Carestream DENTAL

THE DIGITAL DENTIST

DIGITAL WORKFLOW LEADS TO IMMEDIATE IMPLANT PLACEMENT

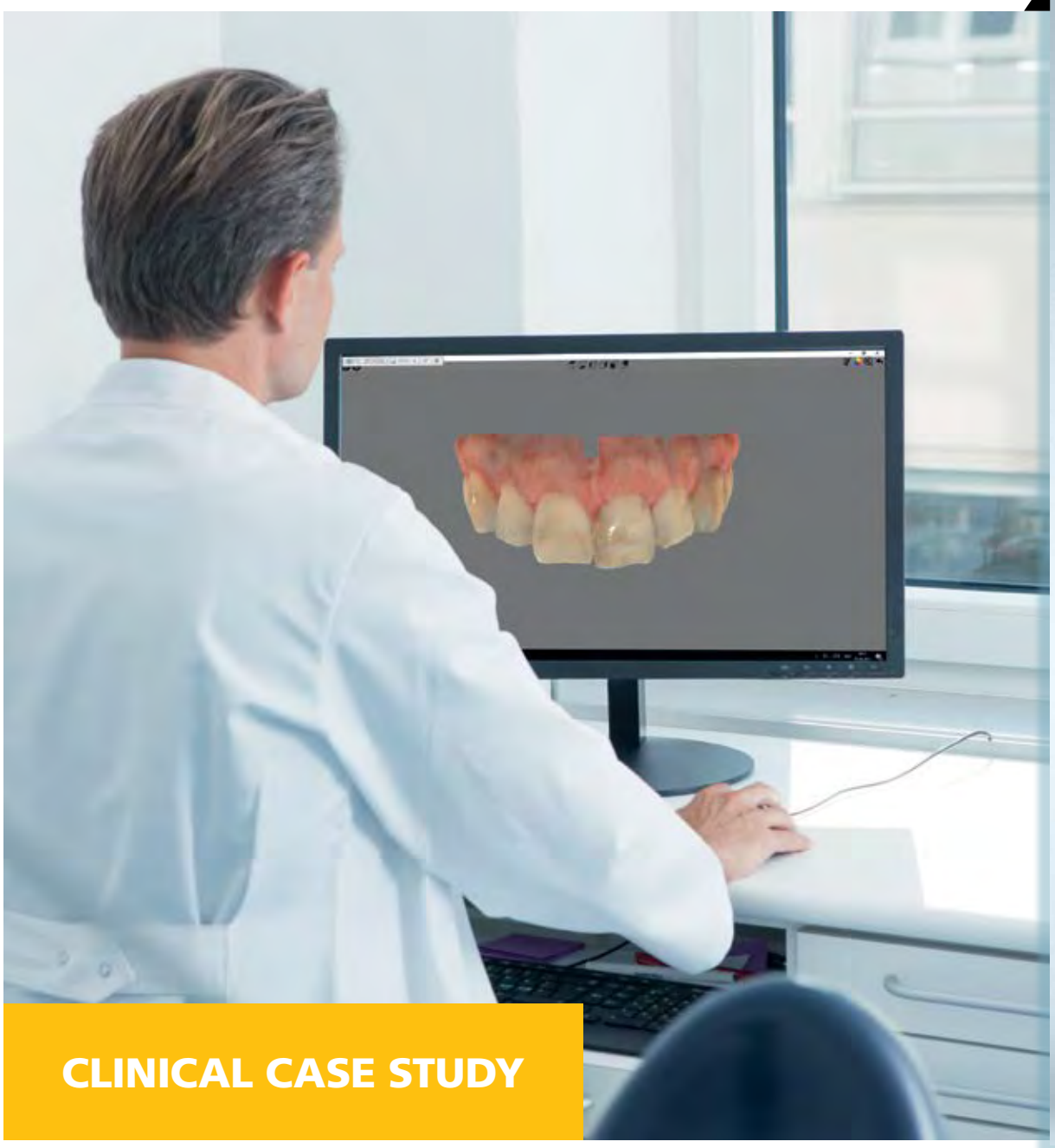
Learn how the right systems and software can lead to a faster final outcome.

