

DIGITAL WORKFLOW FOR SMILE MAKEOVER

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Many years world top specialists were creating treatment protocols. We improved proper planning approaches, learnt preparation rules, different impression techniques. On another hand dental technicians were trying to improve layering techniques to reach better results.

Additionally microscopes and other magnification systems were introduced into a daily practice, and now it is difficult to imagine dentistry without them. Minimally invasive dentistry became not a fashion, but a proper way to treat our patients, realizing that there is no treatment that lasts forever and one day we need to change veneers/crowns/onlays for new ones. And even perfectly done case eventually will have to be re-treated after 15-25 years.

Everything seemed completed.

But no...

Modern dentistry moves one and evolves. We are going digital.

Introduction

Visual control of treatment manipulations is one of the key factors to success. Doesn't matter which technologies or materials we use, without magnification we can not guarantee maximum precision of all steps. Macroanalysis of the face must be followed by microanalysis in the patient's mouth, and we must pay attention to all the smallest details. Our eyes have limits, and even with excellent eyesight, we cannot perfectly see things such as the fit of restorations, margin surfaces after preparation, cracks, and many other details that can play a big role in the treatment plan. This is why it is important to use magnification during all treatment steps.

What is the precision that we have to reach? It's not about a number, it's about pushing maximum quality out of each case.

Case presentation Diagnostic Findings

Extraoral and Facial Findings.

During maximum smile patient shows lots of gum, as a result teeth look really short and all attention is taken by soft tissue. This is why esthetically smile is not satisfactory.

(photo 001,002,003,004)



Photo 001



Photo 002



Photo 003



Photo 004

Temporomandibular Joint and Mandibular Range of Motion

The patient had a normal range of motion and no joint sounds at external palpation. There was no muscle tenderness and no pain in opening or with lateral movements. Manipulation was easy, and the range of motion was within normal limits. There were no signs or symptoms of temporomandibular disorders.

Intraoral findings

The patient had low level of hygiene and bad Perio condition. Additionally - wear of upper teeth, especially frontal zone, diastema and minor rotation of two centrals.

(photo 005,006,007)



Photo 005



Photo 006



Photo 007

Treatment plan

The treatment plan began with a pretreatment interview and video/photo series. Perio treatment was performed to improve patient's hygiene and stabilise Perio condition.

(photo 008,009,010,011,012)



Photo 008



Photo 009



Photo 010



Photo 011



Photo 012

Intra-oral scanning with Trios 4 3Shape scanner was performed. It took about 2 minutes to scan upper, lower teeth and a bite to create virtual models for further analysis and treatment planning.

(photo 045)



Photo 045

Scan and photo/video documentation were sent to M.Vision lab for 3D designing (Dental Designer - 3Shape). Big benefit of digital workflow is time. It takes only few minutes for information to be delivered to the lab. If we compare with analogue workflow, sometimes it could take few days, especially if the lab is in another country.

In addition we checked CBCT and performed sounding procedure to understand bone level and sulcus depth. And took a decision accordingly to perform gingivectomy.

Shape, shape and shape.

(photo 044)



Photo 045

Copy nature - this is our main goal in dentistry for already many years. Dental technicians are improving their skills in waxing year after year. From this perspective digital world gives us many advantages. And one of them is to copy nature by scanning natural teeth. So every single time when we have a patient for hygiene in our clinic and we see beautiful natural teeth, we scan them and get 2 benefits. First one - patient will know that from this moment his teeth and digital saved and can always be precisely re-created with digital technology. Second one - we get one more teeth library for our lab, that we can use for our future patients.

So according to smile, face analysis and wishes of a patient (natural shapes with dominant centrals) library was chosen.

1-2 hours are usually enough to perfectly design upper arch, both esthetically and functionally. After its done, STL file is being sent to 3D printer - Asiga. Usually in maximum 30 minutes after that printed model is ready. So planning part of a workflow is much faster digitally comparing to analogue workflow.

