to 32 µm, and the worst outcomes derived from the interface between the prosthetic screw and the inner threads of the fixtures. The average gap was 18.96 µm.
Conclusion: UA prototypes appeared to be less precise than OA, especially in conometric connections. We need to reconsider the production process for our UA, selecting a lower tolerance class in the manufacturing procedures. Unexpectedly, OA showed improvable characteristics in the screw design.

Evaluation of the masticatory efficiency of single implant mandibular overdentures: 5 year follow up

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Aim: One of the main request and need of edentulous patients requiring prosthetic rehabilitation is having a satisfying masticatory efficiency, so that they can access with less difficulties to a varied and complete diet. For edentulous patients with complete dentures the chief complaint is the instability and lack of retention of the mandibular denture. The insertion of two mandibular implants to retain the mandibular denture has been recognized as the standard treatment. The literature expressed in the last ten years on a different modality of treatment of the edentulous mandible, the connection to a single median implant. The aim of the research is to evaluate the effect on the masticatory efficiency of the prosthetic connection of the mandibular complete denture to a single median implant. The hypothesis is that this rehabilitation is able to improve the masticatory efficiency.
Methods: The within subject trial has been conducted on edentulous elders at the Dental School of Torino. Treated in the same facility and wearing complete denture for at least 1 year, they have been invited to participate to the trial. Exclusion criteria were cranio-mandibular disorders, local and systemic contraindications to implant surgery, neurological degenerative progressive diseases, multiple sclerosis, lateral amyotrophic sclerosis. Single symphyseal implants were inserted in all patients. Delayed load protocol has been followed and prosthetic connection realized after three months, with Locator® attachments (Zest Anchors). Stability and precision were double checked and in case relinings performed. Masticatory efficiency was measured trough the Gummy Jelly method with complete denture (once the denture incorporation was obtained) and after the prosthetic connection (3 months and 5 years). The method used is based on the correlation between the area of the chewed jelly and the concentration of glucose released in a solution were the jelly is immersed. Patients were invited to chew calmly but with energy one of these glucose gummy jellies for 30 times, as they were normally eating. The result of the mastication was collected in a gauze, rinsed under water 25 °C for 30 seconds, diluted in 15 ml of water 35°C and blended for 10 seconds. The solution was analyzed with a measurement device for glicemy. The ability to break the gummy jelly is valuable measuring the concentration of glucose diluted: smaller the pieces, higher the surface in contact with the solution and higher finally the concentration of glucose. Data were reported as average, standard deviation, confidence interval and compared using suitable statistical tests for paired data (T-Student for paired data).
Results: 15 patients were included for the study, following exclusion and inclusion criteria. 10 patients completed at this time the 5 year follow up.
Results confirm the initial hypothesis: masticatory efficiency evaluated with the Gummy Jelly method improved three months after the connection of the implant (+294.54%; p=6,28082E-07). In the following years the efficiency still improved, increasing of a further 137,66% (p=0,003615759).
None of the patients had a negative trend.
Conclusion: Patient treated with overdenture retained by a single median mandibular implant increased their ability to comminute a food test. The increasing trend continue until the 5th year of follow up. This is due to a continuous and progressive adaptation of

the masticatory system to the new retention system, giving the patient a better self confidence in chewing.

Argon assisted surface treatments for introducing organic functionalities on titanium surfaces of dental implants

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Aim: Plasma surface activation and plasma polymers deposition are very promising technologies capable to enhance biologically relevant surface features of biomaterials. The aim of this study was to evaluate the biological effects of two different surface modifications, i.e. amine (NH2-Ti) and carboxylic/esteric (COOH/R-Ti) functionalities. These modifications were obtained from aminopropyltriethoxysilane (APTES) and methylmethacrylate (MMA) precursors, respectively, through an atmospheric plasma jet RF-APPJ portable equipment.
Methods: Three types of specimens were used: pristine titanium (Ti, unmodified control), titanium with carboxylic/carboxylate functionalization (COOH/R-Ti) and titanium with amine functionalization (NH2-Ti). Methylmethacrylate (MMA, Sigma Aldrich, ≥ 99%) has been used for carboxylic/carboxylate groups while amine functional groups have been obtained using aminopropyltriethoxysilane (APTES, Sigma Aldrich, ≥ 98%) as precursor. All sample coatings were characterized by Scanning Electron Microscopy, XPS, FT-IR spectroscopy and surface energy calculations. Stability after UV sterilisation and in water was also verified. Total protein amount was evaluated using SERVA BCA Protein Assay Micro Kit (SERVA Electrophoresis GmbH, Heidelberg, Germany). To perform the in vitro tests, the pre-osteoblastic murine cell line MC3T3-E1 was used. Cell adhesion was evaluated on titanium samples by counting cell nuclei. Cell proliferation was evaluated using Cell Titer GLO (Promega, Milan, Italy) according to the manufacturer's protocol at 1 and 2 days. To assess the osteogenic differentiation Osteocalcin (OCN) was quantified in cell conditioned media by the use of Mouse Osteocalcin ELISA Kit (MyBioSource, Inc, San Diego, USA) following manufacturer's instructions.
Results: Both treated samples showed a higher quantity of adsorbed proteins and they also improved osteoblasts adhesion on the surfaces compared to the pristine titanium. In particular the COOH/R-Ti led to a nearly two-fold improvement of cell adhesion. Cell proliferation at 24 h on coated samples was initially lower than on titanium control, while, at 48 h, COOH/R-Ti reached the same proliferation rate as pristine titanium. Cells grown on NH2-Ti were more elongated and tapered in shape with smaller areas than on COOH/R-Ti enriched surfaces. Furthermore, NH2-Ti significantly enhanced osteocalcin production, starting from 14 days, whereas COOH/R-Ti had this effect only from 21 days. Notably, NH2-Ti was more efficient than COOH/R-Ti at 21 days. The NH2-Ti surface elicited the most relevant osteogenic effect in terms of osteocalcin expression: this establishes an interesting correlation between early cell morphology and later differentiation stages.
Conclusion: The flexibility of the presented surface functionalization process, by virtue of a wide range of potential monomers in aerosol or vapor phase, offers the researchers a new tool that can be used to investigate how to regulate cell fate modulating surface chemistry. It also allows the functionalization of complex 3D shaped materials and devices, such as dental implants, and it can be done in less than 1 minute.

The masticatory muscles activity before and after a full arch immediate loading implant rehabilitation in partially edentulous patients: preliminary data

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Aim: The aim of the present study was to evaluate the difference in the masticatory muscles activity before and after a full arch immediate loading implant rehabilitation in partially edentulous patients.
Methods: Ten subjects, 7 males and 3 females, aged 46-75 years have been enrolled. They were all partially edentulous, eight in the upper jaw and two in the lower jaw, with a high level of bone resorption. After a full extraction of the remaining hopeless teeth, they were rehabilitated with four post extractive implants according to the Columbus Bridge Protocol®. In this technique, the four implants are placed in the median maxillary and mandibular regions. The mesial ones are placed up-right while the distal ones are inserted tilted (30–45°) in order to avoid the anatomical limits of the edentulous arch. Full-arch resin prosthesis supported with metal framework connecting all the implants is screwed following immediate loading protocol (24 to 48 h from the surgery). EMG was recorded in the pre-surgical time, after one week,

at the 1st,3rd,6th,9th and 12th month follow-up appointments. A preliminary follow-up after three months was achieved at the moment. The masseter and temporalis anterior muscles of both sides (left and right) were examined. Bipolar surface electrodes were positioned on the muscular bellies parallel to muscular fibres while a disposable reference electrode was applied to the forehead. The instrument was directly interfaced with a computer to show the data graphically and to record them for further quantitative and qualitative analyses. During all recordings, the subjects sat with their head unsupported, the feet flat on the floor and the arms resting on the legs; they were asked to maintain a natural erect position. Two recordings for the standardization of EMG potentials were made positioned two 10-mm thick cotton rolls on the mandibular posterior teeth of each subject and a 5 seconds maximum voluntary clench was recorded asking to clench as hard as possible, and to maintain the same level of contraction for the whole test. Then the electromyographic activity was recorded two times during a maximum voluntary clench as hard as possible in intercuspal position without the cotton rolls lasting 5 seconds. A series of EMG indices were computed as follows: 1 The Percentage Overlapping Coefficient (POC) was computed to quantify the muscular symmetry. Its value ranges between 0% and 100%. 2 The Activity index (Ac) was used to quantify the balance between couples of muscles. It was calculated as the percentage ratio of the difference between the mean masseter and temporalis standardised potentials; 3 The Torque Coefficient (TC) was used to measure the tendency of the mandible to move toward one side during a symmetric bilateral clenching, given by unbalanced contractile activity of contralateral masseter and temporalis muscles.

Results: The EMG results of the included patients show an average improvement of muscular symmetry (POC), balance between couples of muscles (Ac) and Torque Coefficient (TC) at the preliminary follow up of three months. These findings show a general improvement of the masticatory muscles activity. Implant and prosthetic success rate was 100% after three months.

Conclusion: The preliminary results of our study show that the technique with four post extractive implants according to the Columbus Bridge Protocol® has positive implications in the masticatory muscular ri-equilibrium during clenching. The EMG indices confirm the clinical success rate at three months.

Use of photofunctionalizated dental implants in compromised jaw – case series

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Aim: Photofunctionalization is a treatment that allows the surface of titanium implants. This treatment increases the bioactivity and osteoconductivity of dental implants by changing the external surface of titanium. Main changes operated by this ultra-violet light treatment are: -recovering hydrophilic surface -reducing carbon surface -optimizing surface electrostatic charges. Photofunctionalization is non-additive and non-subtractive method of surface modification. In this paper we examine effect of photofunctionalization on implant success, osseointegration speed, healing time, and peri-implant marginal bone level changes at 1,5 years after implant insertion. For this evaluation we used the resonance frequency analysis (RFA) using the device Osstell RFA allows assess implant stability by measuring implant oscillation frequency on the bone.

Methods: We included in the case series six patients who received nineteen photofunctionalized implants. All implants were photofunctionalized with ultraviolet light with TheraBeam Super Osseo immediately prior to placement. This device performs an automatic program of 12-minute UV exposure. The nineteen implants were placed in fresh extraction socket, simultaneous or previous guided bone regeneration, or sinus lift site. We used Osstell device in combination with clinical evaluationcan to indicate the suitability of an implant for loading and identify potential problems at the earliest stage. Osseointegration speed was estimated using OSI (osseointegration speed index). The implant stability was measured at implant placement, monthly up to load, using the implant stability quotient (ISQ) values. ISQ was calculated like average of four measurements (mesial, distal, buccal, lingual surface) OSI was evaluated by calculating the ISQ increase per month. Marginal bone levels were evaluated radiographically at crown placement and at 1,5 year.

Results: All implants placed remained functional and healthy at 1,5 years. No stability dip was observed for implants regardless of the initial ISQ. ISQs of 58 to 77 at implant placement had increased to 68 to 85 at loading. The ISQ increase per month (OSI) ranged from 3,0 to 8,5 depending on the ISQ at placement. OSI was considerably higher than that of untreated implants reported in the literature ranging from –1,8 to 2,8. A low primary stability (ISQ <70) results in an increase of ISQ greater than a satisfactory primary stability. No

implants showed marginal bone loss. Marginal bone levels had significantly increased at 1,5 year.
Conclusion: More and more data tend to demonstrate how the photofunctionalization can be a valid support to the implant therapy, in the same way both in complex conditions that in standard bone conditions. Photofunctionalization accelerated and enhanced osseointegration of commercial dental implants in complex bone conditions.

Use of porous implants for the prosthetic rehabilitation of fibula free flap reconstructed patients

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Aim: Vascularized free flaps represent today the gold standard in reconstructive treatment of the upper and lower compromised maxillas.
The aim of this study is to perform the advantages and disadvantages of the revascularized fibula free flap (FFF) and the available rehabilitation options with porous implants.
Methods: Between Januar 2009 and September 2016, 45 FFF patients came to our attention. The identification and selection method involved patients who presented maxillary or mandibular reconstruction. Of these, 26 were reconstructed mandibles while 19 were maxillary reconstructions. Fourty patients were outcome of oncological diseases while only the remaining 5 were accident victims presenting the loss of substantial portions of soft and bone tissues. Twentythree of the 40 cancer patients were lower jaws reconstructions while the upper jaws were 17. Of the 5 patients outcome of trauma, 3 were the mandibles, 2 maxillas. For these 45 patients with 211 inserted implants treated and reconstructed with revascularized fibula flaps, the use of 103 titanium tapered implants (with micro rough surface) versus 108 tantalum-titanium porous implants was compared to evaluate the bone reabsorption and implant survival. Immediate implant stability, the peri-implant reabsorption and the survival were evalued. The follow up was after 3,6,12,24 mounths
Results: In large cantylever conditions, tantalum implants have a medium peri-implant reabsorption less than 30% comparing to conventional implants placed in same conditions. Measurements of bone level changes were made clinically and radiologically by evaluating bone level mesially and distally to each implant at implant placement, 6, 18, 24 months later. The vertical distance from the neck of the implant to the crest of the surrounding bone tissue was measured to evaluate peri-implant bone loss. These results are obtained with a two years follow-up; obviously, most patients have been followed for the entire period of two years, but some of them have been followed for maximum four months.
For this reason it is crucial to continue monitoring these systems over time to achieve more predictable results
Conclusion: Mainfold are the prosthetic problems occurring in vascularized fibula free flaps. Each represents a challenge to overcome. Porous tantalum implants showed prognosis improoving of our complex prosthesis around 30% due to the lower degree of peri-implant bone reabsorption.

