Purpose: A 66-year-old male patient applied for dental rehabilitation due to esthetic and functional problems. Decrease of chewing ability and inferior esthetics were detectable due to his worn dentition and old PFM restorations.

Methods: After taking photos and intraoral scans, a complete digital functional registration was recorded with the MODJAW system. By recording all the important functional motions, a new Vertical Dimension was selected within the patient's centric relation. Dental design for creating a digital waxup was done in exocad and 3Shape Dental Designer software using all the recorded patient information. The final design was physically created by 3D printing and transferred to the patient's mouth for functional and esthetic verification. After acceptance of the pre-design, removal of old prosthetics and precisional preparation were done and followed with digital impression taking. Final restoration shapes were copied from original wax up, and milling of the permanent restorations was done using IPS e.max ZirCAD Multi A1 material in Ivoclar PM7 milling machine. Staining and glazing of the restorations were created from IPS Ivocolor. Cementation was done adhesively, using SpeedCEM Plus self-adhesive, selfcuring resin cement.

Results: At the delivery stage a smile makeover was completed for the patient including 24 single-unit crowns and a three unit bridge. Vertical dimension was elevated and esthetics were improved.

Conclusions: Digital technology using functional motion registration and 3D printed trials is a predictable way to securely apply full mouth rehabilitation workflows.

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A digital workflow for diagnosis and therapy of a TMD patient: a case report

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Purpose: A 38-year-old female patient referred to the gnathology team of the San Raffaele Hospital (Milan) complaining of temporomandibular joint (TMJ) pain, especially during the night, and diffuse muscular pain referable to the areas of the masseter, temporal, and cervical muscles, accompanied by migraine, the sensation of occlusal instability, and sometimes vertigo. The purpose of this case report was to show a digital workflow of a gnathological treatment to achieve mandibular repositioning and occlusal stability.

Methods: After a clinical examination, a digital workflow was followed in order to acquire patient's data: 3D models of the patient's arches, masticatory muscles' surface electromyography (EMG), a study of the mandibular cinematic with ModJaw® and cervical ROM (Range of Motion) examination with an accelerometer. The mandibular therapeutic position for the occlusal splints was obtained through ModJaw®. After 4 months of therapy, the patient's cervical ROM was retested to observe if any ROM improvement was achieved.

Results: In a TMD (temporomandibular disorder) patient, digital records helped the clinician make a diagnosis and a therapy plan. Moreover, the digital measurement of cervical ROM allowed to observe an increase in cervical movement angles up to 44% (right lateral bending).

Conclusions: The digital evaluation of static and dynamic parameters of a TMD patient can help the clinician to explore mandibular cinematics and improve the clinical management of the patient.

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Full-digital workflow for a gnathological occlusal device (splint) in a patient with TMJ trauma

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Purpose: In a patient with symptomatic temporo-mandibular-disorders (TMD), the use of a splint is suggested. Evaluation begins with thorough patient history and clinical examination. New technology allows a computerized analysis of temporo-mandibular-joints (TMJ) images and movements, improving diagnosis and treatment planning. Data recorded with software must be correlated to plan and manufacture a splint through a full-digital workflow. The purpose of this case report is to show the full-digital planning of a gnathological treatment.

Methods: A young female with TMDsassociated with previous right TMJ trauma came to our attention. Initial clinical examination evidenced a click of both TMJs and painful muscles. 3D models of the patient's arches were taken with an intraoral scanner. The .stl files were then transferred to the software (ModJaw®). This device records the patient's movements and reproduces them on a monitor to achieve the mandibular therapeutic position. After this, .stl files of the planned mandibular position were shared with the dental laboratory, which used software to analyze all the patient data. Then, the devices were milled with a 3D printer.

Results: Digital records improved the collaboration among dentists and technicians in the manufacture of the occlusal splints. Treatment was planned with the use of a daily and nightly occlusal splint. After a few months of this treatment, the patient was referred for a reduction of TMJ symptomatology.

Conclusions: Digital techniques can help a clinician to explore mandibular cinematics and also allow to realize a full-digital device.

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New Digital Environment Supports Endodontic Complications Reduction: Clinically Driven Ergo-Digital Study

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Purpose: To formulate a digital environment for clinically driven ergonomic patterns assessment among endodontists and evaluate the effectiveness of its practical implementation.

