Prosthodontics

Influence of two conservative preparation designs on the internal fit of CAD/CAM overlays

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Aim: To assess the internal fit of CAD/CAM lithium disilicate overlays luted on maxillary molars that were prepared with a 90° rounded shoulder or with a minimally invasive chamfer.
Methods: Sixteen intact maxillary third molars were selected from a pool of freshly extracted teeth and randomly divided into two experimental groups of eight elements each. All the teeth were subjected to 1 mm occlusal reduction. The two groups received different axial reduction and marginal preparation. In one group, the margin was prepared with a rounded 90° shoulder and positioned on enamel after 1 mm axial reduction. In the other group, an oblique marginal chamfer was created, thinning the preparation along the external perimeter of the tooth (<1 mm). After preparation, all the exposed dentine surfaces were treated with a self-etch adhesive system (Clearfil SE Bond 2), following the principles of the immediate dentine sealing. The prepared teeth were scanned to obtain lithium disilicate overlays (IPS e.max CAD) with the Cerec 3 CAD/CAM system. The intaglio surfaces of the restorations and and the prepared surfaces of the teeth were conditioned for adhesive cementation by following a standard protocol (Clearfil SE Bond 2 with selective enamel etching). Afterwards, the overlays were luted with Variolink II cement. The restored teeth were subjected to thermomechanical aging with a chewing machine (5±3–50±3°C, 80s; 50 N, 259200 cycles, 1Hz). All the specimens were sectioned trice in bucco-lingual direction, thus creating six surfaces of interest for the internal thickness analysis. The sections were photographed at the stereomicroscope and the cement thickness was measured at 20 equidistant points along the adhesive interface with ImageJ freeware software (120 measurements per specimen). The average value of the readings for each specimen was calculated and regarded as statistical unit. The difference in cement thickness between groups was statistically assessed with an independent sample t-test ($p<0.05$).
Results: The mean value of cement thickness was 0.135±0.036 µm and 0.142±0.036 µm in the rounded shoulder and chamfer group, respectively. The statistical analysis did not point out significant differences between the groups ($p=0.668$).
Conclusion: Both the considered preparation designs allowed for acceptable precision with regard to internal fit. The minimally invasive chamfer performed similarly to the less conservative shoulder preparation; its application in the clinical setting seems promising but should be supported by clinical studies.

Conventional methods of retention for facial epithesis

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Aim: A successful facial prosthesis depends on several factors, of which retention is a primary component. Prostheses can be retained by anatomic-mechanical, adhesive, or biomechanical means. The selection of a facial-prosthetic adhesive can be perplexing because little information is available to the consumer. It is for this reason then that we aim to discuss here the properties and behaviour of adhesives in the retention of prostheses.

Methods: review of literature to evaluate the basic principles of adhesion (mechanical, chemical and physical bonding), the requirements of a good adhesive system and the different types of skin adhesion (paste adhesives, double-sided tapes, liquid adhesives and spray-on adhesives).
Results: Several tests have been carried out both in vivo and in vitro. Developing a standardized method of testing of maxillofacial prosthetic materials is essential.
Conclusions: Traditionally, most facial prostheses have been retained by either mechanical or adhesive means. Maxillofacial prosthodontics are left with the problem of selecting the optimum method of retention (mechanical or chemical adhesion) and in relation to the latter, selecting which type is the most suitable for individual patients' needs.