Radiotherapy of head and neck: the role of the dentist

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Aim: Head and neck squamous cell carcinoma (HNSCC) is the sixth most frequent disease among cancers, and still today treatments can provide only a 50-57% survival rate over 5 years. Possible treatments of this pathology are surgical resection of the tumor mass, radiotherapy, chemotherapy or, more often, a combined therapy that inevitably affects both normal and tumor cells during antineoplastic treatments. As a consequence of all these treatments, patients' anatomy and physiologic functioning become reduced or altered. The role of the dentists consists in rehabilitating the functions of the involved district and limiting and treating the collateral effects of radiotherapy. Purpose of this research was to find potential guidelines that could determine dentist's role in implant rehabilitation in patients that undergo RT.
Methods: This study was conducted through a bibliographic research on Pubmed and Medline. Results published between 2005 and 2014 were selected. Studies about implant prosthetic rehabilitation in patients with HNC treated with both surgery and radiation therapy (both standard RT and IMRT) were included. In these studies, success and failure of the therapy were analyzed, and acute and chronic effects,

dentist's role and suggestions for this treatment guidelines were considered too. Results of the search were not considered if published before 2005, and same strategy was adopted for studies about different prosthesis rehabilitation from implant treatment and for those about patients with different diseases from the said ones (HNC).

Results: Nowadays the functional restoration is significantly improved thanks to the innovation in prosthetic rehabilitation and in radiotherapy. In fact the development of 3D image-based conformal radiorherapy (CRT) and intensity-modulated radiotherapy (IMRT) successfully achieved the ability of sufficiently separate the dose response curve of local tumor control and normal tissue complication. The implementation of this technologies permits better shaping of the high-dose volume of the radiation treatment so as to better conform to the tumor volume while minimizing the radiation dose delivered to surrounding normal tissue.

Conclusions: IMRT compared to traditional RT allows to plan adequate treatments evaluating different tissues' involvement and radiation dosage. Using data provided by dose-volume histogram (DVH), it is possible to define the most suitable sites for implant insertion. Placing implants in less irradiated fields minimizes the impact of radiation dosage on treated areas. A conspicuous number of studies suggest effective procedures that could easily be part of official guidelines for the treatment this research considers. This condition makes complicated the structure of a unique protocol for the treatment of these patients.

Here we have tried to share our work attitude based on our experience. However, the constant changes to radiation protocols make it even more difficult to navigate in this area. For this reason that what must emerge as a vital element in the radiated patient's choice of treatment is the need for continuous dialogue between the dentist and the oncologist-radiotherapist. On this basis, it is very important to understand that the post-cancer patient, following the appropriate guidelines and through a continuous update by the dentist, should have access to all the care needed by the simple conservative treatment to the most complex implant-prosthetic rehabilitation .

Implant prosthetic rehabilitation in aesthetic zone with the use of GBR technique

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Aim: The aim of this paper is to present a case report of aesthetic rehabilitation in a patient with periodontal disease.

Methods: The patient came to Dental Clinic in Padova with poor oral hygiene and compromised periodontal status on the lower incisors zone. On the lingual side there was a composite wire from 33 to 43 to reduce the mobility of teeth. Nevertheless, the patient complained of functional and aesthetic discomfort and asked us to resolve the situation of lower incisors. After preliminary recording we did patient's picture, model study and study case. The goal was to have a good compliance level: periodontal treatment (SRP) and patient motivation was made. However four lower incisors were considered hopeless: therefore we proceeded with extractions and gave to the patient a temporary removable partial denture. After three months was made a CBCT to program the surgery: it showed a big bone dehiscence in 31-41 zone. So two implants was placed (Biomet 3i, diameter 4mm) at the lower lateral incisors (32, 42). GBR technique was done whit a resorbable membrane fixed with pins and stitch in the lower central incisor zone. Five months were necessary to allow complete osseointegration, then we made implant connection. To obtain the maximum patient satisfaction implants were connected to two Atlantis personalized abutment (after the precision impression of pickup). All usually step for realization of final prosthetic restoration were made (try the metal bridge, try the form and colour of the teeth) before to give to the patient the bridge on implants 32,42.

Results: With this treatment we achieved aesthetic and functional rehabilitation of lower incisors zone. A good patient compliance was obtained. After nine months periapical radiographs were made and periodontal probing was registered to assess good hygiene and a good gingival health.

Conclusions: Four teeth on two implants on site 32 and 42 proved to be an excellent solution for prosthetic rehabilitation of edentulous area in aesthetic zone. Moreover, GBR technique associated with customized Atlantis abutment demonstrated to increase the soft tissue contour and optimize the gingival profile of the prosthesis. For the long-term success of the rehabilitation patient's compliance is therefore mandatory.

Evaluation and comparison of clinical parameters and oral health-related quality of life (OHRQOL) in patients treated with immediate or delayed loading full-arch implants: retrospective comparative clinical study

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Aim: The Oral Health Impact Profile (OHIP) is a self-reported questionnaire designed to measure the effect of the oral health status on the patient's quality of life (OHrQoL). The aim of this study was to retrospectively evaluate the clinical and radiological outcome of full-arch implant-supported rehabilitations with different type of loading protocol (conventional or immediate), and the patient's reported outcome of quality of life at least 2 years after the final prosthesis delivery.
Methods: Patients included in the study were treated with full-arch implant supported rehabilitations with delayed or immediate loading protocol, depending on the clinical diagnosis and on the patient preference. The retrospective evaluations of OHrQoL, clinical and radiographic parameters were conducted at least 2-year after the final prosthesis delivery. The dichotomized short Oral Health Impact Profile (OHIP-14) was used to assess OHrQoL, Patients were stratified into two groups for the subsequent statistical analysis: immediate loading (IL group; n=20); delayed loading (DL group; n= 16). The null hypothesis was that both treatments would have resulted in equal outcomes if evaluated at least 2 years after the rehabilitation.
Mean OHIP-14 and standard deviation score for each domain were computed for each outcome. Comparisons were secondarily stratified for the gender and a dichotomous variable of construction "follow-up" which was computes as 0 or 1 depending whether the prosthesis in exam had a follow-up being less or more than 5 years
Results: A total of 36 patients (63.4 ± 0.57 years; Male=15; Female=21), were enrolled in the study. Independent t-test showed total OHIP-14 scores to be not significantly different between groups; however, the domains "Functional limitation" and "physical disability" resulted significantly higher in patients within the DL-group. On the contrary, social disability was higher in the IL-group. When the comparison was performed taking sex into account, no significant differences between groups were highlighted. Instead, the stratification for years of follow-up led to significant evidences. When the follow-up was shorter (less-than-5 years), the functional limitation reported scores were higher.
Conclusion: The gold standard for the rehabilitation of edentulous patients is the implant supported prosthesis. The clinical and biological success of implant therapy has been demonstrated by numerous scientific researches, however the patients'-centred outcome has not been sufficiently investigated. Previous studies highlighted the advantages of immediate loading implant protocol with the OHrQoL, but most of them have a short follow-up. Within the limitations of this study, this analysis supports the absence of significant differences between immediate loading and delayed loading full-arch protocol in term of clinical, radiological parameters and OHrQoL.
There is the need of further longitudinal studies analysing OHIP after different years of follow-up to highlight eventual time-related bias. Studies with larger samples could support the reliability of the OHIP in the assessment of the patient's outcome success criteria.

Achieving and maintaining aesthetics in a case of post-extraction implantology prosthetically unfavorable

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Aim: In modern implantology, the aesthetic research has become crucial and necessary objective for each treatment plan. Its achievement is not so granted and simple, especially if complex therapeutic protocols were adopted, such as post-extraction implantology. The aim of this work is to present both the management of a case of post-extraction implant in which the three-dimensional positioning of the fixture was not prosthetically guided, and the obtaining of an aesthetically valid result that has maintained over the time.
Methods: The patient came to our observation with crown-root fracture of 1.4. Considering clinical, radiographic and models examination, according to the patient, immediate post-extraction implant and simultaneous GBR was chosen. The patient showed no systemic contraindications to surgery. We proceed to atraumatic extraction of the fractured element, in order to preserve the thin cortical buccal. A full-thickness flap was raised through crestal incision extending to the gingival sulcus of the two adjacent teeth. The post-extraction socket showed buccal bone very thin, <1 mm. Because of these clinical considerations, an anatomically guided implant placement but prosthetically unfavorable was realized. Implant 3.5 mm in diameter and 11 mm in length was placed (OsseoSpeed TX S Dentsply Implants). The residual gap remaining between the implant shoulder and the buccal crest was filled with

bovine bone matrix deproteinized in small particles (Bio-Oss, Geistlich Biomaterials). Then, the graft is covered with a collagen membrane (Bio-Gide, Geistlich Biomaterials) stabilized with trans mucosal healing abutment. Non-absorbable suture e-PTFE (Expanded Polytetrafluorethylene, Gore-Tex) was used and a collagen membrane exposed was left achieving a secondary intention closure. Recent studies show similar results for both submerged and transmucosal healing implants placed in healed or fresh sockets. After surgery, the patient received antibiotic prophylaxis with amoxicillin and clavulanic acid 2 g/day for 5 days and rinses with chlorhexidine digluconate 0,2% 3 times/day for 4 weeks. At 7 days, suture was removed and clinical follow up were realized (14 days, 21 days and 28 days). Once a complete epithelial closure was performed, monthly controls were made for four months. Conseguently, the second impression with polyether material was taken (Impregum Penta 3M ESPE). Through AtlantisWebOrder, custom abutment was made allowing the compensation of palatal positioning of the fixture. Specifically the bucco-lingual dimension was increased, allowing an aesthetic emergence profile. A provisional screwed was applied in order to condition the soft tissue. Conditioned the transmucosal route final rehabilitation was performed after 4 weeks from the second impression.

Results: Simultaneous GBR with resorbable membrane reduced treatment time, time surgeries, complications and compensated the irreversible contraction of peri-implant tissues after tooth extraction. Regenerative technique allowed to obtain a volume of buccal plate exceeding 3 mm, which is a predictable parameter for a satisfactory aesthetic outcome and decrease of failure risk. After delivery of the prostheses, periodic follow up were performed; the most interesting results was observed at 12 months, where the pink aesthetics restoration was completely, and 48 months, where these parameters were stable with no signs of suffering of hard and soft peri-implant tissue.

Conclusion: Minimally invasive surgery (atraumatic extraction, implant placement and simultaneous GBR technique) and design of a custom abutment allowed the achievement and maintenance over time of a satisfactory aesthetic outcome although surgical and prosthetic starting conditions were not favorable. Although the literature shows that the recession of the buccal gingival is the most frequent problem in case of immediate implant placement, four-year follow-up no recession was recorded.

MRCT Multicentre randomised controlled trial of immediate post-extractive implants with and without bone graft: 3-year follow-up

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Aim: The aim of this research was to evaluate the outcome of single post-extractive immediate implants placed with and without bone grafts in the aesthetic premolar maxillary area after 3-year follow-up.

Methods: 102 patients received 115 immediate post-extractive implants after premolar maxillary tooth extraction. The patients were randomly allocated to immediate implant placement without bone grafting (NO GBR group A: 51 patients) or to immediate implant placement with bone substitute using anorganic bovine bone covered by a resorbable collagen barrier (GBR + BS group B: 51 patients) and assigned to one of two groups with a 1: 1 ratio, according to a parallel group design at seven different centres. After 4 months of healing period, all implants were loaded with provisional single crowns, and replaced by definitive ones after one month. Outcome measures were: implant failures, biological complications, peri-implant marginal bone level changes evaluated on intraoral radiographs, aesthetic evaluation of the vestibular and occlusal clinical pictures assessed using the pink esthetic score (PES), peri-implant probing pocket dept and patient satisfaction, recorded by blinded assessors. All patients were followed up to 1 and to 3 years after loading.

Results: Six patients were withdrawn from the study because of their refusal to attend scheduled follow-up appointments. Seven participants showed surgical complications in the group A (NO GBR) versus two patients in the group B (GBR + BS). Two (2.3%) implants failed: one implant after 1 year in Group B (1.8%), and, after three years, one implant in Group A (1.6%). Bone level evaluation showed increasing bone loss during all follow-up period. After 36 months the Mesial Bone loss mean value was -0,61 mm (SD 0,47) in group B and -1,01 mm (SD 0,79) in group A ($p < 0,001$) and the Distal Bone loss mean value was -0,71 mm (SD 0,59) in group B and -1,12 mm (SD 0,88) in group A ($p < 0,005$). These differences were statistically significant. At 3 years after loading, for implants in Group B with biomaterials and membrane, the increasing Buccal mean probe value was +0.36 mm (SD 0.70) and in absence of biomaterial (Group A) was +0.40 mm (SD 0.58). At T36, the increasing Palatal mean value was +0,38 mm (SD 0,65) and in Group A) was +0,54 mm (SD 0,55). The data analysis showed no statistically significant median probing difference in presence or absence of biomaterials.

