The 4 views of DSD

To have a 3 dimensional understanding of the dento-facial relationship through 2 dimensional photos we analyze 6 photos in 4 specific angles:
- Frontal Facial (retracted and smile) (Fig 1-2)
- Occlusal (Fig 3)
- 12 o’clock Facial (Fig 4)
- Facial Profile (at rest and smile) (Fig 5-6)

The Dynamic Dento-Facial Documentation (video)

The photo protocol was simplified and reduced to 6 photos because of the utilization of the video (Fig 7).

The video became a very important tool for smile design. Since the beauty of the smile comes from its movement, makes no sense to analyze the smile and make treatment plan decisions based only on static photos.

The video analyzes has many advantages:
- it’s easier to make a nice video than to make a nice photo
- the video can be paused at several different moments and a photo can be made out of the video. Every second of a video has in average 30 photos.
- it’s very difficult to capture the most important moments of the smile-face integration on photos as the highest lip line position on smile and the total rest position. On the video is very simple, by moving the video back and forth we can find the exact moment and than make a photo out of it.
- the video shows the reality of what is really looking good and what is not. All the smile design decision will be made by analyzing the video.
- on the video we can analyse the occlusion and excursive movements in motion, mastication patterns, lateral guidance type and interferences.
- from the occlusal video we can see tooth structure, restorations and issues.
- we can analyze phonetics
- we can analyze the patients emotions, character, desires, main complains, etc. The team members that were not present at the initial appointment can get to know the patient through the video.
- the video is much more powerful than photos to show many problems related to dento-facial esthetics. We can catch the patients attention in a much more stronger way.

![Image](image.png)

Fig 7. The Dynamic Digital Dento-Facial Documentation.

3 Videos are made for the DSD protocol:

**Video 1. Facial Video (Fig 7a)**
Some questions will be made to the patient to capture important poses as: smile, laugh, stretch, relax position (“M” position), etc, but also to capture some important emotional characteristics of the patient.
These are the usual questions that we make:
- Why you are looking for treatment, what are your main concerns.
- What do you like and what you don’t like on your smile.
- What is your understanding of a beautiful smile and what are your expectations.

**Video 2. Close up Video (Fig 7b)**
On this video we will ask the patient to count from zero to ten, back and forth, and in between the counting we will ask them to smile, laugh, stretch and relax.
We we also ask the patient to pronounce specific words with the phonetic sounds, “F”, “S” and “V”. We will move the camera 180° to capture these moments in all angles.

**Video 3. Intra oral functional Video (Fig 7c)**
We will ask the patient to chew and perform the functional-excursive movements (protrusion, lateral protrusion, canine guidance). Than the patient can open wide and we can film the upper and lower occlusal surfaces.
The Digital Smile Design guide lines

The main goal of the DSD technique on the computer is to adjust the 4 photos from the 3 main views of DSD (12 o’clock, frontal and occlusal) with each other and with the digital ruler and to add the lines and drawings that will create the Smile Design Frame, always based on the video analysis (Fig 8). The profile photo will be analysed separately and will also be calibrated to the digital ruler (Fig 9).

These 4 photos overlapped with the drawings, ruler and measurements will be added to the conventional documentation of the patient and will be very helpful and different meanings:
The reasons why we believe it’s worth investing time creating these drawings:
- Improve the visualization of issues involving the dento-facial integration.
- Guide the brainstorm process that will create insights for possible solutions.
- Shared with the interdisciplinary team to improve the communication process.
- Utilized on the treatment plan presentation for the patient improving the educational process, increasing motivation and case acceptance.
- Paramount to guide the wax-up, mock-up fabrication integrated with the face reducing intra oral esthetic adjustments (Fig 10-13).
- Overlapping the drawings with any type of 3D software as CAD/CAM, Orthodontics, Guided surgery and Orthognatic, facilitating a 3D digital planning guided by Smile Design (Fig 14-18).
Fig 10. The digital drawings
Fig 11. The Facially guided wax-up
Fig 12. The Esthetic mock-up

Fig 13. The pre op situation and the mock up.

Fig 14. Overlapping the DSD drawings with the CAD/CAM software to fabricate a digital wax-up or restorations.
Fig 15. Overlapping the DSD drawings with Orthodontic software to plan digital set-ups and fabricate ortho aligners or devices guided by Smile Design.