WHAT CBCT CAN REVEAL

Discover why 2D imaging sometimes isn't enough.

SYSTEM AND SOFTWARE INTEGRATION LEADS TO GREATER EFFICIENCY

From evaluation to treatment planning, integration makes a big difference.



FACT SHEET

Dr. Beat R. Kurt

Dr. Beat R. Kurt received his Master's degree in dental medicine in 1990 from the University of Bern, and completed his postgraduate education in oral surgery at the clinic of dento-maxillo surgery at Central Hospital of Lucerne. He currently specializes in implantology, guided implant surgery, soft tissue management and bone augmentation and is a referral for oral surgery, complex reconstructive dentistry and synoptic dentistry.

Dr. Kurt has been in private practice for 20 years in Lucerne, Switzerland, and has over 12 years of experience working with various guided surgery systems. He currently uses the Camlog and Straumann implant systems in his practice, and has three years of experience in using a complete digital workflow.

CLINICAL CASE STUDY

IMMEDIATE IMPLANTATION AND RECONSTRUCTION: A COMPLETE DIGITAL WORKFLOW

LEARN HOW THE RIGHT SYSTEMS AND SOFTWARE CAN LEAD TO A FASTER FINAL OUTCOME.

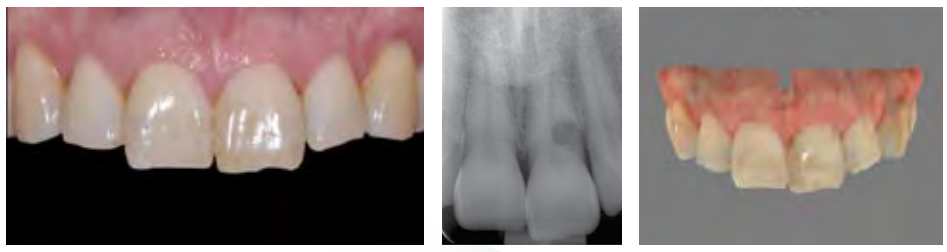
OVERVIEW

A 54-year-old patient was referred to our practice and presented with an external granuloma on tooth #21. The patient's periodontal situation was healthy.
Our solution: immediate anterior tooth replacement using Carestream Dental's CS 3600, smop by swissmeda and exocad.

TREATMENT

Initial examination records included intraoral and extraoral images, intraoral radiography, a cone beam CT scan and a CS 3600 intraoral scan of both the maxillary and mandubular arches including bite registration.

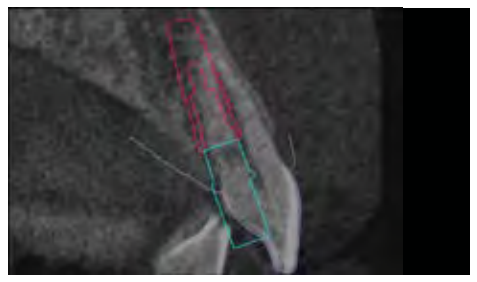
The .PLY file from the CS 3600 scan was imported into Meshmixer software as the virtual wax up. The file was modified to virtually extract tooth #21, and was exported as an .STL. The .STL file was then imported into smop software as the final digital model to plan the implant placement and design the surgical guide.



Initial photo, radiograph, and intraoral scan

Implant planning in smop showing a combination of the CBCT data with the intraoral scan


Virtual extraction of tooth #21 for the design and production of the surgical guide

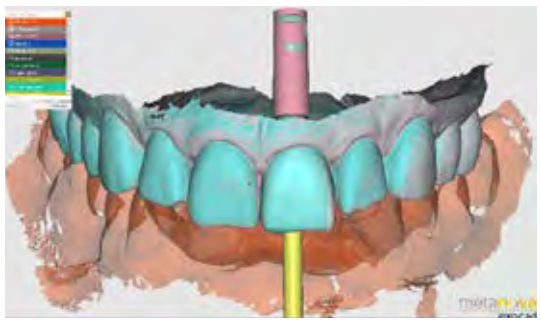



Export of the .STL data of the scan body, model and wax up for the manufacturing of the provisional crown

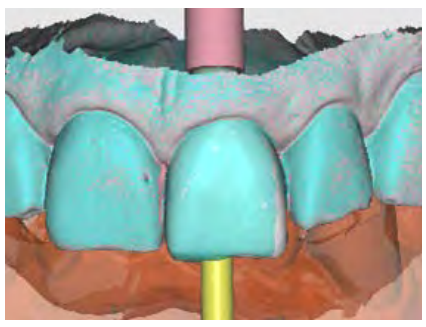
SURGICAL GUIDE & IMPLANT PLANNING

Next, the Camlog implant for tooth #21 was planned in smop software, including placement of the screw-retained crown and virtual contruction of the surgical guide template.