Conclusion: According to literature, the use of additional anorganic bovine bone substitute with a resorbable

collagen barrier in defects around immediate post-extractive implants improves the bone response and the aesthetic outcome of surgical procedures.

The Vascular Endothelial Growth Factor (VEGF) evaluation during human adypocite stem cells (HASCS) proliferation and osteogenic differentiation

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Aim: Mesenchymal stem cells (MSC), isolated from human tissues, are largely studied for future application in regenerative dentistry and medical applications. The Adypocites seem to play a crucial role in tissue regeneration terapies. During proliferation and differentiation processes the angiogenesis have a critical role in physiological and pathological condition, related to the increased demands for blood. The Vascular Endothelial Growth Factor (VEGF) protein is an important mediator of angiogenesis processes during physiological dental tissues development. In this study the expression of VEGF was evaluated in human adypocite stem cells during in vitro proliferation and osteogenic differentiation.
Methods: 10 samples of human adypocite (hASC) obtained from subcutaneous fat surgical procedures from 10 patients of ISCCR San Raffaele Vita e Salute University and University of Foggia were selected and cultured in lineage-specific inducing media, differentiated into osteoblasts and adipocytes (evaluated by Alizarin Red S and Red Oil O stainings, respectively), thus showing a multipotency.
Results: The hASC, grown under undifferentiating conditions, are negative for hematopoietic (CD45, CD31, CD34, CD144) and positive for mesenchymal (CD29, CD90, CD105, CD166, CD146, STRO-1) markers, that underwent down-regulation when cells were growing in osteogenic medium for 3 weeks. In this condition, they also exhibited an increase in the expression of osteogenic markers (RUNX-2, alkaline phosphatase) and extracellular calcium deposition, whereas the expression of receptors (VEGFR-1 and -2) for vascular endothelial growth factors (VEGF) and related VEGF binding proteins was similar to that found in undifferentiated hASC. The exposure of hASC growing under undifferentiating or osteogenic conditions to VEGF-A165 peptide (10-40 ng/ml) for 8 days dose- and time-dependently increased the number of proliferating cells without inducing differentiation towards endothelial lineage, as evaluated by the lack of expression of specific markers (CD31, CD34, CD144). Additionally, exposure of hASC cultured in osteogenic medium to VEGF-A165 for a similar period enhanced cell differentiation towards osteoblasts as evaluated after 14 and 21 days by Alizarin Red S staining and alkaline phosphatase activity quantification. These findings may have clinical implications possibly facilitating tissue repair and remodeling.
Conclusion: According to the results obtained, the VEGF factor would seem to play a very important role during proliferation and differentiation processes of reprogrammed mesenchymal stem cells derived from human adypocites, promoting the bone differentiation. Hoveover more researches may be needed to understand the fine interaction mechanisms of VEGF and bone growth for clinical application in regenerative medicine.

Mandibular overdenture retained by two immediately loaded mini implants: evaluation of chewing cycles and masticatory efficiency before and after implant anchorage

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Aim: Compared to the traditional complete denture, the Mandibular Implant Retained Overdenture (MIR-OVD) provides the patient with increased comfort and masticatory efficiency and improved quality of life. The purpose of this study is to evaluate the increase of prosthetic stability, the masticatory efficiency and cycle patterns of a mandibular overdenture retained by means of two immediately loaded mini implants with a diameter inferior to 3mm.
Methods: A total of eleven patients with edentulism were submitted to the clinical study. LODI implants (Locator overdenture implant system, Zest Dental Solutions™) were adopted. All surgical interventions were performed by same operator. After performing anesthesia with Mepivacaine 20mg/ml , epinephrine 1:100.000, a total thickness flap with median release incision was elevated. Implants were 10 mm long and the choice of the diameter, 2.4 mm or 2.9 mm, depended on bone ridge thickness. The two implants were inserted in interforaminal lower jaw bone. Subjective prosthetic evaluation, masticatory cycles and masticatory efficiency tests were performed

in order to evaluate the prosthetic functional improvement and patients' satisfaction tests were held before and after implant anchorage. Implant evaluation was carried out by means of a chart which included: probing depth (PD), plaque index (PI), bleeding on probing indices (BOP), implant mobility and pain on percussion. These tests were performed at six different times: T0: before implant surgery T1: after anaesthesia and before the beginning of implant surgery T2: after implant insertion under anaesthesia T3: after three months T6: after six months T12: after one year from surgery.
Results: The clinical study demonstrated 95% implant success after 12 months without any surgical and post surgical complications. It was evidenced a statistically significant increase ($p<0.05$) of comfort, denture stability and phonetic starting from the 3rd month after surgery whereas a statistically significant increase ($p<0.05$) of masticatory efficiency and cycle patterns one year after implant insertion and loading.
Conclusions: A mandibular overdenture retained by two mini implants with immediate loading protocol, allowing less invasive surgery, decreased post operative pain and significative cost reduction, could be a viable treatment option for the rehabilitation of mandibular edentulous patients. A long-term follow up and a larger patients' sample will be called for to confirm and validate these data.

Ultrasonic instrument effects on different implant surfaces

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Aim: From the literature we infer that efficient peri-implant debridment cleaning result is obteined using metal tips rather than plastic material tips. Plastic tips allow to alter, the least possible, fixture superficial properties or analized specimens. Aim of this study was to evaluate in vitro effects of ultrasonic instrumentation using Acteon Implant Protect® ultrasonic grade IV titanium tips on implant surface micro- and macro-topography.
Methods: Nine 6 mm diameter and 2,6 mm height titanium disks were used in this study, with 3 different kinds of surface: machined, laser-treated and sandblasted. Four 500x500 µm areas were selected on each surface. Each area was equidistant from the disk center and from the disk border. Each area was analized using a Talysurf CLI 1000® profilometer and captured with an optical microscope at 3x enlargement and with a scanning electron microscope at 100x and 300x enlargement. Successively the surface of each titanium disk was instrumented for a total of 40 strokes by a single operator using Implant Protect® (Acteon®) ultrasonic tianium tip. The tip was angulated tangentially. Calibrations were performed with scales before the experiment, and the average pressure applied in this study was 30g. Back and forth movements were performed in the same direction for 40 times. For the Satelec® scaler a power setting 3/10 was set at 25 to 32 kHz. Instrumentation was achieved with a continuos water irrigation. Pictures were acquired again by optical microscope and scanning electron microscope. After instrumentation any contaminants were searched with SEM-EDX (Scanning Electron Microscope – Energy Dispersive X-ray spectrometry). All reserched values were subjected to statistical analysis.
Results: Each image acquired with optical microscope and with Scanning Electron Microscope reveals instrumentation signs with tested tips. Machined and sandblasted surfaces showed a significant Ra reduction (p value < 0,05). Only laser-treated surface showed scratch signs without substantial Ra reduction. Contaminants were not found with EDX analysis before specimen instrumentation and after instrumentation neither. Before instrumentation and after instrumentation sandblasted surface presented a considerable quantity of Al and O.
Conclusion: To be effective implant surface ultrasonic instrumentation has to be done with titanium tips, not whith plastic material tips. Nevertheless titanium tips instrumentation causes alterations of implant surface microtopography; in addition different implant surfaces undergo different kinds of structural alteration non-clinically definable.

Early loading of TI-ZR dental implants with a chemically modified surface: 1-year results from a prospective study

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Aim: The purpose of this prospective clinical study was to evaluate implant survival, success and marginal bone loss (MBL) of early loaded Titanium-Zirconium alloy implants with a chemically modified sandblasted, large-grit, acid-etched (SLActive®) surface.
Methods: Patients (age ≥ 18) without any systemic or local contraindications to implant therapy, who were missing at least one tooth in either posterior maxilla or mandible, were included in the present study. Each subject received a Straumann Roxolid® dental

implant with a SLActive® surface (diameter: 4.1, 4.8 mm; length: 8, 10, 12 mm) to support a single fixed restoration. All implants were placed in fully healed sites with a bone density ranging from type I to type III. An ISQ > 65 was adopted as a critical value for early loading protocol. Healing caps were inserted at time of surgery and provisional restorations and abutments were placed after 3 weeks in mandible and 4 weeks in maxilla. Permanent fixed single crowns were applied after 3 months of loading. Primary outcome was marginal bone loss from baseline (implant insertion) to 12 months; the secondary endpoints were implant survival and success rates. Standardized periapical radiographs were obtained at the time of implant placement, at implant loading and 1-year after implant loading. The marginal bone level was determined using a dedicated software and expressed as the distance from the implant shoulder to the first bone-to-implant contact on the mesial and distal side of the implant. The mean values were obtained for each implant. The MBL from implant placement to 1 year of function was calculated.

Results: A total of 28 implants were placed in 28 patients (14 men and 14 women, age 51.6 ± 14.8 years). One implant was excluded from the study because it didn't achieve critical ISQ value of 65 and a different loading protocol was adopted. No implant failures or technical complications were recorded after a 12-months follow up, giving an implant survival and success rates of 100%. The mean MBL after 1 year was 0.32 ± 0.22 mm.

Conclusions: Within the limitations of this study, the results showed that Straumann Roxolid® implants with a SLActive® surface are a safe and predictable treatment option in case of early loading procedures. It ensures a faster functional and aesthetic restoration compared to conventional loading. Despite the more aggressive protocol, favorable clinical-radiographic outcomes were observed after a 12-months follow up in case of single tooth restoration in premolar/molar regions. Further clinical studies with larger population and longer follow-up are required to confirm our findings.

Orbital and periorbital emphysema following maxillary sinus floor elevation: case report

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Aim: During the past 150 years, subcutaneous emphysema has been described as a rare complication in dentistry. Its etiology resides in maneuvers performed by the patient or the dental professional. Irrespective of etiology, air is forced through the soft tissues, thus producing rapid swelling of the area. The present report describes a case of orbital and periorbital emphysema (OPE) occurred in the early post-surgery phase of a maxillary sinus floor augmentation procedure.

Methods: In the right maxillary posterior area of a 49 year-old, non-smoker caucasian woman, the third and second molars and the distobuccal and palatal roots of the first molar had been extracted 10 years earlier, and the patient was willing to rehabilitate the area with a fixed prosthesis. The oral rehabilitation plan included the placement of an implant distal to the residual root of the first maxillary molar. The residual bone height of 4 mm, as evaluated by computerized tomography, prevented the insertion of an implant of the desired dimensions. Therefore, the patient underwent a bone augmentation procedure. A 10x8 mm window was prepared by abrasion of the lateral bony wall of the maxillary sinus with a piezoelectric instrument. The Valsalva maneuver, as assessed immediately after preparation of the lateral window or elevation of the sinus membrane, was negative. The space underneath the elevated membrane was grafted with a bovine-derived xenograft. A 9.5 mm-long and 4.0 mm-wide implant was placed. Primary stability was obtained, and a healing screw was placed. Then, a second xenograft apposition was placed buccal to the implant fixture to seal the lateral access to the sinus. The total amount of xenograft used was 2.5 g. The lateral window was covered by a 13x25 mm resorbable collagen membrane without fixation devices. A submerged healing protocol was adopted.

Results: On the first day after surgery, the patient presented urgently referring that she had roughly blown her nose a few hours after surgery. This maneuver had been immediately followed by rapid swelling of the right side of the face at the level of the periorbital and orbital area. Antibiotics were prescribed and the patient was instructed to continue the prescribed anti-inflammatory therapy. An ophthalmologic visit was performed at 2 days after surgery. No alteration of visual acuity was detected. At 2 days after surgery, facial swelling had decreased substantially and a residual erythema of the sclera was observed with complete remission of the eye vesicles. The complete remission of the clinical signs of OPE was observed at 10 days after surgery. At 6 months after implant surgery, the implant was successfully loaded.

Conclusions: The present case report showed that OPE can occur from nose blowing after maxillary sinus augmentation and concomitant implant placement. OPE resolved without professional interventions (i.e.: surgical drainage) and did not affect the success of the augmentation procedure or the implant-supported rehabilitation.