Fig 16. Overlapping the DSD drawings with CBCT software to analyze the relationship between the smile design project, the hard tissues.

Fig 17. Overlapping the DSD guide lines with a Guided Surgery software to plan grafting procedures and 3D implant position guided by Smile Design.
The Smile Design process

After adjusting the 3 photos to the facial planes and to each other (Fig 19), the Smile Design frame needs to be developed. By analyzing the video we will place the lines over the photos. This process is performed on the slide (fig 20) and it’s organized in 8 steps:

Fig 19. The 3 photos are leveled with the face, calibrated to each other and cropped to allow a closer look to the teeth and gum.
Fig 20. A typical slide where we perform the smile design process with the 3 photos on the left and the video on the right. The position of all the lines that will create the frame will be guided by the analysis of the patients facial features and smile integration on the video. The dynamic analysis through the video allows for a better decision making process regarding the dento-facial integration reducing the mistakes and intra oral esthetic adjustments.

The Smile Design Frame in 8 steps

The frame will be an extra information that together with the conventional documentation of the patient (x-rays, models, medical history, clinical exam, perio-chart, etc...) will help for a better decision making process, interdisciplinary interaction and treatment planning development. The frame is not a definitive rule that needs to be matched at any costs. As we know beauty doesn’t mean perfect symmetry. The idea is to develop a treatment that gets as close as possible to the frame always creating the most simple, easiest and conservative treatment possible.

Step 1. The Mid Line

Determine the mid line. The facial mid line not always matches the dental midline. The idea is to find if we have a dental mid line shift and/or cant and make the decision about what position you want to take in consideration to start the smile design process. As we know, mid line shift is not as relevant esthetically as the mid line cant that should always be fixed to harmonize with the face. To help on this decision making process we will watch the video and pause the video when we have a good moment to add a line over it to have a better guess about what position looks good with the whole face when in motion.
Fig 21. Example of the DSD slide that has the 3 photos on the left and the facial video on the right. By pausing the video in specific moments and adding lines over the paused video (facial image) we can determine where we want to place the mid line over the 3 photos on the left. On this patient the dental mid line is canted compared to the facial mid line.

**Step 2. The Smile Curve**

Determine the smile curve or digital “wax rim”. The smile curve position and shape will also depend on the facial dynamic analysis done through the video. The video is paused in several moment and photos can be made from the video.

Fig 22-25. Photos taken from the paused video to help the dynamic smile analysis.

Moment that we want to analyze on the video to determine the smile curve:

The real rest position (Fig 24):
-to analyze the relationship between upper lip and incisal anterior upper edge. The literature gives us certain parameters the video analysis will guide our final guess.

The natural smile (Fig 25):
- to analyze the buccal corridors relationship with the cheeks and determine if we should change them by widening or narrowing the arch.

The smile in angles (Fig 22-23)
- to analyze the length of the posteriors in relationship with the lower lip to see if they should be longer or shorter, that means a smile curve that is more steep or flat.

Fig 26. Positioning and shaping the smile curve according to the dynamic facial analysis.

**Step 3. The Interdental Width Proportion**

The relative width proportion from the frontal perspective is a very good guide to help us on the smile design process. In the past the Golden Proportion was utilized to determine the ideal width from the frontal perspective of the centrals, laterals and canines. Now a days this proportion is not any more utilized as ideal but new proportions were developed as the RED (Reoccurring Esthetic Dental Proportion), the one we prefer. This proportions says that from a frontal view, if the centrals are “x”, the laterals should be “0.7x” and canines “0.5x”. The interdental proportion ruler is placed over the mid line and the width is changed according to the video analysis and according to esthetic principles from denture set-ups (references).
Fig 27. Interdental Width Proportion ruler calibrated over the 3 photos based on the video analysis.

**Step 4. The Central Width/Length Proportion**

The ideal central incisor proportion of a central should be around 80%. We usually work with the limits of 70 to 90%. Inside these limits we can develop a nice central incisor. Since we already have the incisal edge position and the width, by working with the central template we will be able to analyze the relationship of the gingival margin to the other parameters.