Once the planning and design of the implant placement and surgical guide was complete, the files were exported as a digital model in both .STL and .PLY formats, and as a .PLY wax up showing the virtual scanbody. Next, a print was made of the guide template using a 3D printer from Stratasys (Eden260 – material: MED 610).
The data was then imported into exocad software and the PMMA crown was designed and constructed using a Camlog glued-on titan base abutment.

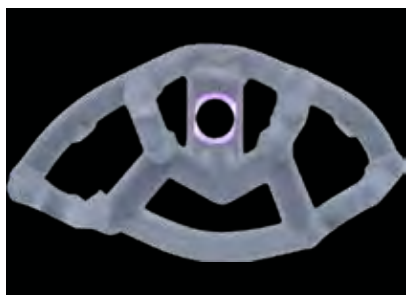


Import of the .STL data of the scanbody, model and wax up in exocad software



Prefabricated provisional crown





Camlog Guide system

EXTRACTION

The tooth was extracted, and a 4.3mm, 13mm Camlog Conelog implant was placed using the printed smop guide. The buccal defect was then filled with Bio oss collagen from Geistlich. The flap was repositioned, and the temporary screw retained crown was placed.


Extraction of tooth #21

GUIDE PLACEMENT AND IMPLANT POSITIONING

Placement of Camlog Conelog implant using Camlog guide system

Final placement of the temporary screw-retained crown

Before-and-after treatment comparison

Perioperative care included antibiosis with amoxicilin and clavulan acid for one week, chlorhexidin 0.2% and mefenamin acid. Sutures were removed one week after implant placement.

CONCLUSION

After 12 weeks, the referring dentist placed the permanent crown to complete the restoration.

Follow-up intraoral photo and radiograph

Final restoration

FACT SHEET

Kunal Shah, D.D.S.

Dr. Kunal Shah is the Principal of LeoDental in Hendon, London. In this clinical case study, Dr. Shah demonstrates the integral role that the CS 8100 3D imaging system played in delivering predictable treatment and the very best outcome for the patient.

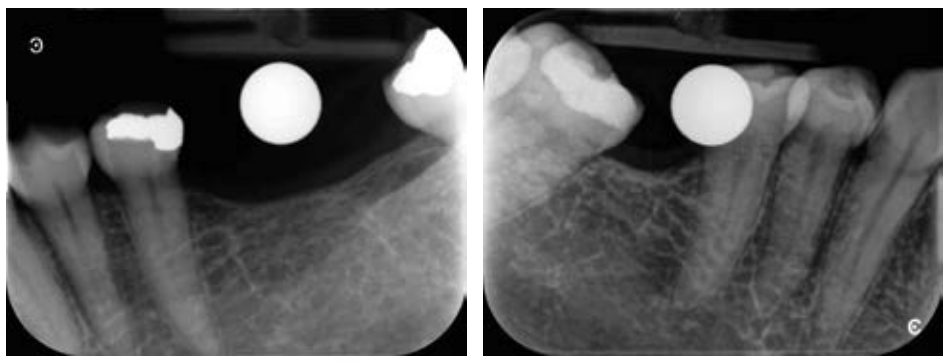
CLINICAL CASE STUDY

WHAT CBCT CAN REVEAL

DISCOVER WHY 2D IMAGING SOMETIMES ISN'T ENOUGH.

OVERVIEW

A healthy, 52-year-old female patient—with no relevant medical background, moderate previous dental restorations and generally good oral hygiene—had had LL6, LL7 and LR6 extracted 15-20 years ago. For the majority of that time, this loss in dentition did not impact her lifestyle. Recently, however, she was having issues with eating. The adjacent teeth were starting to drift and the opposing teeth on the other side were erupting, creating a functional problem rather than an aesthetic one. She was referred to LeoDental for implant surgery.