Implant prosthetic rehabilitation in HIV-positive patients: a comparison of two different implant surface roughness

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Aim: The aim of this study is to compare the clinical and radiological outcome of implants with different surface roughness in HIV controlled patients.
Methods: Partially or completely edentulous HIV patients showing adherence to antiretroviral drug regimen and good oral hygiene that could benefit from implant prosthetic restorations were enrolled in the present study. Each patient received at least one dental implant and two different types of implant surfaces were compared: one group of implants had an higher roughness surface (Microrough surface MRS) and the other one was electrochemically treated, with low roughness surface (Full Contact Covering Surface FCC). The surgeon was blinded to the type of implant surface used. Depending on patient requirements, single implants or full arch rehabilitations, immediately loaded according to the "All on four" protocol, were performed. Re-entry procedures for healing abutment placement have been carried out for single implants at least after 50 days from implant placement. Follow-up visits were scheduled at 6 (T1) and 12 (T2) months after implant insertion and included both radiographic assessments of bone level around the implants and clinical parameters evaluation (plaque accumulation and bleeding index). Survival criteria for implant were presence of implant stability, absence of radiolucent zone around the implants, no mucosal suppuration, and no pain. One year follow-up after implant insertion was considered.
Results: Implants were placed in 59 patients and the overall number of fixture was 208. Twenty-six "All on four" complete-arch rehabilitations (104 fixtures) and 104 single implants were achieved. For single crowns and fixed partial dentures, definitive metal-ceramic restorations were cemented onto the definitive abutments. In the rehabilitations according to the "All-on-four" protocol, a screw-retained full-arch prosthesis was positioned few hours after surgery. Low incidence of complications and good survival rates with Marginal Bone Level (MBL) outcome were recorded after one year follow up. Mean marginal bone levels measured at T1 were 0.82 ± 0.21 mm for FCC implant surface and 0.90 ± 0.42 mm for MRS implant surface and at T2 were 0.89 ± 0.32 mm for FCC implant surface and 0.99 ±0.45 mm for MRS implant surface. Not statistically significant differences were found between the two different implant surfaces (P>0.05). Implant failure occurred in 3 patients (6 fixtures out of 208): one patient developed early implant failure due to primary infection, the other two lost their implants due to peri-implantitis. The implant survival rate was 100% for FCC implants and 95,3% for MRS implants. In all cases an absence of fractures of the acrylic resin superstructure was found.
Conclusion: Within the limitations of the present study, due to the short follow-up and the number of implants, low roughness implant surface seems to be less susceptible to primary infection and peri-implantitis, in immunocompromised but immunologically stable patients, compared to microrough surface. However, not statistically differences were found and further studies are needed to investigate the correlation between implant surface roughness and survival rate in HIV positive patients.

Survival rate of "all-on-four" rehabilitations in hiv-positive patients

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Aim: The aim of this study is to evaluate the survival rate of "All-on-four" rehabilitations in HIV-positive patients, recruited at San Luigi Center for Infective Disease, I.R.C.C.S. San Raffaele Hospital, Milan.
Methods: In this study 17 immunocompromised but immunologically stable patients were included. Patients were partial or total edentulous. All of them required an implant prosthetic restoration of one or both jaws. The "All-on-four" protocol was followed; 4 implants were placed in maxilla and/or mandible, 2 mesial implants placed axially and 2 distal implants placed tilted (from 30° to 45°). Pre-operative evaluation was both clinical and radiological. Each patient underwent implant placement and immediate loading in the same day, obtaining aesthetic and function. Implant insertion was considered with one year follow-up. Follow-up visits included radiographic assessment of bone level and clinical parameters and were performed at 6 and 12 months.
Results: Implants were placed in 17 patients, with a total amount of 104 implants. 6 patients received rehabilitation of both jaws, 2 patients were rehabilitated only in the mandible and 9 patients were rehabilitated in the upper jaw. Mean marginal bone levels (MBL) were recorded at 6 and 12 months. At 6 months the mean MBL in axial implants was 1.01 +/- 0.81 mm while in tilted implants was 1.23 +/- 0.32 mm; at 12 months the mean MBL was 1.17 +/- 0.43 mm in axial implants and 1.31 +/- 0.21 mm in tilted implants. Not statistically significant differences were

found between axial and tilted implants over time. An high long-term survival rate was achieved. Implant survival rate was 94,24%. Implant failure occurred in three patients, six months after the immediate loading. One patient lost all four implants, while the other two patients lost only ones, with a total amount of 6 implants failed. At a later time, all implants were re-placed. In comparison with previous studies a better survival rate and better marginal level were measured.
Conclusion: Within its limitations, this study shows that the "All-on-four" protocol represents a predictable treatment for the rehabilitation of completely edentulous jaws in HIV-positive patients. It shows the advantages in function and aesthetic for the immediate loading. Furthermore, patients have a higher degree of satisfaction compared to removal prothesis. However, further studies are needed to analyze medium and long-term follow-up data.

Clinical and radiological evaluation of a new conical connection implant in immediate loading: a prospective study with 18-months follow-up

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Aim: The present study aims to evaluate the rate of survival rate of immediate loading implants characterized by an internal conical connection with a double taper principle.
Methods: A total of 89 patients, aged between 27 and 78 years old, of which 40 female and 49 male, were enrolled in this study at the Department of Dentistry, IRCCS San Raffaele hospital in Milan. 57 patients required and immediate loading implant-prosthetic rehabilitation for partial edentulism and 12 patients for total edentulism. The following exclusion criteria were applied: the absence of any active infection or severe inflammation in the areas intended for implant placement, presence of chronic system disease, smoking more than 15 cigarettes per day, a bruxism habit, and poor oral hygiene. The implant used is characterized by an internal connection with a double taper principle. The first taper is an internal cone used to support and close the prosthesis combined with an internal hexagon. The second taper is an interaction surface between the prosthetic abutment and the head of the tightening screw, which is conical itself. Implants were positioned in post extraction sockets or healed bone, and were both considered single rehabilitations, then fixed partial rehabilitations on 2 implants, followed by full arch rehabilitations according to the "all on four" procedures. Radiographical and clinical follow up were performed before surgery, and at 1, 3,6, 12, 18 months after implant placement; keratinized mucosa width (KM), modified bleeding index(mBI), Modified Plaque Index (mPI) were analyzed.
Results: In total, 40 single implants, 34 implants in fixed partial rehabilitations and 128 in "all on four" rehabilitations were placed with the "all on four" technique. In each case immediate loading protocol was performed. A 18 months follow-up, no complications were observed and the survival rate of implants was 98.02%. No fracture on temporary prosthesis , no mobility due to the prosthetic unscrewing of the provisionals were observed,. Radiographic examinations, showed stable bone levels over time (Marginal Bone Loss: for immediate loading 0.13 $\pm$ 0.05 mm, for all-on-four technique 0.11 $\pm$ 0.08 mm).
Conclusion: Within the limits of this study, the new implant showed a high success rate and no incidence of prosthetic complications when applied in immediate loading.

Comparison between 3D model and patient in guided bone regeneration

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Aim: The anterior maxilla has traditionally been seen as a challenge when it comes to successfully placing dental implants. This is due to a combination of poor bone quality, ridge atrophy and bone resorption following extraction. Many techniques are available today for the experienced surgeon to rebuild lost bone, including autogenous onlay block grafts, allograft block grafts, distraction osteogenesis and guided bone regeneration (GBR). Studies in animals and humans have shown that GBR is an effective technique to augment atrophic ridges. Despite the fact that GBR is a predictable procedure, complications can and do arise that may compromise outcomes. The most frequent of these include membrane exposure, fenestration/dehiscence, infection, graft particle leakage, collapse of the grafted site and excessive bleeding. Although GBR has a high rate of success, it is surgically challenging and presents various risks and complications. However careful pre-surgical

planning is crucial and will reduce risk and incidence of complications. Cone Beam Computed Tomography (CBCT) provides greater detail and has become a commonly used diagnostic tool for implant treatment planning. Yet, it can still be challenging to convert the two-dimensional cross sectional images from CBCT into the three-dimensional surgical area.
Methods: Digital Imaging and Communications in Medicine (DICOM) images from the patient's CBCT were converted into STereoLithography (STL) files (OsiriX Lite, Geneva, Switzerland) and transferred to a 3D printer (Formlabs, USA) to generate a polymer model of the maxillary defect. Medical adhesive tape was added to the model to mimic the oral mucosa for a more realistic simulation of the actual surgical environment. This allows to rehearsal the surgical procedure several times before performing it on the actual patient.
Results: 3D-printed models can be used to gain insight and become familiar with a patient's exact anatomy prior to surgical procedures. 3D models can be used for preoperative simulation of the surgical procedure itself, which is advantageous to a surgeon who will perform the procedure. Using such models can aid in reducing surgical time, limiting the amount of soft tissue manipulation, familiarizing the surgeon with the patient's specific anatomy, reducing the risk of intra-operative complications and decreasing the potential for error.
Conclusion: The purpose of this presentation is to compare the use of a 3D printed model to familiarize with the anatomy of the patient prior to the surgery in order to plan and avoid possible complications.

Volabolome real time analysis in implantology

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Aim: The aim of the present study was to investigate the volatile profiles of oral cavity before and after implant surgery. In healthy conditions human body emits a bouquet of odorants termed Volabolome characterizing the physiological status, which are the results of a number of events above all the outcome of endogenous metabolism and symbiotic bacterial activity, including genetic, sex and diet. The Volabolome is the 'scent' of an individual in a given condition, healthy or pathological. Volatile analysis encounters several obstacles due to amount and concentrations of compounds for identification, isolation and quantification as indicative of relevant alterations in clinical status and have required the development of new techniques and analytical methods. However, a growing body of literature reports qualitative and quantitative breath exhaled Volatile Organic Compounds (VOCs). Till now few data are available about the way these compounds are generated after implant surgery. Here we study VOCs presence, amount and variations in implant healing process.
Methods: In the study 35 patients (19 males and 16 females, age ranging from 32 to 50 years, mean age 42 years), with no periodontal disease and needing implant prosthetic rehabilitation, were enrolled. The standard implant site preparation procedure, as recommended by the implant manufacturer (Bone System, Milan - Italy) was used. The real time VOCs analysis was performed immediately before surgery and after 10 days. All recordings lasted 120 seconds, and the sampling rate was 1 Hertz. The recording system used was an iAQ-2000 equipped with a metal oxide semiconductor (MOS) having a sensing range of 450-2000 ppm CO_2 equivalents, which is able to detect a broad range of volatile compounds (both organic and inorganic, e.g., volatile sulfide compounds, alcohols, aldehydes, aliphatic hydrocarbons, amines, aromatic hydrocarbons, ketones, organic acids, and CO), while correlating directly with the CO2 levels. VOCs raw data were subtracted from both the environmental and the oral cavity in order to avoid bias due to VOCs 'contaminants' from these districts; furthermore a data normalization by Log10 transformation were performed. We performed normality test and sample size analysis by using two independent sample t-Test; MANOVA and one way ANOVA statistical analysis, for all α was set at 0.05.
Results: Real time analysis VOCs curves were recorded from all subjects before and after implant surgery. Post-surgery curves showed an increased VOCs amount than the pre-sampled ones. The area below VOCs curve in pre- and post- experimental phase was analyzed; statistical significant difference, $p<0.01$, was found in VOCs concentration between pre- vs. post- surgery values. Further, analysis was performed on VOCs frequencies in pre- vs. post-surgery; the distributions were fitted by two different Gaussian curves with $R2 = 0.95$ for pre- and $R2 = 0.71$ for post-implant positioning. For each patient the frequencies distribution analysis, in the Gaussian curve, returned a healing pattern.
Conclusion: The Volabolome real time analysis in implantology is a helpful, non-invasive, diagnostic tool in order to quickly assess the level of tissue healing in implant positioning.

Lateral approach for sinus floor augmentation:

crestal versus vestibular incision

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Aim: Nowadays Sinus floor augmentation is a predictable bone grafting procedure in cases of alveolar ridge atrophy due to alveolar bone loss. A previous study evaluated the effect of different bone window dimension on the amount of new bone formation, the influence on the surgical times and the postoperative pain. Few information are available about patient's perception outcomes after procedures of sinus floor augmentation. This study aims to compare in a split mouth analysis the differences between two flap designs (crestal and vestibular incision) investigating the post-operative pain and the operative time. Only few cases are examined to investigate the trend of those outcomes.
Methods: 5 patients (4 male, 1 female; mean age 59,8 years old) who had been scheduled for two, left and right, sinus-floor augmentation were asked to enroll in a prospective clinical study. Each patient underwent to two sinus lift during the same surgery. Randomization of treated sites was performed immediately before the surgical intervention. An evaluator registered partial and total time of intervention for both the test and control sites which were respectively reported in seconds and minutes. After the intervention a therapy made of chlorhexidine 0,2% (for 21 days), betamethasone 1mg (3 cprs the first day, than 2 and 1cpr the second and the third day) and amoxicillina + clavulanic acid 875+125mg (2 times a day for 6 days) was given to the patients. Patients were recalled after 7 and 15 days and their opinion was assessed using the VAS. consisted of a 10-cm-long line representing the spectrum of evaluation from 0% (no discomfort at all) to 100% (very relevant discomfort); the distance from the left extremity of the VAS to the mark made by the patient was measured to the nearest millimeter and reported as a value (0–10).
Results: All the surgery has been carried out. Membrane perforation occurred in 2 out 10 sinus lift in two different patients and they were managed using extreme care while continuing membrane detachment and applying a collagen membrane into the sinus cavity. In one case in the immediate postoperative time, the patient reported a submucosal emphysema which regressed spontaneously after 2 days. The great amount of data is not adequate to highlight a statistical difference between the two groups concerning the VAS score. There is not statistically significant difference in the total surgical time ($p>0.05$) between the test and group control; futhermore, no significant ($p>0.05$) differences emerged in the partial time on the preparation of the flap comparing the two groups.
Conclusion: Due to the few information, at this point of the study ,we have no significant results available. However, according to the results, we can see an improving trend of patient's post-operative pain in the test side, probably due to the lower dimension of surgical wound. This kind of flap doesn't seem to affect surgical time, both total and partial.