When models were received in a clinic, design was checked and confirmed with a patient. For silicone key was used Putty + light body, Honigum from DMG.

(photo 018,019,020)



Photo 018



Photo 019

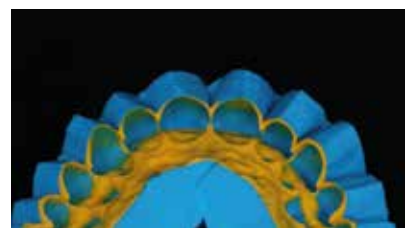


Photo 020

Great benefit during digital designing is possibility to integrate future smile into a portrait of a patient. And also check the guidance.

This mock-up was intended for motivational purposes (1st version), not final design. We designed extra volume buccally, because of the rotation of central incisors.

(photo 021)



Photo 021

In addition digital slices of future design over present teeth were sent to the doctor from CAD designer to visually understand thickness of mock-up and marginal adaptation.

(photo 013,014)

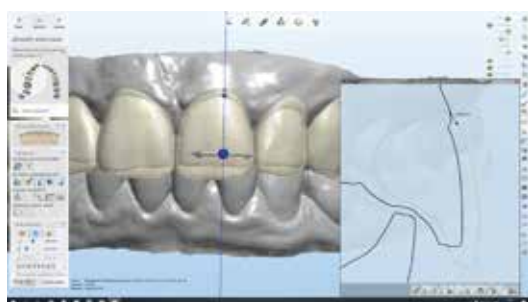


Photo 013

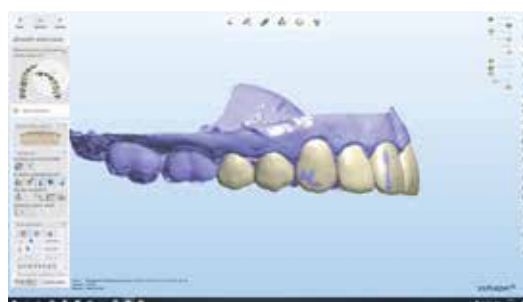


Photo 014

Clinical procedures

After mock-up - Luxatemp, DMG was transferred to patient mouth, reference points of future zeniths position we re there.

Gingivectomy was performed.

(photo 022,023)



Photo 022



Photo 023

After that final prototype was transferred to patient mouth before starting teeth preparation.

"M.Vision kit" by Nazariy Mykhaylyuk was used to perform micro invasive reduction.

(photo 0 - "Preparation set" and "MicroVision kit" by Nazariy Mykhaylyuk.)

All procedures were done with CJ microscope. It gives us a possibility to control all minor details and be very precise with teeth preparation. We used depth cutters 0,3 mm

(by Bernard Touti) to make sure we have enough space for ceramic veneers and at the same time not to over prep the teeth.

(photo 024)



Photo 024

To keep vitality of the pulp we needed to use new burs, gentle pressure and enough water irrigation. As a final step of preparation we used enamel chisels (by Deppeler) to finalize micro marginal zones, to make them sharp and visible for CAD designer.

After minimally invasive preparation through mock-up, we performed retraction with cord in combination with retraction paste (DMG) to visualize all the micro margins.

(photo 025)



Photo 025

Next step - scanning procedure to create digital copy. It all took us about 3 hours from A to Z.

(photo 042,043,)



Photo 042



Photo 043

After, provisional restorations were made using bisacrilic material Luxatemp, DMG. Spot etch and bond technique was used. To be precise on the margins, flowable composite was used.

(photo 026,027)



Photo 026



Photo 027

Lab procedures

After intra-oral scan was received in lab, CAD designer starts using same teeth library that was used for a second mock-up. It is very important point, because for final restorations patient receives same teeth shapes, as she already confirmed before.

(photo 041)



Photo 041

Software allows to see all the margins really close, that means that work can be done maximum precisely. So microscopic dentistry and digital workflow complete each other perfectly. Final CAD design for ceramic restorations took about 3 hours from A to Z.