Pre-op periapical X-ray with metal ball for reference

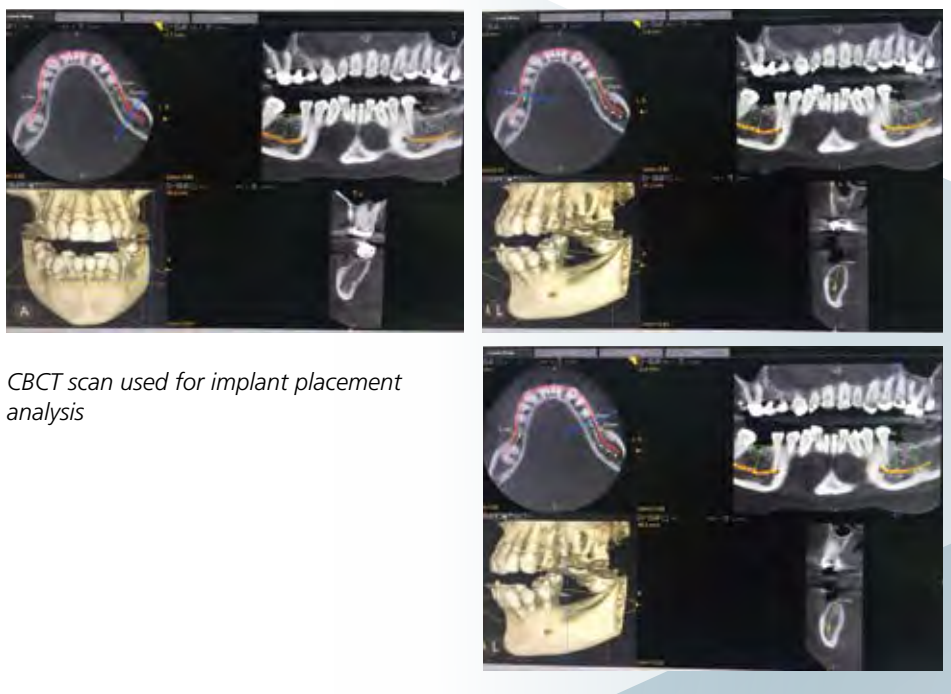
TREATMENT PLANNING

We took a periapical X-ray with a ball bearing, as well as a CBCT scan with the CS 8100 3D. The first scan enabled the surgical team and me to assess the height of the bone, but the 2D image couldn't gauge the buccal-lingual aspect or the bone density.

CBCT provided the 3D element, allowing us to:

- Track the depth from the crestal bone / bony ridge toward the nerve
- Assess the mesial-distal width present for placement of the LL6, LL7 and LR6
- Determine the buccal-lingual dimensions
- Account for the biological width

We were then able to calculate the vertical depth and nerve anatomy with high accuracy.



CBCT scan used for implant placement analysis

We evaluated the scans with the referring doctor and placed virtual implants on the X-rays. This exercise helped us to determine exactly where the implants should be placed, as well as the angulation, platform, length and type of implants required. We then took impressions using a single-stage wash putty technique and fabricated a study model and surgical stent with mock acrylic teeth. We practiced the surgery on the model, visualizing the implant position and comparing it to the virtual plan.

The goal of this upfront effort was to fine tune the treatment plan to minimize surgery time and associated risks. Based on my experience, I believe that the quicker the surgery, the better the primary stability and integration of the implant. From an aesthetic standpoint, a faster surgery also seems to lead to better gingival and mucosal healing, resulting in less future recession. Soft tissue is a key element for good aesthetics and the long-term success of the implant.

IMPLANT PLACEMENT

The surgery was a repeat of the virtual process the team performed during the planning stage. We raised a flap and followed the sequence of implant placement according to the manufacturer's instructions (Nobel Biocare implants, in this case). We placed the three implants in the pre-determined sites, fitted the healing abutments and closed the flap.