A clinical study on immediately loaded prostheses with a cast metal framework in reduced number of implants rehabilitations in totally edentulous patients

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Aim: The aim of this study was to compare definitive acrylic resin prostheses with a cast metal framework and definitive screw-retained full arch acrylic resin prostheses without a cast metal framework, both immediately loaded and supported by 4 implants (2 axial implants and 2 tilted implants), in totally edentulous patients after a 3-year-follow-up.
Methods: This study was performed in the Dental Clinic of San Raffaele Hospital in Milan. 54 partially or totally edentulous patients with severe maxillary or/and mandibular atrophy of posterior regions were selected for this study. 12 patients received a total oral rehabilitation of both arches. Only patients with good oral health, with no signs of infection and inflammation and without systemic disease were selected; patients with bruxism or smokers (more than 15 cigarettes per day) were not included in this study. All patients received an immediately loaded definitive prosthetic rehabilitation supported by 4 implants (2 axial implants and 2 tilted implants), for a total of 264 implants placed, according to the "All On Four" immediate function protocol. After surgery, patients were random allocated in order to receive a definitive acrylic resin prostheses with a cast metal framework or a definitive screw-retained full arch acrylic resin prostheses without a cast metal framework: a total of 31 screw-retained full arch acrylic resin prostheses without a cast metal framework and a total of 35 cast metal framework prostheses were delivered to the patients. Follow-up visits were performed up to 36 months after implant insertions and included radiographic assessments of bone level around implants and clinical and prosthetic evaluations.
Results: After a 3-year-follow-up the success rate of axial implants was 98,5%, the success rate of tilted implants was 97,76%, the success rate of maxillary

implants was 97,5% and the success rate of mandibular implants was 98,61%. No prosthetic failure was observed, although 4 non-solidarized prostheses have submitted small cracks in the material. No significant difference was evaluated in the loss of peri-implant tissue between axial and tilted implants, in both arches.
Conclusion: The implant success rate of this study is comparable to the literature rate for the "All On Four" immediate function protocol. These positive results and biomechanical advantages suggest the use of this rehabilitation technique. In conclusion, the same clinical result was found for patients who received a definitive acrylic resin cast metal framework prostheses and for those who received a screw retained full arch acrylic resin prostheses.

The treatment of atrophic alveolar bone crest with mandibular autogenous bone grafts according to Khoury's approach: a clinical and histological study

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Aim: Aim of this study was to describe clinical and histological outcomes of the mandibular autogenous bone grafts according to Khoury's approach.
Methods: Nine patients were consecutively enrolled in this study. Inclusion criteria was a vertical defect of the alveolar crest (>2mm) associated or not with an horizontal defect where dental implants are needed. Patients were treated with vertical bone regeneration according to Khoury's approach. Two pre-surgical values were detected to quantify the dimension of the defect using a CBCT images and the 3D Diagnosis® software: 1. The maximum length between the mesial and the distal bone peak of the defect (M-D line), 2. The maximum depth of the defect, measured as the distance between the M-D line and the more apical spot of the residual alveolar crest. After 8 month of healing, presurgical CBCT images were superimposed with the postsurgical CBCT images using the 3D Diagnosis® software. Four values were registered, taking implants as a reference: 1. The height of the residual alveolar bone crest before the surgery; 2. The height of the alveolar bone crest after the surgery; 3. The obtained increase; 4. The width of the postsurgical alveolar bone crest, measured 1mm apical to the top of the implant fixture. The tissues detected from bone samples were: 1. Total Bone Volume, 2. Non Vital Bone, 3. Mineralised Bone, 4. New Bone, 5. Soft Tissue.
Results: Nine patients were enrolled in this study (4 men and 5 women), aged between 40 and 63 years old (average 52.7 +/- 7.7). No drop out were recorded. Six defects were maxillary while three were mandibular. The average of the M-D line was 26.9 +/- 7.4 mm. The average height of the defect was 6 +/- 1.5 mm. After 4 month of healing, 21 implants were insert and 12 bone samples were collect for the histological analysis. From the radiological analysis, resulted that: 1. The average height of the residual alveolar bone crest before surgery was 5.6 +/- 3.7 mm, 2. The average height of the alveolar bone crest obtained after the surgery, measured after 8 month of healing, was 12.11 +/- 3.7 mm, 3. The average increase obtained was 5.6 +/- 2.8 mm, 4. The average width of the alveolar bone crest, measured 1mm apical to the top of the implant fixture, was 8.1 +/- 2.3 mm. All of the 12 bone samples, taken from the regenerated site, were suitable for the histological analysis and it resulted that: 1. The average percentage of the bone volume was 53 +/- 16%, 2. The average percentage of the non-vital bone was 0.30 +/- 0.34%, 3. The average percentage of mineralized bone, corresponding of the graft bone, was 58.76 +/- 19%, 4. The average percentage of new bone was 63.34 +/- 14%, 5. The average percentage of soft tissue (adipocytes, blood vessels and bone marrow) was 31.32 +/- 11%.
Conclusion: Khoury's technique proved to be effective in increasing bone quantity on atrophic crest. The bone tissue obtained was extremely vital thanks to the use of the bone chips, collected using a bone scraper from the bone graft, that seemed to allow a more, better, faster and complete blood vessel's penetration inside the bone graft. This let to maximise the osteogenic property and the regenerative capability and, as a result, a high percentage of vital bone.

Oral rehabilitation of fully edentulous patients according to the "all on four" protocol at the Dental Clinic, Department of Dentistry, San Raffaele Hospital, Milan

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Aim: The aim of our study was to evaluate the survival rate of "All on four" rehabilitations in patients referred to the Dental Clinic of San Raffaele Hospital, Milan. This unit is aimed to devolve effective and efficient care for poorer and/or unhealthy social classes, ensuring quality service and excellence. In this context, Undergraduate and Postgraduate students have the opportunity to work safely, under the supervision of

highly skilled doctors and tutors.
Methods: Fully edentulous patients or with a severely compromised natural dentition, as a consequence of deep caries or severe periodontitis, both in compromised and healthy conditions, requiring an implant prosthetic restoration of one or both of the jaws, were included in the present study. Each patient received at least one fixed full-arch maxillary rehabilitation. Four implants were placed in each jaw according to the "All on four" treatment concept: 2 mesial implants placed axially, 2 distal tilted implants to shorten cantilever. Immediate loading protocol was achieved in order to obtain immediate function and aesthetics on the same day of surgery. Follow-up controls were performed at 3 (T1) and 6 (T2) months after implant insertion and included both radiographic assessments of bone level around the implants and clinical parameters evaluation. According to Albrektsson & Sennerby, survival criteria for implants were the presence of implant stability, absence of radiolucent zone around the implants, absence of mucosal suppuration and no pain.
Results: Implants were placed in 11 patients and the overall number of complete-arch immediately loaded prostheses was 15 (60 implants). Four patients received rehabilitation of both jaws, four patients received a maxillary rehabilitation and three received a mandibular rehabilitation. Low incidence of complications and medium-term survival rates were recorded after six months of follow-up. Implant failure occurred in 1 patient (1 fixtures out of 60), and the implant survival rate was 98,4% (100% for axially positioned implants and 96,8% for tilted implants). Prosthetic provisional failure occurred in 2 patients.
Conclusions: Within the limitations of our report, the "All on four" treatment concept is a viable procedure for the rehabilitation of fully edentulous patients, showing the advantages of both the immediate loading, which allows immediate function and aesthetics, and the full-arch fixed prosthetic restoration, with a higher patient satisfaction compared to removable prostheses. However, there is still a lack of consensus and long-term data in the modern literature; further studies with larger samples size and longer follow-up should be carried out to validate and strengthen our conclusions.

Clinical efficacy of using plasma-argon treated versus steam-cleaned or chlorexidine-disinfected abutments: a triple-blind randomized trial

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Aim: Previous studies suggested the inflammatory response at the implant-abutment interface as a possible cause of bone remodeling around implants. Some authors focused on the importance of abutment sterilization because its surface touches hard and soft tissues. Different methods can be used to clean and sterilize abutments, such as autoclaves, chlorexidine and plasma treatment. Our study aimed to evaluate if the placement of Argon-Plasma treated abutments can influence bone remodeling or peri - implant clinical parameters compared to the placement of autoclaved or chlorexidine-disinfected abutments.
Methods: This is a single-center (IRCCS San Raffaele Hospital, Milan, Italy), triple-blind, randomized, controlled study. It included patients needed an implant-prosthetic rehabilitation of one or more elements in the mandible or maxilla, on which it was possible to make a bridge with at least one intermediate element between two abutments. All patients were older than 18 years, not affected by systemic diseases, without pathological periodontal pockets. They didn't smoke, or smoked less than 10 cigarettes per day. Their alveolar bone volume allowed the insertion of one implant with a minimum diameter of 3.3 mm and a minimum length of 8.5 mm. Patients pregnant or breast-feeding, taking biphosphonates, with acute infections in progress or requiring bone regeneration were all excluded. For each patient, in an edentulous site (at least 3 months from extraction) one or more implants separated by an intermediate element were placed and a biphasic protocol was applied. In this protocol we considered three groups of patients. After the reopening (which toke place at 3 months), the abutments were placed: in the first group were autoclaved, in the second one disinfected with chlorexidine, while in the last one were treated with Plasma Argon system. A blind operator, after the placement of the abutment, estimated radiologically the peri-implant bone remodeling and clinically the following periodontal parameters: Keratinized Mucosa height (KM), modified Bleeding Index (mBI), modified Plaque Index (mPI), Probing Depth (PD).
Results: Till to date 67 patients were included to our study. A total of 78 dental implants were inserted. Only 1 implant was removed and replaced due to primary failure. No prosthetical complications occurred. 69 implants were definitely loaded and 7 were provisionally prothesized. No significant differences in radiographic bone remodeling and peri-implant tissues between the three groups of patients were found from these results.
Conclusions: Our clinical and radiographical results suggest no significant differences among the three groups of patients. However, probably the follow-up considered didn't allow a valid examination of the relationship between abutments' different treatments, bone remodeling and peri-implant tissues' health.

Survival rate and bone resorption in the immediate loading of atrophic maxilla rehabilitated with long implants

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Aim: No studies have analyzed the effectiveness of long tilted implants (18-20 mm) in the immediate loading rehabilitation of low quality bone. The aim of this prospective study was to estimate the survival rate and peri-implant bone resorption over time around long implants (18-20 mm) in full-arch immediate loading rehabilitations of edentulous maxillae in low quality bone sites (D3-D4).
Methods: Between May and September 2014 a sample of 48 patients referred to the Division of Implant and Prosthetic Dentistry of the University of Genoa was selected. Patients were fully edentulous in the superior maxilla or with seriously compromised teeth, with bone atrophy in the posterior areas and low bone quality, comprised between D3 and D4. They were treated with an immediate implant loading protocol. Four dental implants were inserted: 2 normal (10-15 mm long) or longer implants in the anterior maxilla and 2 long (18-20 mm) tilted implants in the posterior maxilla, mesial to the anterior wall of the maxillary sinus. Intraoral periapical films were accomplished to assess interproximal bone levels at the time of prosthesis delivery (T0) and at the 24-month follow-up appointments (T1). Differences in the absolute change of bone resorption over time were assessed comparing the following variables: implant side (mesial vs. distal), implant site (anterior vs. posterior), implant length (long vs. normal implants), performing a Mann-Whitney U Test.
Results: Forty-five patients (26 male, 19 female) with an average age of 64 years (range: 41-91) were identified. Patients were rehabilitated with a total of 186 dental implants and the mean follow-up period was 24 months (range: 23-26). Two long distal implants (18 mm) failed after 1 month in two different patients. No significant difference in bone loss ($p = 0,68$) over time between the two sides of the implants (mesial and distal) was found. A statistically ($p = 0,011$) significant difference in bone resorption between anterior (mean: 0,9 mm) vs posterior (mean: 0,8 mm) implant sites was found. A slightly statistically significant ($p = 0,053$) difference in bone resorption between long (mean: 0,7 mm) and normal implants (mean: 1,1 mm) was found.
Conclusions: The use of long tilted implants (18-20 mm) seems a viable tool in low quality bone (D3-D4), and they presented low bone resorption at the 2-year follow-up. However, their use implicates higher surgical difficulty and a proper learning curve is necessary.