Methods: The study cohort was formed out of 30 clinicians, who agreed on videorecording of their clinical working patterns during endodontic treatment using a 3-orthogonally related capturing algorithm. The human simulation tool was used for CAD-modeling of clinically driven endodontic environment, within which ergonomic parameters of each doctor were registered based on RULA (Rapid Upper Limb Assessment)

and REBA (Rapid Entire Body Assessment) criteria. Associations between registered non-ergonomic patterns and the prevalence of complications noticed during endodontic treatment were evaluated under regression analysis with further data cleaning and structured prediction. Optimization of working patterns included CAD-engineering of modified cinematic chain and barycenter's coordinates interactions for each endodontist recruited in the study.

Results: Provided regression analysis approved statistically augmented associations between trends of endodontic complications prevalence registered among upper molars and premolars with non-ergonomic working patterns of recruited clinical dentists, represented by r=0,69 (p < 0,05) та r=0,57 (p < 0,05) (under the condition of standardized leveling any other factor influence within the individually formulated digital clinically-driven environment). Optimization of ergonomic features identified within doctor-customized CAD-engineered cinematic chain supported the reduction of endodontic complications prevalence by 31.6% and 18.5% among upper molars and premolars, respectively.

Conclusions: Digitalization of clinically driven working patterns registered among endodontists supports further identification of critical issues within ergonomic sequences and provides possibilities for their optimization. Such an approach could be successfully implemented in clinical practice while helping to minimize endodontic complications prevalence.

Keywords: cinematic chain; digital environment; endodontic complication; Ergonomics

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Esthetic Rehabilitation of Patient with Multiple Diastema following Orthodontic Treatment and Maxillofacial Surgery: a Case Report

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Purpose: To perform esthetic rehabilitation with diastema closure of a patient after ortho-surgical treatment using lithium disilicate veneers.

Methods: A 22-year-old male patient with multiple diastema in the maxillary arch following orthodontic treatment and maxillofacial surgery applied for prosthodontic treatment. Digital planning was done on preoperative photographs in 3Shape Smile Design software. The width/length ratio of the central incisors had key importance when choosing a triangle tooth form with a Proportional Smile Design. Study casts were mounted by facebow and bite records for analog wax-up (KaVo Protar evo 5B Articulator). Wax-up was guided by the contour line of smile design. A silicone block was prepared for the functional mock-up which was found esthetic and comfortable for the patient. A 0.4 mm width butt joint preparation was used for IPS e-max CAD lithium-disilicate veneers. Two phases one-time A-silicone impression was taken with double-cord technique. Veneers were delivered by superimposing the abutment teeth and the wax-up STL files in CAD software (Ceramill Mind). Restorations were manufactured from IPS e-max CAD lithium-disilicate MT A2 blocks and were individually characterized. The final restoration was cemented with LC adhesive resin cement (Variolink Esthetic LC) in rubber dam isolation.

Results: The patient was satisfied with the esthetic and functional outcome of the final restorations.

Conclusions: Analog/digital workflow following treatment planning with 3Smile Design software makes treatment predictable. Proportional Smile Design is an effective method for designing a smile balanced with the face. High-quality CAD/CAM materials offer superior esthetics for patient satisfaction in the case of minimal invasive preparation.

Keywords: Adhesive cementation; CAD/CAM; Lithium disilicate; Smile Design; Veneers

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Multi goal, guided approach as a minimally invasive treatment: a case report

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Purpose: The use of surgical guides provides accuracy, predictability and shortens clinical time. Templates are widely used in implant dentistry. Studies present also the application of guides for targeted endodontic microsurgery. Nevertheless, most studies focus on one application of guided surgery. This case report presents single guided surgery for implants placement, sinus floor elevation and endodontic microsurgery.

Methods: The 3-in-1 surgery was planned as an alternative to a staged approach. A 57-year-old female required endodontic microsurgery of tooth 24 and implants in sites 25 and 26 where sinus lift procedure was needed. One complex surgery was performed using the flapless approach for implant placement. OneCAS kit was used for guided, hydrostatic sinus floor elevation and OneGuide kit for implant placement and targeted micro endodontic apicoectomy through the VISTA approach. Retro preparation and retro fill were done. Implants and healing abutments were placed according to the virtual plan.

Results: Tapered implants 4.0×10 and 4.5×8.5 were placed with ISQ 78 and 76, respectively, for 25 and 26 sites. Healing was uneventful and sutures were removed after 7 days. After 4 months, impressions were taken for crowns on teeth 24 and 27 and implants 25 and 26. After one year from initial surgery no complications happened, clinical and radiological examinations reveal proper healing of all treated sites.

Conclusions: Multi goal approach and combining a few surgeries in one, supported by proper planning and guided execution may be an option for low invasive and efficient treatment.

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Full versus semi-digital workflow in case of surgical management of mandibular cyst

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