The LL7 was very difficult to access, but the surgery was simple because we had planned ahead and knew to use the extension elements available with the implant system for this position. We presented the patient with a post-op kit, which contained further information on caring for the surgical site, maintenance tools and any relevant medication.

Because the patient had already become accustomed to the spaces in her mouth, there was no need for temporaries in this case, which further encouraged good soft tissue healing with no occlusal load on the implant.

FOLLOW UP

During the follow-up appointment one week after surgery, the patient reported no pain and there were there no problems with the implant site. We allowed three to four months for healing before asking the patient to return for periapical X-rays, removal of the abutments, intraoral scanning to reveal soft tissue healing and irrigation of the site. We took an impression using an open-spaced tray (customized for the patient by the lab) with the implant impression copings in place.


LL6, LL7 and LR6 following ~3-month integration


LL6, LL7 and LR6 with healing abutments following ~3-month integration

After two more weeks, the lab delivered the screw-retained restorations, and we fitted them. We chose shade A3 and took an impression of the opposing arch to determine bite.


Placement of screw-retained restorations

OUTCOME

By the end of treatment, the patient was delighted with the outcome. From the professional team's perspective, there were no complications or unexpected events, which we can attribute to both meticulous planning and the harmony with which our team worked.


Post-op periapical X-rays

CLINICAL CASE STUDY

FACT SHEET

Jean-Michel Foucart, D.D.S.

Jean-Michel Foucart holds his D.D.S. degree as well as a master's and Ph.D. in oral and maxillofacial imaging. He's also an orthodontic specialist. He opened his office in Eaubonne, France, in 1992. He's also:

- An associate professor in oral and maxillofacial anatomy and imaging
- A hospital practitioner in orthodontics and maxillofacial imaging
- A legal expert (Versailles Court of Appeal)
- A radiation protection expert adviser
- An author of more than 120 national publications and communications

THE DIFFERENCE INTEGRATION MAKES IN THE ORTHODONTIC PRACTICE

FROM EVALUATION TO TREATMENT PLANNING, INTEGRATION MAKES A BIG DIFFERENCE.

OVERVIEW

Dr. Foucart is not a newcomer to digital imaging. In fact, he bought his first digital panoramic and cephalometric system in 1998. When a diagnosis called for computerized tomography (CT), Dr. Foucart used a system at the university. In 2007, he transitioned to cone beam computed tomography (CBCT) with the CS 9000C 3D to take advantage of the benefits the technology offered: higher resolution, faster processing, a lower dose—and the convenience of having an in-house system. He later moved to the CS 9300C to benefit from a larger 3D field of View.

THE IMPORTANCE OF CBCT

When asked what capabilities he values in a CBCT system, Dr. Foucart replied, "We should always strive to seek the lowest dose possible while still obtaining the necessary diagnostic images. A CBCT system with multiple fields of view—like my CS 9300C—helps doctors achieve that goal. In addition, the system should provide true panoramic and cephalometric imaging."

Dr. Foucart also appreciates a system that provides automatic cephalometric tracing. "Tracing facilitates diagnoses," he said. "With a system that does it automatically, you save a lot of time. The feature registers each anatomic landmark, and accuracy is about 80 percent. There's no need for a time-consuming manual analysis."
Dr. Foucart appreciates the improved view of impacted cuspids that CBCT imaging provides. He can determine the presence of ankylosis, which panoramic imaging does not reveal. "With 2D imaging, I can see only the frontal and lateral, but with 3D I can see the entire form and analyze the relationship between the teeth and the maxilla, as well as the roots and whether they cross," said Dr. Foucart. "I can determine the exact angle of the tooth."

True panoramic and cephalometric imaging

CBCT systems provide an improved view of the cuspids

His patients can more easily understand their clinical situation—especially when there are impacted cuspids or serious concerns—from the images generated by the CBCT system. Plus, referrals can choose from the images Dr. Foucart has already taken, preventing the need to reimage the patient.

THE SPEEDINESS OF THE CS 3600

Dr. Foucart has been working with the CS 3600 intraoral scanner since January 2016. He loves the speed of scanning as well as the ability to immediately view the digital model on the screen. And thanks to CS Model+, he can analyze the entire scan within minutes. "Creating a digital model with an intraoral scanner is much faster than traditional methods," said Dr. Foucart. "Taking the conventional impression, pouring in plaster, sending the impression to a lab and then waiting for delivery of the model is not an efficient process."