The effect of autologous platelet concentrates on alveolar socket preservation. A systematic review

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Aim: Prevention of alveolar bone resorption after tooth extraction may be useful for implant rehabilitation of the edentulous site minimizing the need for augmentation procedures. A number of studies have investigated the efficacy of autologous platelet concentrates for the preservation of the alveolar bone volume after tooth extraction. Although encouraging results have been published, the available data are still controversial. The aim was of the present systematic review was to assess the effect of platelet concentrates on alveolar socket preservation after tooth extraction.
Methods: A literature search in PubMed and in the Cochrane Central Register of Controlled Trials, was carried out on February, 2017 using an ad hoc created search string by two independent and calibrated reviewers. Prospective controlled trials, in which a test group using exclusively a platelet concentrate was compared with a control group in which extraction sockets were left to heal spontaneously, were included. The requested follow-up was at least 2 months. Subjects considered eligible for the study were free of systemic diseases and there was not restriction on age or number of patients. Studies on animals, case reports, case series, retrospective studies, technique descriptions, and narrative reviews, as well as studies that included the extraction of impacted third molars, were excluded.
Results: The initial search provided 130 articles. After screening titles and abstracts, eliminating duplicates, evaluating full-texts for eligibility criteria, seven studies published between 2010 and 2016 were included. A great heterogeneity was found in terms of study design, methodological aspects and outcome evaluation, so that a meta-analysis of data from these studies could not be carried out.
Conclusion: Although there is some evidence that the use of autologous platelet concentrates after tooth extraction may be beneficial in terms of accelerated soft tissue healing and reduced postoperative pain and discomfort, data about hard tissue healing are still controversial. A better standardization of

experimental design and methods, including type and location of teeth to be extracted, cause of extraction, measurement techniques for alveolar bone changes monitoring, favouring more sensitive technologies, such as Cone Beam Computed Tomography scan, should be addressed by researchers in order to provide a solid base for the comprehension of the real clinical effect of autologous platelet concentrates on alveolar socket preservation after tooth extraction.

Histological features of sinus bone regeneration failures related to peri-implantitis

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Aim: Different and relatively rare complications, leading to the failure of the graft, may occur after sinus bone regeneration: infection and inflammatory reaction, movement of the implant inside the sinus, formation of an insufficient bone quantity, and the production of an oroantral fistula. The aim of this case series was to evaluate, from an histologic and histomorphometric point of view, the effects of peri-implant infections on the surrounding grafted sinus biomaterials.
Methods: From a sample of three hundred twenty-nine patients treated between July 2008 and May 2014 at the Department of Medical, Oral and Biotechnological Sciences of the University of Chieti, for maxillary posterior atrophy with sinus augmentation procedures and implant rehabilitation, only five patients (3 women and 2 men, mean age: 56 years, range: 49 to 64 years), treated with a total of 19 implants placed in grafted sinuses, showed a loss of implants for a peri-implant infection, after 5 years of loading. Intraoral examination revealed edema and redness in two cases and edema with sinus tract formation in another case. Each of the five cases presented showed an implant with clinical and radiographic signs and symptoms of peri-implantitis (presence of plaque, bleeding on probing, purulent discharge from the site, presence of a pocket depth higher than 6 mm, and bone loss beyond physiologic remodeling). Removal of infected implants from augmented sinuses did not result in resolution of the infection. All five patients showed persistence of the infection and reported severe pain in the sinus area, 3 to 4 weeks following implant removal. In all cases, surgical curettage of the affected maxillary sinuses was performed. The inserted biomaterials (phycogenic hydroxyapatite in two cases, porcine bone xenograft in two other cases and anorganic bovine bone in one case) and the accompanying inflammatory tissue infiltrate were totally removed with curettes. The sample was stored immediately in 10% buffered formalin and sent for histopathologic examination. The maxillary sinuses were filled with an autologous platelet gel.
Results: In all five cases. Necrotic bone was found lining the different biomaterial grafts. Macrophages and inflammatory cell infiltrate were observed around the grafted particles. No blood vessels were observed. Histopathology showed the presence of a few autogenous bone particles located within the grafted material. In some fields, newly formed bone was lined by a rim of osteoclasts and many inflammatory cells as well as areas of necrosis. Resorption phenomena of the grafted material were observed. Necrotic compact mature cortical bone was present in many areas. Newly formed bone was found around and between the grafted biomaterial particles. No gaps were observed at the bone-biomaterial interface. The microblocks of graft materials and newly formed bone were surrounded by necrotic tissues, inflammatory cells, and bacteria. The bacteria were also present inside the bone grafts.
Conclusions: The clinical data, particularly the histologic pattern, were similar in all five clinical cases and across all three biomaterials analysed. The inflammatory reaction does not seem to be related to a particular biomaterial. Peri-implant infections can spread from the implant surface to the entirety of the maxillary sinus graft. Complete removal of all infected bone graft material is the treatment of choice in such cases. Removal of the implants and systemic antibiotics therapy are not enough to eradicate the infection in this necrotic tissue.

Alveolar ridge dimensions in mandibular posterior regions: a retrospective comparative study of dentate and edentulous sites using computerized tomography data

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Aim: To comparatively evaluate ridge dimensions at edentulous and dentate mandibular posterior sites.
Methods: Computerized tomography scans of 45 patients (22 males; mean age: 54.5 ± 10.9 years, range: 24–71 years) with one edentulous lacuna (including

at least two adjacent teeth among second premolar, first molar and second molar) and the contralateral dentate sites were analyzed. On the panoramic slice of each CT scan, a digital line parallel to the CT scan plane was traced passing through the CEJ of the homolateral canine or first premolar. This digital line was visualized on the section of interest (SOI) of dentate and edentulous sites as a reference point (P) to perform vertical linear measurements. On the SOI of edentulous and contralateral dentate sites, the following recordings were performed: relative ridge position (rRP), measured as the distance (in mm) from P to the most coronal point of the alveolar crest (in dentate sextants) or the ridge (in edentulous sextants) (hcrest); bone height (BH), measured as the distance (in mm) from hcrest to the most coronal point of the inferior alveolar canal; bone width (BW), measured as the width (in mm) of the alveolar crest recorded 1 mm (BW1mm), 3 mm (BW3mm) and 5 mm (BW5mm) apically to hcrest; alveolar canal height (ACH), measured as the distance (in mm) from the most coronal point and the most apical point of the inferior alveolar canal; basal bone height (BBH), measured as the distance (in mm) from the most apical point of the inferior alveolar canal to the inferior border of the mandible.

Results: At all positions (i.e., second premolar, first molar and second molar), edentulous sites showed a significantly higher rRP, a lower BH, and a lower BW1mm compared to dentate sites. BW3mm and BW5mm were significantly lower at second premolar and first molar edentulous sites compared to their dentate counterparts. At first molar and second molar, edentulous sites showed a significantly lower ACH compared to dentate sites ($p \leq 0.001$). The mean difference in BH, rRP, BW1mm, BW3mm and BW5mm between dentate and edentulous sites was not significantly different between males and females. The proportion of patients with sufficient bone dimensions for implant placement without any bone augmentation procedure was 45.8%, 75.5% and 72.4% at second premolar, first molar and second molar edentulous site, respectively. The proportion was always lower in females than in males.

Conclusions: In the posterior mandible, edentulous sites showed lower bone height when compared with contralateral dentate sites. Second premolar and first molar edentulous sites exhibited lower bone width than dentate sites at all positions (i.e., 1, 3 and 5 mm apical to the bone crest), while this difference was more attenuated at second molar sites. The magnitude of the difference between edentulous and dentate sites seems not to be dependent on gender.

Effects of instrumentation, pressure load and bone density on heat production during implant site preparation in porcine bone

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Aim: The aim of this study is to evaluate, in an ex-vivo animal model, the influence of the instrumentation, pressure load (PL) and bone density (BD) on bone heating during implant site preparation (ISP).

Methods: 40 implant sites were prepared in porcine ribs with two different cortical thickness representing D2 and D4 classes according to Misch. Porcine ribs were fixed in a special thermal bath that keeps a constant temperature of 37°C, simulating human body temperature. Sites were performed with a conventional drill system (Intrasurg® 300, KaVo Dental GmbH, Biberach an der Riß, Germania) and a piezoelectric device (Piezosurgery® 3, Mectron s.p.a., Carrasco, Italia). In order to allow passive, standardized and reproducible ISP, handpieces were positioned in a wood support that can only move vertically depending on the pressure load applied (500g or 1500g, depending on the study group). A round bur, a 2-mm pilot drill and a 3-mm pilot drill were used in sequence for ISP with conventional drill system, drill speed of 1.100rpm and saline external irrigation of 50mL/min at room temperature. Three different inserts (OP4, IM2P, IM3P) were used in sequence for ISP with piezoelectric device, IMPL mode and saline external irrigation of 50mL/min at room temperature. Implant sites were randomly divided into the following 8 groups of 5 samples according to instrumentation used, pressure load and bone density: Group 1: conventional drill system, BD D4, PL 500g; Group 2: conventional drill system, BD D4, PL 1.500g; Group 3: conventional drill system, BD D2, PL 500g; Group 4: conventional drill system, BD D2, PL 1.500g; Group 5: piezoelectric device, BD D4, PL 500g; Group 6: piezoelectric device, BD D4, PL 1.500g; Group 7: piezoelectric device, BD D2, PL 500g; Group 8: piezoelectric device, BD D2, PL 1.500g. The bone temperature rise was recorded by two thermocouples connected to a digital thermometer with an accuracy of 0.1 °C, set at a distance of 1mm from the final osteotomy at a depth of respectively 5mm and 10mm. Sample size was calculated and for the statistical analysis was used a two-way ANOVA with SPSS Statistic.

Results: The greatest rise of average temperature was observed in group 5, during ISP with the piezoelectric device and PL of 500g in D4 porcine ribs ($\Delta T = 21.78 \pm 11.98$°C) while the lowest was observed in group 3, during ISP with the conventional device and PL of 500g in D2 porcine ribs ($\Delta T = 0.06 \pm 0.10$°C).

The use of piezoelectric device caused statistically significant temperature increase ($p<0.001$) compared to the use of conventional drill system and in 77% of measurements temperature exceeded the threshold of 47°C indicated by Eriksson & Albrektsson to avoid irreversible bone damage. Pressure load ($p=0.161$) and bone density ($p=0.125$) didn't significantly influence the temperature increase.
Conclusion: Many variables were studied as possible factors influencing early phases of osseointegration, among which bone heating has a paramount importance. Surgery techniques can highly influence bone heating and piezosurgery had shown conflicting results on this topic. In this study, piezoelectric device caused higher temperature increase than conventional drill system, which may be explained by longer time spent for ISP. Within the limits of the present study, bone heating during ISP is primarily influenced by the instrumentation used, while pressure load and bone density seem to play a minor role.

Clinical evaluation of immediate loading post-extractive implants placement in aestethic zone: cases report

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Aim: The purpose of this study is to evaluate the clinical and aesthetic outcomes of single post-extractive implant in the anterior maxilla whit and without the use of a computer aided surgical guide.
Methods: In the first case, after the tooth extraction, the implant was added by the use of a surgical guide and immediately non-occlusally loaded. A patient Pre-surgical TC and a scan of the diagnostic wax up were matched on the NobelClinician® software to allow the clinician to pre visualize the ideal prosthetic result. Implant position was virtually planned, in order to obtain a prosthetically correct angulation and depth of the implant. Implant placement was obtained through the use of pilot drill stereolithographic surgical guide. In the second case, the post-extractive implant insertion was obtained without the aid of the surgical guide. A buccal flap palatally sliced was elevated in order to expose vestibular and palatal walls of the alveolar socket. An handmade acrylic resin occlusal mask was produced in the second case to give the technician the final implant position. Conventional impression technique with coping and impression tray was taken for the second case.The temporary crown was than inserted out of occlusal function and will remain in place for 6 months prior to initiation of definitive restorative therapy. The space between implant and bone wall was grafted by eterologous bone chips covered with a collagen resorbable membrane for both the cases.
Results: In the first case the implant was inserted with more than 40 Ncm torque. Thanks to the the surgical guide, the implant position wasn't influenced by the alveolar socket and it was placed palatally and 3mm below the CEJ of adiacent teeth. After 6 month from the surgery the patient showed a good maintenance of bone and tissue levels. In the second case, the implant was inserted with 50 Ncm Torque. Final implant position was 3 mm under the CEJ of adiacent teeth. A correction of the vestibular soft tissue was necessary to overcome the absence of keratinized mucosa. With the temporary crown immediately non-occlusally loaded, it was possible a progressive implant function with a correct maintenance of gum parable.
Conclusion: This prospective study shows that single post-extraction implant performs clinically and aesthetically well under immediate non-occlusal loading conditions in the anterior maxilla. The use of computer guided template has simplified the implant insertion procedures and the subsequent prosthetic steps, sharing with the technician the estimated implant position before surgery. The NobelClinician® system was able to process the diagnosis, treatment planning and implant placement based on restorative needs and surgical requirements. The temporary crown has enabled a recovery both functional and aesthetic of the anterior region of the upper jaw.

Split crest and implants placement in Kennedy's Class III: comparison of two surgical techniques

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Aim: Alveolar crest-splitting and horizontal distraction is an established surgical technique to enable implant insertion into the narrow, lateral atrophic alveolar crest. The ridge split technique consists of splitting the vestibular and buccal cortical tables creating space with osteotomes. Splitting is classically performed with chisel and hammer or with rotating or oscillating saws or with ultrasonic instruments. This surgical technique is challenging for the oral surgeon and restricted to crest-widths of 3 - 5 mm: significant procedural bone loss at osteotomy, the need to prepare a full thickness mucoperiostal flap and milling a baseline osteotomy

to weaken the bone for distraction inhere significant risks of accidental fractures. Aim of the study was to investigate differences between Piezotome Crest Splitting without vertical cute and manual technique with vertical cuts.