(photo 040)

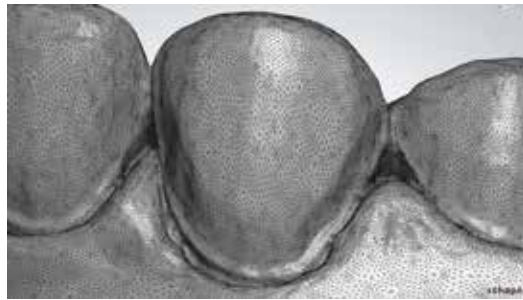


Photo 040

After – milling process of final restorations starts. It took about 30 minutes per tooth. In this case we use Empress CAD (Ivoclar Vivadent). From our perspective its the most esthetic material if we speak about monolithic restorations.

When milling was done, final lab step was 3D staining. And this moment is discussible with patients. Some of them prefer more characterisation, some of them prefer just a bit. For upper arch case it took about 3 hours.

(photo 028,030,031)



Photo 028

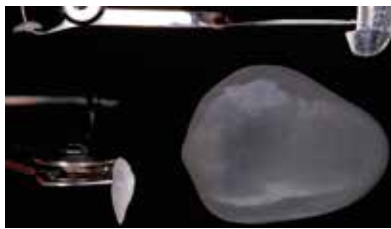


Photo 030



Photo 031

Bonding procedures

Often question in digital dentistry is – what is possible minimum thickness of restorations? In this case it was 0,3 mm. These are usual possible numbers that we reach when we speak about digital workflow. This is why operator had to be very careful not to cause any damage.

(photo 047)

Before bonding, precision (dry-fit) is also checked with control of microscope.

(photo 046)



Photo 047



Photo 046

Bonding procedure took 3 hours. Rubberdam isolation was used for adhesive protocol to avoid saliva leakage.

For bonding we were using Variolink Esthetic from Ivoclar Vivadent in combination with Optibond FL from Kerr.

Enamel etching – 30 sec

Applying Optibond FL

Ceramics etching with Fluoric acid 10%, 60 sec

Ultrasonic bath with alcohol FOR CERAMIC RESTORATIONS

Applying 2 bottle silane from DMG

OptibondFI on the surface of veneers, air, transparent Variolink paterial.

After we position it all on a surface of a tooth, remove access of material and light cure 2 sec, continue removing material. Applying air block (glycerin) and perform final light curing 45 sec each side, with soft start.

(photo 048)



Photo 048

Under control of microscope transition zones tooth-ceramic are finished with a blade + silicon discs for polishing.

(photo 049)



Photo 049

Discussion

Can we use digital dentistry for esthetic cases today? This is actively discussable topic. A lot depends on a dentist/technician team.

With a switch to digital protocol, many things change in a clinic but even more - in a lab. Loosing a comfort zone for learning curve can be scary for some specialist, but this is normal. To gain nice results with new technology, first we need some time to learn. The author of article thinks that a lot depend on loosing a comfort zone, and if you are ready to do its you will get many advantages.

It's not like switching from PFM to full ceramic restorations. It gives dentists and labs possibilities for easy co-operation, even if they live in different countries. Labs do not need to outsource cases anymore, they can do everything "in-house". So as a result they get main benefit - time! Full arch smile upgrade (prosthetic part) was done in 3 days only.

Conclusion

Should we go digital?

Probably it is not about going or not, it's about when?

The author is already using digital workflow for 100% of his cases for last 5 years.

This is why answer is - yes. Digital is for sure next step in dentistry that we will all make, sooner or later.

We can work less, produce more (with stable and repeatable quality) and enjoy life.

Final result 1 year after bonding.

(photo 032,033,034,035,036,037)

To learn more about digital dentistry, you are welcome to visit our live patient courses in M.Vision Study Resort - <http://mvision.pro>



Photo 032



Photo 033



Photo 034



Photo 035



Photo 036



Photo 037

References

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