The CS 3600 increases efficiency in additional ways, too. For example, the CS 3600 can export 2D .JPEG images directly into the patient's imaging chart from the 3D impression. This powerful integration between the CS 3600 acquisition software and the patient's imaging chart eliminates the need for the practice to acquire traditional 2D orthodontic intraoral photographic records for the patient's chart.

HD 3D digital impressions acquired with CS 3600

Dr. Foucart's staff typically scans 7-8 patients per day and can complete both arches in about 5 minutes—although they've completed the process, including a palatal scan, in as little as 3 minutes, 13 seconds before.

From the patient's perspective, intraoral scanning is significantly more comfortable than a conventional paste impression. Gagging is no longer an issue, which greatly hampers productivity because you have to start the acquisition process all over and hope that gagging doesn't happen a second time. Patients also enjoy seeing the images as they appear on the computer in real time.

Dr. Foucart values the open file format of the CS 3600's output: a digital file is more useful and can be sent as is for printing to a third party or in-house. Additionally, open files provide the practitioner with the freedom to share the files with labs or referrals without any restrictions. Labs or referring doctors can use their CAD software of choice to view and utilize the data sets.

To more efficiently store models, Dr. Foucart previously scanned them with his CS 9300C and then used CS Model to create a digital version. But now his staff can take the digital impression file acquired by the CS 3600 and use CS Model+ to create a digital model—a much faster and more concise process which eliminates the need for a conventional impression.

Dr. Foucart finds CS Model+ to be very useful in analysis. CS Model+ automatically segments the teeth on the digital model in about one minute. The segmentation is automatic, and Dr. Foucart merely has to confirm that the segmentation is correct. CS Model+ then automatically creates a setup, which is essentially a treatment simulation. Generating the setup takes the software approximately one minute and then 2-5 minutes to simulate different clinical possibilities in complex cases. This capability enables Dr. Foucart to provide each and every patient a more comprehensive treatment analysis—without taking an undue amount of time to complete it. "Before CS Model+, I did not produce a model analysis on all of my patients because it was too time consuming. Now all my patients are checked in CS Model+ software. The result is a more comprehensive treatment analysis," said Dr. Foucart.

CS Model +

Additionally, CS Model+ has been a helpful tool for more advanced treatment planning of complicated cases, which represent approximately 20 percent of Dr. Foucart's patient base. The CS Model+ software enables him to perform multiple treatment setup simulations on a single patient and select the options that best meets the patient's needs. The simulation video also helps Dr. Foucart communicate the treatment goals to the patient, providing a helpful visual of how the treatment is likely to proceed.

A SMARTER WAY TO WORK

Each system and software solution has its own benefits it brings to the practice. But the truly noteworthy advantage lies with the gains in efficiency and information from the integration between them all. "There is a huge benefit to the workflow when all the products and software are designed to work together seamlessly. For example, I can now analyze all of my patient's orthodontic records very quickly—in less than five minutes," said Dr. Foucart. "How? I start with my auto-tracing from the ceph system. Then I launch the auto-segmentation feature in CS Model+. I verify the segmented and numbered teeth. Next, I launch the auto-set-up capability and modify my set-up criteria for the treatment when required. When I run the report, the values from the automatic tracing automatically merge into CS Model+. The findings from CS Model+ include the relevant information, so there is no need for me to manually enter the results from the cephalometric analysis. This not only saves time, but also prevents human error."

Dr. Foucart's practice truly is experiencing the gains in efficiency that systems and software integration brings. The streamlined workflow, with all components synchronized and working in harmony, enables Dr. Foucart to spend the optimal amount of time with his patients. His patients value the comprehensive diagnostic analyses and treatment plans—complete with images. "All of the information provided by my systems and software enables me to feel confident in my diagnosis and my patients to feel confident about accepting treatment," said Dr. Foucart.

WORKFLOW INTEGRATION | **HUMANIZED** TECHNOLOGY | **DIAGNOSTIC** EXCELLENCE

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