Methods: 10 cases of split mouth (groupA) , Kennedy's class III with Piezotome technique and 10 (groupB) with ERE technique but with partial thickness flap. 40 implants were inserted simultaneously and clinical parameters such as intrasurgical complications, patient morbidity, implant loss and vertical bone loss (VBL) in the first three years after surgeries were recorded comparing sites with less than 2 mm width with sites of more than 2 mm.

Results: At the 12-month evaluation, in CIG, the peri-implant crestal bone loss showed an average of 1.08 ± 0.77 mm for Implants placed after Piezo-splitting and 1.09 ± 0.32 mm for implants of second group. In DIG, a mean peri-implant crestal bone loss of 1.13 ± 0.66 mm for group A and 1.06 ± 0.91 mm for group B. No statistically significant difference (P > .05) in crestal bone loss between two groups was detected at the 6- or 12-month follow-up in either arch. Likewise, no statistically significant difference was found between CIG and DIG. After three years a significant difference (p = 0.24) of VBL could be observed between the group with less than 2 mm crest-width (mean: 0.97 mm, max: 2.0 mm/min: 0.0 mm; SD: 0.41) compared with the group with more than 2 mm crest-width (mean: 0.69 mm, max: 1.5 mm/min: 0.0 mm; SD: 0.36) but was still significant lower when compared with the results of similar studies published with a mucoperiostalflap approach and baseline bone-cut. The cumulative 3-year-implant-sur-vival-rate was 98.8%, no accidental fracture of the distracted buccal bone-plate occurred

Conclusion: The results of this study suggest that there are no significant differences between using Piezotome Crest Splitting compared to a manual technique with osteotomes even if using a partial thickness flap in the upper jaw. The procedures is highly predictable and significantly reduces the challenge of surgical skills and leads to negligible patient-morbidity. The higher VBL in crest- widths of less than 2 mm can easily be compensated by subcrestal placement of implants.

Two-year clinical outcomes following therapy of peri-implantitis (PI) using an ER,CR:YSGG laser application

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Aim: The elimination of the causes that gave rise to the perimplantitis (PI) are the complete removal of granulation tissue infected by the implant surface with the sterilization of the surrounding tissues. In the context of therapeutic protocols for periimplantitis proposed by several authors, the Er, Cr: YSGG laser has been shown to have efficient decontamination activities and to facilitate tissue regeneration. Evaluate the clinical outcomes following therapy of PI with adjunctive application of an Er,Cr:YSGG laser application after an observation period ≥ 2 years.

Methods: The monitoring protocol for patients with implants requires a baseline session with the detecting of periodontal probing depths and plaque, the radiological images with high resolution and the periodic follow-up sessions. PI was defined as presence of probing pocket depths (PPD) ≥5 mm with bleeding on probing (BoP) and/or suppuration and ≥2 threads with bone loss after delivery of the restoration. At baseline (BL), 12 patients with 19 implants. All procedures were performed under local anesthesia (2% Mepivacaine with 1:100,000 epinephrine). Implant sites were treated with polishing and US followed by application of a Er, Cr: YSGG laser (settings: 2,780 nm, 2,5W, 30 Hz, 50% water, 40% air) with Radial Firing Perio Tip RFPT 5-14. RFPT is primary radial emission of laser energy with a portion of straight emission, and better access to the narrow part of the peri-implant pocket. This provides more efficient irradiation of diseased or inflamed soft tissue as well as calculus deposits for treating moderate to advanced peri-implant disease. This procedure was performed at Day 0 (i.e., baseline) and the recall every 4 month. Adjunctive antiseptics or adjunctive systemic antibiotics were not prescribed. Warnings & Precautions: doctor, patient, assistant and all others inside the operatory must wear appropriate laser protective eyewear for the 2,780 nm wavelength (OD 4). Use caution when using the tip inside the periodontal pocket. Excessive force could break the tip and inconvenience the patient. Laser protective magnification loupes are recommended for this procedure. The laser triggers microexplosions in the treatment site and surrounding area using water absorption, ensuring efficient disinfection of both the visible and hidden treatment sites. The microexplosions are created when the laser energy is absorbed by the water and the volume expands in the next instant by 800 to 1,000 times. After removal of the contaminated tissue, the microexplosions produced eliminate both the accretion on the implant surface and the contaminated, oxidised titanium layer without affecting the osseointegration. With a curette move aside the gum tissue and checking the accuracy of the cleaning and removing of subgingival concretions

Results: The deepest PPD decreased from 6.9±2.8 mm to 3.5±0.7 mm at vestibular and from 7.0±2.3 mm to 3.9±0.9 mm at lingual/palatal sites respectively.

The % of implants with ≥1 site with BoP decreased from 100% at BL to 41% after 2 years. The % of implants with suppuration decreased from 82% at BL to 0% after 2 years. With x-ray images taken at timed intervals, in the presented cases, could be established after a certain time the satisfactory bone formation and that the periimplant had stabilised.
Conclusion: Mechanical therapy of PI with adjunctive application of an Er, Cr: YSGG laser yielded significant clinical improvements after an observation period of at least 2 years.

Recovery of dental implant anchor after fracture / worn of screw connection

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Aim: In the oral implantology panorama, sometimes parafunctions (such as bruxism and clenching), masticatory overload and incorrect design, cause breakage of the screws that anchor the abutments to implants, resulting in prosthetic failure. At present, we do not have any conclusive guidelines about this problem, we have to remove the implant, which is not always feasible.
Methods: The bioengineering support allows the recovery of the implant and the prosthetic crown with a special kit (Speedy Screw Recovery Kit), which contains a ball burr milling for the removal of the broken connection screw. The alloy of the burr avoids the overheating of the biological tissue during the removal. The calibrated burr prepare the housing of a special threaded bushing which is cemented with an adhesive inert biological cement (Speedybody cement) and a Titanium / Fiberpolymer abutment to restore the prosthetic stump on the system. This abutment is geometrically designed and engineered for the purpose of the implant recovery and allows the reuse of the prosthetic crown to. This abutment allows the dispersion of the masticatory functional load and respect the fixture as it is a resilient viscoelastic material, with physical and mechanical properties of 54 GPa and 300 kJ / m2 with high resistance to fatigue loading. This rescue procedure must be associated to the decontamination of the periimplant tissue, as it is said in the periimplantitis protocols. In this study, we also use the Er, Cr: YSGG laser.
Results: The recovery of these implants, yet well integrated, shows three needs: 1) remove the fractured screw, 2) restore the implant internal thread to create an anchorage, 3) seal perfectly the abutment to the implant. At present you do not have any conclusive guideline of the problem but to remove the implant, not always feasible. The use of this special ball burr to remove the broken screw and the sealing method lead to a functional recovery of the osseointegrated implant, avoiding the previously risk of the development of periimplantitis.
Conclusion: The execution of this recovering method of the prosthetic implant with simple technique, using different biomaterials like titanium and fiberpolymer, taking advantage of their different properties, enable successful, atraumatic, non-inasive and quick recovery, containg costs and promoting patient comfort. Anyway, it is necessary the follow-up of the patient to control the oral health and the peri-implant tissues.

Mesenchimal cells promote endothelial cell migration and organization through a complex crosstalk in co-culture

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Aim: The aim of the present study was to evaluate the biological effects of the interaction between human microvascular endothelial cells (HMEC) and mesenchymal stem cells (MSC) differentiated into osteoblasts, in order to better understand the complex cross-talk mechanisms that happen in co-cultures. For this purpose, we used MSC derived from different tissues: adipose tissue (ASC) and from human deciduous teeth pulp (SHED). These cells were induced to differentiate or not into osteoblasts using an osteogenic growth medium.
Methods: Three different cell types were used: Stem cells from Human Exfoliated Deciduous teeth (SHED), Adipose-derived Stem Cells (ASC) and Human Microvascular dermal Endothelial Cells (HMEC). The flexible Bio-Plex system (Bio-Rad Laboratories, Hercules, CA, USA) was employed to measure the concentration of some specific biomolecules in both MSC: Monocyte Chemoattractant Protein-1 (MCP-1), Interleukin-6 (IL-6), Interleukin-8 (IL-8), Growth-Regulated Alpha protein precursor (GROa), Interleukin-10 (IL-10), Interleukin-12 (IL-12), Vascular Endothelial Growth Factor (VEGF), Hepatocyte Growth Factor (HGF), β-Nerve Growth Factor (β-NGF), Macrophage migration Inhibitory Factor (MIF), Stem Cell Factor (SCF) and Stromal cell-Derived Factor 1-α (SDF-1α). To induce osteogenic

differentiation, both SHED and ASC were cultured in osteogenic media for 7 days by supplementing their normal growth medium with 50 µg/ml Ascorbic Acid, 10 mM ß-glycerophosphate and 0.02 mg/mL dexamethasone. SHED and ASC viability was assessed using the CellTiter-Glo assay. A wound into a confluent monolayer was introduced to investigate cell motility. The ability of HMEC to in vitro capillary-like structures was studied on growth factor-reduced Matrigel (BD Bioscience, Franklin Lakes, NJ, USA).

Results: A first comparative analysis using the BioPlex technology revealed differences between the two MSC types in the basal expression of cytokines, growth factors and interleukins. Moreover, we evaluated cell proliferation and the expression of the main osteoblast differentiation markers (OCN, OPN, BMP-2, BSP-1, collagen type I) to verify the efficacy of the differentiation conditions. Then, both ASC and SHED (differentiated or not) were co-cultured with HMEC to investigate the biological effects exerted on microvascular endothelial cells. To this aim, we investigated proliferation, migration and angiogenic potential in vitro of HMEC. We demonstrated that co-cultivation with endothelial cells in an osteodifferentiating context positively stimulated the biological effects.

Conclusion: Mesenchymal stem cells induced to differentiate into osteoblasts enhance endothelial activation by simulating the process of bone differentiation in which angiogenesis plays a key role. These preliminary data suggest that relatively accessible tissues such as adipose tissue and dental pulp can represent an important source of mesenchymal stem cells, which can be suitable for regenerative medicine, after in vitro osteoblastic differentiation and, in particular, for autologous cell transplant.

A novel surface treatment for dental implant abutments may improve soft tissue cell response

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Aim: The aim of this work was to investigate how anodization and silicon-based amorphous coatings may enhance the adhesion of soft tissue cells to the Ti surfaces. Therefore, the purpose of this study was to determine in vitro the early cell response of human epithelial cells and fibroblasts on the aforementioned surface modifications.

Methods: Ti-Al-V titanium samples were prepared and shaped as 12 - 12 - 4 mm cylinders (l - l - h). Four types of specimens were attained: pristine titanium (Ti, unmodified control), anodized titanium (AnoTi) and two different thin film coatings based on amorphous silicon (a-Si_90 and a-Si_350). Microstructure was studied by means of a Scanning Electron Microscope (Zeiss EVO 50, Carl Zeiss AG, Oberkochen, Germany). The wetting properties were investigated by optical contact angle (OCA) measurements with the sessile drop technique, using an OCAH 200 (DataPhysic Instruments GmbH). To characterize the biological response in vitro, the epithelial cell line HACAT and the fibroblast cell line NHDF (ECACC, Salisbury, UK) were used. Cells were maintained in DMEM supplemented with 10% fetal bovine serum (Life Technologies, Milan, Italy), 100 U/ml penicillin, 100 U/ml streptomycin, were passaged at subconfluency to prevent contact inhibition and were kept under a humidified atmosphere of 5% CO_2 in air, at 37°C. Cell adhesion was evaluated by counting cell nuclei. The proliferation rate was assessed by Cell Titer GLO (Promega, Milan, Italy) according to the manufacturer's protocol at 2 days. Data were analysed by GraphPad Prism6 (GraphPad Software, Inc., La Jolla, CA, USA). Each experiment was repeated at least three times. Statistical analysis was performed by using the Student t-test. A p value of <0.05 was considered significant.

Results: The non-treated Ti cylinders show a quite hydrophilic behaviour, with an average contact angle (CA) value for water and diiodomethane (CH2I2) of 35° and 40° respectively. After the anodization process, a transition toward the hydrophobic regime was found. The a-Si coating is able to impart two opposite behaviours to the surface, according to the difference in the growth temperature of the film. The surface of the cylinders coated with a-Si grown at low temperature (sample a-Si_90) showed nearly the same hydrophobic behaviour with respect to the anodized sample (Ano-Ti), with an average CA of 80° and 49° for H2O and CH2I2, respectively. On the other hand, the wetting behaviour of the high temperature grown a-Si coating (sample a-Si_350) is comparable with the one observed for the untreated Ti samples. HaCaT cells display an increased proliferation level on AnoTi samples whereas NHDF shown a similar proliferation level on AnoTi and non-treated Ti samples, showing a reduced viability on a-Si_90 and a-Si_350. HaCaT shown a high level of adhesion on AnoTi and as-Si_90 samples at both 2 and 24 hours. Furthermore, NHDF cells display a significantly higher adhesion level only on AnoTi sample at both 2 and 24 h.

Conclusion: In conclusion, this work supports the use of titanium anodization as a strategy to enhance the adhesion of soft tissue cells to the Ti surfaces.