Fig 28. The central shape can be picked based on the Morpho-Psychology analysis. The ideal central width-length proportion can be used as a starting point to analyze the relationship between the proposed incisal edge and width with the gingival margins. All the drawings and guide lines can be changed and adapt to a more realistic situation according to the discrepancies that are identified.

**Step 5. The Gingival Curve**

The gingival curve will also be determined with the help of the video analysis (Fig 22-25). The gingival curve will be placed over the cervical of the proposed new central and the
inclination of the curve towards the posteriors will be determined to create a nice and realistic relationship between the curve and the upper lip according to the posterior gingival display.

Fig 29. The gingival curve is placed to create a harmonious relationship between the gingival display, the lips and the face.

Step 6. The Papillae Curve

The papillae curve is placed in between the 2 curves, incisal and gingival, and all 3 curves should converge on both sides to an imaginary vanishing point close to the commisural. This papillae curve should be slightly closer to the gingival curve. The literature says that the height of the papillae is usually 40% of the height of the crown (reference) (Fig 31).

Fig 30. Positioning the papillae curve in harmony with the incisal and gingival curve.
Step 7. The Vermilion Curve

From the very important 12 o’clock view we can analyse the relationship between the interpupilar line, comisural line, arch form and vermilion of the lower lip. After adjusting the image to the guidelines we can zoom in and analyse the relationship between the teeth, arch curve and the vermilion curve that will help determine the ideal buccal-palatal position of each tooth. The interdental ruler is also very useful to be used on this view.

Step 8. The Arch Curve

By integrating the analysis of the occlusal photo with the facial frontal video we can understand if the arch is too narrow or too wide in relationship with the face. The curve will than be placed over the occlusal view to translate this observation and also to analyse the symmetry of the arch. Also from the occlusal view we will overlap the interdental proportion guide to evaluate the space distribution. This is the last of the 8 steps to create the Smile Design Frame. Now all 3 photos are calibrated with each other and also overlapped with the guide lines that will help on the
treatment planning process as well as to guide esthetic wax-ups (real or digital) calibrated to the face.

Fig 33. Evaluation of the buccal corridor from the frontal view helps on the positioning of the curve over the occlusal photo.

The Digital Smile Design technical step by step with Keynote-Mac

The DSD Quality Control and Interdisciplinary Communication

Orthodontics Quality control and Communication

The communication between the Ortho team and the restorative was always a challenge. Main challenges:
- Analise the ortho movements according to the dento-facial integration
- Plan the ortho movements to allow for better and more minimally invasive restorative procedures.
- Confirm that after the ortho treatment tooth and soft tissue position are where we planned to be.

The DSD drawings and communication protocol helps to minimize the mistake in all these moments.

The DSD drawings and guidelines will:

1. Help the team to understand if the case is an ortho case.
2. Help to communicate with the orthodontist and get their feedback based on the final restorative goal.
3. Help the orthodontist to plan the type of procedure and movement needed.
4. Help the restorative to do the quality control after ortho is done to check if goals are achieved, if the braces can be removed and if the treatment can proceed.
Fig 34. Pre op photo with the smile design drawings guiding our Ortho communication and planning.
Fig 35. Post ortho photo showing the quality control drawings overlapped to evaluate, before removing the braces if ortho is really done and following the initial smile design plan.

Fig 36. The pre op position of the teeth are outlined in red.
Fig 37. In yellow is the ideal position of the teeth according to the final smile design project done following the facial guidelines. In blue is the desired outline of the final restoration. This way, ortho is done to create the possibility of minimally invasive restorative procedures.
Fig 38. The drawings of the ideal desired position of the teeth are overlapped on the post ortho photo to check if the movement is finished or if we need to proceed a little more. That’s why the DSD ortho quality control should always be done before removing the braces if conventional ortho is the case. If aligners are been used the quality control will be useful to check if more aligners will be needed.

Fig 39. Comparison of pre and post op ortho photos. On this case done with aligners. The drawings over the bottom post ortho photos are confirming that the aligners were able to achieve the goals pre determined so the case is ready to proceed with prep less veneers.
Wax up

Mock up

Final Restoration

Direct composite

Denture Set-ups

Ortho Set ups
The complete Digital Workflow

The Photo Video protocol for DSD

The Emotional Smile Design Communication Approach
The 3 R’s and the DSD drawings