Prosthetic rehabilitation after maxillectomy with temporal flap: a case report

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Aim: The two prominent location of malignancies that may result in maxillectomy are the palate and paranasal sinuses. The majority of tumors of the palatal and paranasal sinus region are epidermoid carcinomas, namely squamous cell carcinoma. Neoplastic, inflammatory, and infectious etiologies of maxillary defects must be also considered. Surgical closure of such defects may be considered when the disease is in remission, but such cases have not been reported. The size and location of the defect also influence the method of restoration. Small defects of the alveolar ridge and hard palate are easily closed surgically. Through the description of the rehabilitation procedures carried out in a patient with a emimaxillectomy covered by a flap, we want to describe the advantages and disadvantages in this kind of reconstruction.
Methods: Prosthethic rehabilitation of a 68-year-old female, presenting a maxillary squamous cell carcinoma, who underwent to a right maxillectomy, reconstruction with a temporal flap and radiotherapy is presented. Restorative treatment involved first impression with alginate, an individual tray in light-curing acrylic; then we use putty silicone to restore the vertical dimension of occlusion, and light silicone for the definitive impression.
Results: Most maxillectomy defects should not be closed or reconstructed with soft tissue flaps. When appropriate retenction for an obturator prosthesis can be obtained, speech and swallowing are restorated to normal levels in almost all patients. Closure may preclude fabrication of a prosthesis , leading to compromise midfacial contours, speech articulation, mastication and swallowing. Palatal contours have to be reestablished and replacement teeth must be properly positioned if speech and swallowing are to be restored. Palatal contours are often distorted, making it impossible to properly position denture teeth in a subsequent removable partial denture (RPD). Facial contours are best restored with an obturator prosthesis. Patients with total maxillectomy defects that have been restored with soft tissue flaps often present with compromised lip and cheek contours, and in most patients these contours cannot be readily restored with an RPD.
Conclusion: By using the basic principles of prosthodontics, the restorative rehabilitation of this patient with an acquired maxillary defect closed by a flap, is going to be difficult for what is going to be function (masticatory efficiency, speech, swallowing). One of the main reasons is due to the difference between resiliency of the normal side with bone and mucosa, and the side of the temporal flap. So the retenction stability and support is going to be compromised. Good result from surgical point of view and psychologically.

Prosthetic rehabilitation of the soft palate insufficiencies: a case report

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Aim: Patients with acquired defects or congenital malformations of the palate exhibit disturbances in speech, including hypernasality, nasal emission, and decreased intelligibility of speech. Cancer resection is the most common cause of acquired palatal defects, whereas cleft palate is the main cause of congenital defects. Palatal defect can be repaired by reconstructive surgery and/or a dental prosthesis. When surgical treatment is not considered as an option, prosthetic management of velo-pharyngeal incompetence is traditionally managed by a palatal lift prosthesis, whereas velo-pharyngeal insufficiency is carried out by means of a pharyngeal obturator.
Methods: Pharyngeal obturators restore the congenital or acquired defects of the soft palate and allow adequate closure of palatopharyngeal sphincter. This case report describes the clinical and laboratory procedures used for fabrication of palatopharyngeal obturators for soft palate insufficiency in order to prevent food and liquid leakage into the nose and to improve speech integrity. In dentate and partially edentulous patients the retention and stability of the pharyngeal obturators is

easily achieved by the existing teeth. However, it may be hard to achieve adequate retention with conventional prostheses in edentulous patients.
Results: The acquired palatal defect was repaired by a maxillary complete denture with superior extension of the obturator, which was designed to improve retention and stability of the upper single denture. The final prostheses provided good chewing and speech functions and the patient was satisfied with the upper denture after placement.
Conclusion: Results were satisfying for both the patient and physicians, but our conclusion is that patients have unique problems and need to be treated individually: only multidisciplinary approach with the combined intervention of the prosthodontist, the otolaryngologist and the speech-language pathologists can help the patient to regain his personality, both physically and psychologically.

Oral health status in a group of institutionalized elderly people: the relationship between nutritional status and prosthesis

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Aim: In geriatric patients, especially in institutionalized elderly people, the maintaining good nutritional status is important. Malnutrition, in turn, is associated with a decrease in functional skills, increased susceptibility to infection, increased hospitalization and higher mortality. Several studies have demonstrated that the good nutritional status depends on many factors such as good oral health conditions. In fact, edentulism can significantly impact oral and general health and quality of life, including nutrition and enjoyment of food. Furthermore, the presence of incongruous removable prosthesis may have adverse effect on the oral health and the denture supporting tissues. The reduced masticatory ability may lead to changes in dietary selection with risk of an impaired nutritional status especially in elderly with partial and/or complete dentures. The aim of this study was to evaluate the oral health status in a group of institutionalized elderly population and to determine a possible relation between partial/complete removable prosthesis and the nutritional status using body mass index (BMI).
Methods: This randomized study was conducted in a nursing home care in Ancona. 30 elderly patients between 71 and 99 years old were examined. For each patient age, sex, presence of fixed prosthesis, presence of partial and/or complete removable prosthesis, number of teeth in the mounth, and BMI were recorded.
Results: A total of 30 subjects (25 females and 5 males) with a mean age of 87.13 ± 6.18 years were included in this study. The patient distribution according to dental status was the following: 10 patients showed no prosthesis; while the others 20 had the following dental prosthesis. In particular, 2 subjects had 1 fixed prosthesis in both maxillary and mandibular arch, 3 patients had both fixed prosthesis and removable denture, and 15 patients had only partial and/or complete denture in one or both arches. The patient distribution according to BMI was the following: 6 patients were overweight, 13 normal weight, 9 slightly underweight, and 2 with severe thinness. The mean of BMI was 20.85 ± 4.21. Considering the edentulism status, 8 patients had more than 20 teeth, 11 patients had between 10 and 19 teeth, 11 patients had less than 9 teeth. In particular, the patients with more than 20 teeth were: 4 overweight, 3 normal weight, and 1 slightly underweight.
Conclusion: This preliminary study not showed significant relationship between prosthesis and BMI values ($P > 0.05$). Also no significant relation was found between number of teeth (present in the mouth) and BMI values ($P > 0.05$). In particular, a female of 80 years old without teeth and without prosthesis had a value of BMI of 24.4 (normal weight): this can be due the correct calorie intake with homogenized food. These preliminary results suggest that the relationship between oral health conditions, dietary intake, nutritional and general health status in older adults is complex, with many interrelating factors. It is necessary to increase the number of examined patients to establish if an adequate rehabilitation could improve the nutritional status of partially or totally edentulous patient.