Bioactive sphene coatings for dental implant applications

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Aim: Sphene (CaTiSiO5) is a bioactive silicate ceramic which has been recently proposed as coating material for dental and orthopedic applications. The aim of this work is to review the current literatures about the use of sphene ceramic as bioactive coating on titanium implants.
Methods: The Scopus database was used as searching tool to find articles that are published in the English language between 2006 and 2016, about the use of sphene ceramic as coating material for dental and orthopedic implants. The search was executed with various combinations of the following keywords: "implant", "sphene", "titanite", "coating" in the publications title, abstract and keywords. A similar search on Medline (PubMed) was performed for completeness.
Results: Literature review identified 7 published articles which met the inclusion criteria. The publications consisted of 6 in vitro studies and 1 includes both in vitro and in vivo animal study. Sphene ceramics were produced as coatings on Ti6Al4V or commercially pure Ti substrates using the sol-gel method, a hybrid technique of microarc oxidation (MAO) coupled with heat treatment, plasma-spraying, or airbrush spraying. The reported substrate roughness ranged from a minimum of 0.1 µm to a maximum of 2.15 µm. In two articles, in vitro tests were performed using pure sphene ceramic disks. Sphene coatings exhibited improved bonding strength and chemical stability, when compared to hydroxyapatite coatings. In addition, it was demonstrated that sphene was able to support human osteoblast-like cell attachment, spreading and proliferation in vitro study. Also, in vitro response of human osteoclasts and endothelial cells to sphene ceramics at the molecular level was investigated, showing positive results. Finally, in vivo bone formation around Ti6Al4V implants coated with sphene was demonstrated in sheep femurs after 6 weeks, showing bone to implant contact measurements and push-out strength values comparable to that of hydroxyapatite coatings used as control.
Conclusion: Sphene ceramics seem to be safe and promising materials as coating for orthopedic and dental implants. Further pre-clinical studies are needed before clinical application.

The cone morse connection as a prevention to bacterial infiltration: an *in vivo* randomized controlled study

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Aim: The aim of this study was to evaluate the bacterial leakage around Cone Morse connection implants (Implacil, De Bortoli, Sao Paulo, Brazil) and to compare these data with those from implants with an internal or external implant-abutment connection.
Methods: The study was designed as a randomized, controlled study. In each of 18 patients (5 males, 8 females, mean age 61,1±8,41), a single operator (GT) placed a Cone Morse implant and an internal or external implant-abutment connection implant.
After the a period of 6 months, after the final restoration with ceramic or zirconia crowns, a sample of subgingival microbiota was collected.
Inclusion criteria were: No bleeding on probing; No systemic or topical antibiotic therapy in the last 6 months; No radiological signs of peri-implantitis; Last professional hygiene 4 months before the sampling; Good general health and no assumption of drugs.
Microbiological evaluation: All samples were collected using paper swabs by the same operator (AS); the analysis were conducted using a PCR test (Biomolecular Diagnostic, Firenze, Italia). The total bacteria count and the pathogens (aggregatibacter actinomycetemcomitans, porphyromonas gingivalis, tannerella forsythensys, treponema denticola, peptostreptococcus, prevotella intermedia, fusobacterium nucleatum, campylobacter rectus, eikenella corrodens) count were done.Statistical analysis: Mann-Whitney test was used; $p < 0.05$ was considered statistically significant.
Results: For the total bacteria count, the number of bacteria found around Cone-Morse implants was lower than the one found around other implants. The difference was statistically significant (U-value=96;

Z=-2.07233; p=0.03846) .
In the analysis of the pathogens bacteria count, the Cone-Morse implant system had a lower bacterial infiltration than the other group. This difference was stastically significant (U-value=86; Z-score= -2.38871; p=0.01684).
Conclusions: The Cone Morse connection seems to be a valid barrier to bacterial leakage in the peri-implant soft tissues. This fact can explain why Cone Morse connection implants are more to maintain the peri-crestal bone levels and to reduce the incidence of inflammatory events in the peri-implant soft tissues. Studies with a higher number of patients are recommended.

Use of narrow-diameter titanium-zirconium implants (Roxolid®): our experience

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Aim: The aim of this study was to report our clinical experience in the use of narrow-diameter dental implants made by a titanium-zirconium alloy (Roxolid®, Institut Straumann AG, Basel, Switzerland), evaluating primary stability and osseointegration, as well as marginal bone loss levels after one year of functional loading.
Methods: To address the research purpose, a retrospective cohort study was conducted and implemented at the Department of Oral and Maxillo-Facial Sciences. 22 patients, between 53 and 72 years old, received 35 Straumann Bone Level implants (diameter 3.3 mm, SLActive®), all made by a TiZr alloy (15% Zr and 85% Ti) with different lengths (8, 10 or 12 mm). Provisional restorations were performed after 12 weeks, while final restorations (21 single crowns, 7 three-unit bridges) were delivered in an interval of time between 15-16 weeks after placement. The following parameters were evaluated: implant success and implant survival; marginal bone loss (MBL); Resonance Frequency Analysis (RFA) to evaluate ISQ; incidence of implant and prosthetic related complications. According to Buser et al., successful implants can be characterized by the following criteria: absence of persistent pain or dysesthesia; absence of perimplant infection with suppuration; absence of mobility; absence of continuous peri-implant radiolucency. The marginal bone loss was recorded by taking mesial and distal periapical radiographs for each implant and measuring the distance between implant shoulder and the first bone to implant contact. The avarage of mesial and distal MBL values was calculated to obtain a single value for each implant at baseline and after 3,6 and 12 months of functional loading. Resonance Frequency Analysis was also recorded, at the same intervals of time, by an Osstell Mentor™ (Osstell AB, Gothenburg, Sweden) and evaluated in ISQ values (Implant Stability Quotient, Osstell ISQ, Osstell AB), from 1 (low stability) to 100 (high stability). Probing pocket depth (PPD), Plaque index (PI) and Sulcular bleeding index (SBI) were evalueted as clinical parameters before implant placement and during follow-up time. Implant-related complications or adverse events were recorded, if present.
Results: After 12 months implant survival and success rates were 100%. All implants placed showed a normal osteointegration and marginal bone loss (MBL) was -0.29 +- 0.37mm. Medium ISQ values were 73.7+-7.6 (range of 57-83) at surgery, 74.4 +- 6.4 (range of 65-83) after 12 months. During the follow-up period only 3 subjects reported adverse events.
Conclusions: Within the limitations of this study, Roxolid dental implants, thanks to their mechanical properties, offered an optimal resistance to mechanical stress and prosthetic load, despite the use of narrow diameter fixtures.

Threedimensional evaluation of stress over dental implants abutment connection: comparison of different shape and load

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Aim: There is a level of stress, defined as the tolerance limit, below which a biomaterial can be loaded indefinitely, that is, the structure can withstand a number of repeated load cycles over time without there being any failure by fatigue. The aim of this paper is to underline the mechanical properties of dental single crown prosthodontics materials in order to differentiate the possibility of using each material for typical clinical condition and masticatory load. Objective of the investigation is to highlight the stress distribution over different common dental crowns by using computer-aided design software and a three-dimensional virtual model. In this study the biomechanical behavior of prosthetics dental crowns subjected to static loads in contact with the jawbone have been highlighted.
Methods: By using engineering systems of analyses like FEM and Von Mises investigations it has been highlighted the strength over simulated lower first premolar crowns made by chrome cobalt alloy, golden alloy, dental resin and with zirconia. The tooth used in

this study comes from a scan of a real M1 tooth. The scanning file was constituted by a cloud of points and provided information about the surface of the body and not about its internal composition. The recomposition of the material stratification that defines the tooth was processed in environment cad. The intermediate and superficial layers of the tooth, were obtained through scaling and subtraction Boolean operations carried out in sequence; the layer of enamel thus obtained is changed from 0.9 mm to 0.3 mm (the minimum thickness is recorded on the end of the tooth), while the dentin has a thickness ranging between 1.21 mm and 0.5 mm. The prosthodontics crown models have been created and put on simulated chewing stresses. The three dimensional models were subjected to axial and oblique forces and both guaranteed expected results over simulated masticatory cycle. Dental resin presented the low value of fracture while high values have been recorded for the metal alloy and zirconia.
Results: The FEM analysis carried out on the tooth modeled with natural materials was performed in the same conditions described above; although for this specific case the constraint configuration can not be considered as realistic, it was assumed that, in order to have a reliable comparison with the models made of biomaterials, the constrain configurations should be the same.
Conclusions: Clinicians should choose the better prosthetic solution for the teeth they want to restore and replace. Both prosthetic dental crowns offer long-term success if applied following the manufacture guide limitations and suggestions.

Carbon fiber vs. metal framework in full-arch immediate loading rehabilitations of the maxilla – A cohort study

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Aim: The aim of the present study was to compare clinical outcomes of frameworks made of carbon fiber reinforced composite (CFRC) versus metal frameworks in full-arch immediate loading rehabilitations of the maxillae. Implant survival rate, bone loss and prosthetic complications were evaluated. The null hypothesis was that implant rehabilitated with fixed prostheses reinforced with CFRC framework presented the same implant survival rate and bone loss of metal framework reinforced prostheses.
Methods: 42 patients (test group) were rehabilitated with full-arch immediate loading rehabilitations of the upper jaw (total: 170 implants) following the Columbus Bridge Protocol with 4 to 6 implants with tilted distal implants. Resin screw-retained full-arch prostheses endowed with carbon fiber frameworks were delivered within 48 hours. The mean follow-up was 22 months (range: 18-24). The outcomes were statistically compared with those of patients rehabilitated following the same protocol but using metal frameworks (control group: 34 patients with 163 implants - data reported in Tealdo et al. 2014). Differences in bone resorption over time between the implant sides (mesial and distal) and between the two groups were assessed performing Mann-Whitney U Test.
Results: Ten implants failed in the control group (6.1%), none failed in the test group (p=0.002). A statistically significant difference in peri-implant bone resorption was found between the two groups (p = 0.004), with greater mean peri-implant bone resorption in the control group (1 mm) compared to the test group (0,8 mm).
Conclusions: The null hypothesis has to be rejected. Carbon fibre frameworks may be considered a viable alternative to metal ones and they presented less marginal bone loss around implants and a better survival rate during the observation period.

Case report: post extraction immediate loading implant in esthetic zone

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Aim: The purpose of this case report is to show the basic steps to get a proper estetic and functional rehabilitation in case of post extraction immediate loading implant of an frontal element.
Methods: A 54 years-old woman presented to the Prosthetic Department of Dental School (University of Turin) with 1.2 compromised: a subgingival tooth decay and periodontal disease were visible with a periapical X-ray exam. With a periodontal evaluation the buccal plate seemed to be present. To meet the aesthetic demands of the patient, a post-extraction immediate implant placement with immediate esthetic provisional has been proposed. Study models have been realized by the dental technician to be able to obtain a wax-up with a pre-surgical prosthetic planning, in order to have a surgical guide and to perform a correct implant placement. Local anesthesia with articaine (adrenalin 1:100.000) has been performed (1 carpule, ¾ on buccal side, ¼ on the palate), followed by atraumatic extraction of the tooth. After the extraction a deep

surgical debridement of the area has been done, by probing the walls of the socket the presence of the buccal plate has been confirmed. Thanks to the fair anatomical conditions, the surgery has been performed without raising a flap. Considering the tooth position and the high esthetic demands of the clinical case (upper lateral incisor), a narrow platform implant with external hexagon and aggressive apical macro morphology has been chosen (NP nobel speedy groovy, 3.3x13mm). Aiming to perform an immediate esthetic loading, primary stability of the implant (35N torque insertion) was achieved. The provisional was obtained modifying the previously realized acrylic surgical stent on the anatomy of the lost tooth. A careful relinig of the provisional allowed a good soft tissue healing maintaining the gum geometry. Moreover, the immediate crown was left completely out of occlusion in order to avoid micromovement during the healing period of the implant. A screw-retained provisional was used to avoid cementing problems and to have a better control of the restoration. The patient was instructed to completely avoid any function on the provisional and to maintain good oral hygiene. After 4 months, we checked the osseointegration with a periapical X-ray and we proceeded on the prosthetic procedure for the fabrication of the final crown.

Results: With the immediate loading provisional we obtained a good aesthetic result for the patient and we guided the gum healing immediately after the extraction, avoiding to lose the natural position of the gum. With the final crown we gave both the aesthetic and the functional rehabilitation, maintaining the soft tissue geometry obtained with the gum conditioning action of the provisional emergency profile.

Conclusion: Respecting every step and the timing of the immediate non functional loading procedure in the esthetic area, it is possible to obtain predictable results achieving osteointegration together with the most natural esthetic outcome.

Resuming the key point of the procedure: a careful presurgical evaluation of the clinical case, together with a digital or traditional wax-up in cooperation with the dental technician; an atraumatic extraction preserving the anatomical structure of the post extrative site; a prosthetic/surgical stent to guide the correct insertion of the implant during the surgery procedure; high level of primary stability to avoid micromovement of the implant, together with the control of the occlusion to avoid any function during the osteointegration; correct relining of the provisional restoration during the healing period; a correct impression technique to be able to duplicate the anatomy of the periimplant tissue obtaioned by the relining of the provisional restoration.