Cemented or retained screw for single dental implant restoration: parametric evaluation of the bone tissue reaction under the masticatory load

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Aim: The application of dental implants in order to recover areas of missing teeth is going to be a predictable technique, however some important points about the implant angulation, the stress distribution over the bone tissue and prosthetic components should be well investigated for having final long term clinical results. Two different system of the prosthesis fixation are commonly used. The screw retained crown and

the cemented retained one. All of the two restoration techniques give to the clinicians several advantages and some disadvantages. Aim of this work is to evaluate all the mechanical features of each system, through engineering systems of investigations like FEM and Von Mises analyses. Specifically the perimplant bone area has been evaluated.
Methods: In this experimental study we chose titanium grade 4 for the construction of the implant, the abutment screw and abutment. For prosthetic crowns the choice fell on feldspathic porcelain. The properties of materials have been specified in terms of Young's modulus, Poisson's ratio and density. The different physical behaviour of materials with respect to the loading forces has been considered. In our case, the alloys of titanium have a plastic behaviour, thanks to which are resistant. Titanium, in fact, is able to absorb loads, even intense, possibly meeting to a permanent deformation but without tending to fracture. Titanium alloys have a limit of resistance at least 5 times greater than that of the ceramic, it can be subjected to a voltage of up to 1000 MPa (equivalent to 1000 kg on each mm2 of surface) and do not involve rupture of the crash, or fractures per pulse. For this reason, in our 3D model, the more resistant component within the implant-prosthesis system is precisely the dental implant. The bone-implant boundary conditions established in this FEM analysis are those of a perfect interlocking gear. In this study it was chosen to simulate "osseointegration perfect" with a contact type defined bounded that, by definition, is characterized by a total contact surface between the implant and the bone, with no possibility scroll between the two. Although this represents a choice of approximation and simplification, as it does not exist in reality a clinical condition in which there is a 100% contact between the implant surface and bone margin.
Results: The finite element analysis shows that the two connections implant-prosthetic, which differ in their physical structure and their constituent parts, are characterized by a different distribution and dissipation of mechanical stress. The load determines a distribution of Von Mises stress fairly uniform with values of 50 MPa to 60 MPa and screwed prosthesis for cemented prosthesis. The higher voltages are recorded at the point of contact between the apical margin of the prosthesis and the bone.
Conclusion: This parametric analysis with finite element evaluation of the implant-prosthetic connections cemented and screw retained put in place an engineering and biomechanical comparison between two different types of implant-supported prostheses, concluding that a screw retained prosthesis on an implant seems to be less durable and tends to fracture more than a cemented prosthesis. The stress seems well tolerated by the bone tissue in the both used system and no problem of fracture has been recorded.

How the macro-design of dental implants influences cells response. A literature review

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Aim: The purpose of this literature review is to assess whether or not the macro-geometry of titanium dental implants could enhance or lower the cells response during the healing process of soft and hard tissues around implants.
Methods: We took into account papers published until November 30th 2016. We excluded studies focusing on micro- or nano-structural features of titanium dental implants, and finite element analyses (FEAs) on the mechanical behaviour of fixtures inside cortical and medullar bone. We adopted all possible combinations of the following key-words: "osseointegration", "implant macro-design", "thread geometry", "cell response", "fibroblasts".
Results: We found a total amount of 565 articles and we selected 20 studies to be submitted to full text analysis, basing on these selected exclusion criteria: micro- or nano-structural features, surface treatments, biomechanical trials. We reviewed, among the others, some orthopaedic researches. The macro-geometry of implant devices appears to be less crucial than micro- or nano-modifications in guiding cells responses, and none focused on direct histological cascades. Only two out of twenty papers detected statistically significant differences between various macro-characteristics in terms of BIC (%). Favourable design could be represented by deeper and closer threads.
Conclusion: Basing on currently available literature there is evidence lack of data about the given topic. Existing studies are not sufficient to demonstrate the superiority of one implant design in recruiting host's osteogenic cells. In vivo confounding BIAS could lead to unreliable results.

Chewing patterns in single implant mandibular retained overdenture

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Aim: Mastication is one of the most important functional activity of the stomatognathic system. It is a rhythmic movement characterized by a diversity of jaw patterns, established by the integration between the peripheral and cortical inputs and the pattern generator in the brainstem. It has been observed that mastication is involved in cognitive processes and the preservation of the physiological chewing pattern is important for the quality of life of elederly subjects. In edentulous patients, the loss of teeth, the loss of periodontal mechanoreceptors and the alveolar bone resorption without new bone formation, require an important adaptation of the neural motor control. Neverthless, the functional aspect of the single implant mandibular overdenture is still little known even though the balance of the masticatory function is important for avoiding damage to the stomatognathic system and for maximizing efficiency. Aim of this study was a within-subject comparison of chewing pattern kinematics in complete denture wearers with and without a single implant retention during an observation period of 5 years after the prosthetic connection.
Methods: The within subject trial has been conducted on edentulous elders at the Dental School of Turin. 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. All patients underwent the recording of the chewing cycles with a kinesiograph K7 (K7-I; Myotronics, Tukwila, WA, USA), using a gelatinous semi-solid (20x20x20mm) bolus. The kinematic signals were analyzed using a custom-made software and where recorded three months after the ancorage of the lower denture to a single-tooth implant and at 5 years follow-up.
Results: 15 patients were included in the study, following exclusion and inclusion criteria. 10 patients completed at this time the 5 years follow up. The results showed a significant decrease of the anomalous percentage of the reverse chewing patterns at 5 years follow-up ($P<0.03$) and a significant improvement of the parameters involved in the chewing efficiency: total number of chewing cycles ($P<0.01$) (closure angle $P<0.03$, pattern width $P<0.01$, height $P<0.01$, duration $P<0.001$, closure duration $P<0.004$).
Conclusion: A denture anchored with a single implant is more retentive and for this reason patients subjectively feel more comfortable during mastication. This study showed that beyond the subjective sensation, significantly the anomalous pattern decreased and the chewing patterns objectively improved the parameters of efficiency; accordingly, the neural control of the masticatory function becomes more stable with positive influence on the maintenance of the cognitive activity of the elderly.

Retention strength of metallic posts with ball-attachments for tooth-supported overdentures

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Aim: The aim of this study was to evaluate the retention strenght (pull-out) of metallic posts with ball attachment (Pivot Block, Rhein 83, Bologna, Italy), undergone to three different surface treatments and luted with a self-etching, self-adhesive cement. The null hypothesis was that neither the sandblasting of the post surface, nor the retentive notches made on the post, nor both treatments increase the pull-out force (N) of the post from the tooth ($p = 0.05$).
Methods: Sixty human teeth extracted for orthodontic or periodontal reasons were selected and stored in 0.02% thymol solution. The teeth, cleaned of calculus and debris, were sectioned with a diamond bur at the level of the most coronal cement-enamel junction. Once the root canals were shaped, the post-spaces were prepared at a depth of 10 mm. The roots were embedded in resin cylinders so that the canals were coaxial to the cylinders. The Pivot Block metallic posts were randomly divided into 4 groups: A) untreated surface (control); B) sandblasted surface; C) retentive notches; D) retentive notches and sandblasted surface. The notches of groups C and D were 3 semicircular shaped notches at 3 mm, 5 mm and 7 mm from the coronal plate of the post; they were 0.4 mm. deep, made with a 0.8 mm diamond bur. The sandblasting of groups B and C was performed with 50µm particles (aluminum oxide powder). The posts were luted with RelyX Unicem 2 Automix cement, light cured for 40 seconds. The pull-out test was performed with Instron 4301 machine at a pulling speed of 0.5 mm/min; the maximum values for post removal were recorded. The Kolmogorov-Smirnov (KS) test was used for normality of distribution; ANOVA and Bonferroni-Dunn test for pairwise comparisons were used to determinates

differences in the pull-out force measurements. The level of significance was set at $p < 0.05$.
Results: The mean values of pull-out strength were the following: group A (control): 113.12±51.32 N; group B: 224.63±42.54 N; group C: 485.37±68.36 N; group D: 355.80±118.47 N. The KS test showed a normal distribution of values for the 4 groups (group D: $p = 0.089$, groups A, B and C: $p = 0.15$). The ANOVA and Bonferroni-Dunn test showed significant differences ($p < 0.0002$) among the 4 groups.
Conclusion: the null hypothesis was rejected; the results suggest that the retention of the posts may be improved through surface treatments such as sandblasting and/or retentive notches.

Complications in full-arch implant supported prostheses

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Aim: Implant prosthesis generally present more complications than teeth's ones. Many studies confirmed this tendency, but in the literature there isn't a consensus on considered data. In details, in the literature there's a lack of standardized data about implant – supported full – arch prosthetic complications in relation to different variables, such as structure and layer materials. The aim of this study was to retrospectively evaluate the frequencies of different complications after treatment with implant - supported screw retained full-arch fixed prosthesis. The main aim was to evaluate the frequency of prosthetic complications of the structure. The second aim was to evaluate the frequency of prosthetic complications of resin versus the ceramic layer.
Methods: The study group comprised 98 patients who had been treated with implant-supported screw retained full-arch prosthesis from 1 to 5 years earlier. For each case records like treated arch (maxillary or mandibular), number of implants used, implant connection type (external or internal), structure type (titanium CAD/CAM, chrome -cobaltium CAD/CAM, fusion) and layer type (ceramic or resin) were scrutinized: The following notes of office and laboratory complications in association with implants and superstructures were registered.

- C1: tooth break;
- C2: screw access opening;
- C3: occlusal adjustments;
- C4: pigmentation;
- C5: biologic complications (es.:mucositis, gingival inflammation, ...);
- C6: opening of the gum space to facilitate cleaning;
- L1: prostheses relining;
- L2: tooth or layer fixing;
- L3: bar break;
- L4: teeth reassembling;
- L5: prosthesis remake;
- L6: fixing after an implant loss;

A Kaplan Meier statistic evaluated the prothesis survival rate of the ceramics one and of the resin ones. The two layers results had been compared with a Mantel – Cox statistic.
Results: Among 483 implants, 9 failed (6 in the superior maxilla and 3 in the inferior maxilla). During the follow – up period, an average of 36% of all prosthesis resulted free of complications The most common interventions made in the office were the restoration of the layer of the prosthesis and the closing of the screw access (47 events). Considering the laboratory complications, the most common was the reassembly of teeth (13 events). Laboratory complications were significantly more common among the ceramic layered prosthesis.
Conclusion: Clinical and laboratory prosthetic complications are common. Regular follow – ups to maintain optimal function and health in patients treated with this type of prosthesis are thus mandatory.

Prosthetic rehabilitation of velopharyngeal incompetence: a case report

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Aim: Velopharyngeal incompetence is the dysfunction of an anatomically intact velopharyngeal mechanism occurring in patients with neuromuscular disorders, such as Amyotrophic Lateral Sclerosis (ALS). The primary consequence is an incomplete velopharyngeal closure causing serious communication and psychological disorders. Velopharynx incompetence is a contributing factor to speech disorders, such as dysarthria, and implies the presence of hypenasality and inappropriate nasal escape. It also decreases air pressure during speech. Furthermore, it often causes tongue atrophy and soft palate paralysis, leading to deglutition disorders. One prosthetic option of treatment is Palatal Lift Prosthesis (PLP); it can achieve velopharyngeal closure by moving the soft palate superiorly and posteriorly, ensuring a correct velopharyngeal closure and a consequent decrease of hypernasality. The aim of this report is to present the prosthetic rehabilitation of three patients with velopharyngeal incompetence.
Methods: Three dentate patients were considered; three appointments have been assigned. 1) A preliminary impression was made with alginate and diagnostic casts

were prepared with dental stone. 2) The technician then realized a self-curing resin palatal baseplate. The resin lies beyond the soft palate, with a characteristic shape named "Beaver tail", until the post-dam line. 3) The baseplate was tried clinically, checking the fit and the contact of the resin with the soft palate. An impression of the baseplate in situ was taken with alginate and another cast was prepared. The aim was to extend the baseplate further on the soft palate up to reach the optimum length. The baseplate must be comfortable for the patient. 4) A new resin plate, with wire clasps, was realized. 5) The PLP was tried again clinically. The patient is invited to talk to check the retention, the palatal adaptation, the pronounce of guttural letters, and the hypernasality. Then patients will pronounce the letters S, L, R, T, to check whether there is dislocation and pain on the anterior teeth.

Results: 2 out of 3 patients have reported a reduction in the nasal sound of the voice and good tolerance in wearing the prosthesis. The third patient did not tolerate psychologically PLP as expected. It resulted very important to assess clinically the stability of the prosthesis and the vocal modulation and timbre.

Conclusion: Patients treated with palatal lift showed an improvement both psychologically and functionally.

In vitro mechanical comparison of carbon fiber prosthetic frameworks produced with two different techniques

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Aim: Thanks to its high performance characteristics the carbon fiber (CF) can be used for the construction of screw retained implant prosthesis with distal cantilever, alternatively to CrCo or titanium. The CF is an anisotropic material with excellent mechanical properties: high strength, stiffness and toughness, high lightness and excellent shock absorption which depends on the spatial arrangement of fibers. This last characteristic is fundamental to introduce this material in the prosthetic's implant. Aim of this study is to compare the CF traditional technique process (manual carbon fiber textures) with an innovative CF preformed discs for milling method (CAD-CAM).

Methods: We performed the shape of "specimen zero" with CAD technology similar to the most distal implant connection: central hole, lateral connectors and distal cantilever. The first group of samples (14) was obtained directly from CAM milling of two discs in CF. The second group (17) was obtained with traditional way using a mold filled with hard silicone. In order to obtain the same shape of the first group we used as model the milled specimen zero. Each group has two subgroups: First ("Disc1" vs "Disc2"); Second (8 CF layers vs 12 layers). Each group of specimens was then subjected to vertical load test in order to measure the maximum peak strength of the material (intrinsic elastic modulus). "Zwuick-Z150" was used to produce a vertical load and to transform data into digital graphics.

Results: Vertical load test results of each group provided a measure of resistance's specimen. First group's means was 151,6N +/- 26N; Second group's was 207,9N +/- 51N. The difference between the two groups was statistically significant (Student's T-test) p value: 0.0018, ($\alpha = 0.05$). In order to compare the two groups we transformed the values of resistance per unit area: 4,4N/mm^2 vs. 6.3N/mm^2 because all the specimens had dimensional variability:

- Group 1: h from 4,88 to 5,95 mm- hall diam. from 6,65 to 6,95 mm
- Group 2: h from 4,50 to 5,80 mm- hall diam. from 6,25 to 6,75 mm

The variability within the two groups is probably due to:

- Group 1: for CF disk were used the same CAD-CAM criteria (number and position of pieces in the disk) traditionally used for metallic framework in order to optimize the production. Probably, the connections between the CF samples were too thin for this material, as a consequence excessive vibrations arised during milling.
- Group 2: the variability is certainly linked to the human factor and the increase of the number of layers didn't seem to influence the size and resistance.

Conclusion: The CF is an high-performance material with mechanical properties that contribute to peri-implant bone health. Its ability consist to dissipate loads up to 60% reducing the maximum force transmitted from the implant to the bone. The productive process, digital or traditional, influences the material's mechanical peculiarities. According to our results, preformed disc's milling causes partial loss of these characteristics if compared with the traditional technique. This difference is quantified in the order of 30%. This loss of mechanical properties is probably due to the interruption of CF disc's fibers and as a consequence the loss of anisotropic organization. On the other hand, the standard technique, if properly executed, maintains carbon fibers' continuity and mechanical characteristics are preserved. In conclusion, CAD-CAM technology and preformed CF discs don't guarantee framework's performances as that of the product obtained with traditional techniques.