Mastering the implant digital workflow

By Dr Ross Cutts, UK

Whether we like it or not, we are embracing the digital era in our brave new world. Many dental practices are now becoming paper-free—a digital innovation—and even using tablet computers to record patient details and medical histories. We are continually surprised by the rising age of the technologically savvy patient, particularly those of a certain generation who perhaps we assume would be less than the perceived iPhone generation.

This change in the patient demographic and attitude towards technology is filtering through to us in the dental professions. The nuts and bolts of implant dentistry tends to lend itself more readily to the digital revolution of dentistry in the UK and now globally. Many practitioner opposed to or reluctant to embrace it are actually being influenced by it through shifting workflows in dental laboratories, even where more traditional clinical practices are followed chairside. Quite often, wet impressions are poured and stone models are scanned to produce STL files for laboratories to process during crown and bridge unit manufacturing.

As an implant clinician, one does not have to invest in a CT scanner or chairside intraoral scanner—there are ways that other centers and laboratories can provide these services. However, having these tools at one’s disposal greatly increases one’s efficiency and means one is not reliant on external services for one’s patients.

So how do we begin the implant digital workflow? Successful implant treatment begins with thorough case assessment and planning of the proposed restoration. This is important for all cases, not just what we deem the complex ones. Even the most experienced implant clinician can miss a potential treatment planning hazard, especially during a busy day. Accurate study model casts are an essential part of this; however, we can now use intraoral scans preoperatively to begin the digital workflow. We take a scan rather than impressions to form digital models. Our laboratory can then use these to create digital wax-ups of proposed treatment outcomes.

We are routinely used to 2-D radiographic imaging techniques in dentistry, but with the availability and access to CBCT scanning devices now, we are able to assess bone quantity and quality of proposed implant surgical sites. With ever-reducing doses of 3-D imaging and improving accuracy, we are able to use CBCT scans, combined with clever software packages such as CoDiagnostix (Dental Wings), to plan safe and accurate implant placement and restoration. We are able to preoperatively plan precise implant placement with safe surgical margins away from important anatomical structures, such as the inferior alveolar nerve or maxillary sinus. From this, we are then able to design and either mill or print a surgical guide to use for precise implant placement.
Even with assisted surgery or guided surgery, there are sometimes certain restrictions that prevent us from achieving the most ideal implant placement, such as this case shown where posterior access in the second molar region was reduced, so achieving the perfect parallel was extremely difficult.

There are fully guided systems available that allow for absolutely precise implant placement, but these are fraught with complexities and should be reserved for experienced clinicians. The accuracy of surgical guides should not be used to make up for a lack of surgical competency however.

If soft tissue-supported, mobility completely negates any accuracy of the guide, so it should only be used for a pilot drill and then a more conventional surgical protocol adopted.

If bone-supported, raising of a very large surgical flap is likely.

- It is very difficult to ensure accurate full seating of a bone-supported guide in the precise planned position and this relies upon external fixation.

Once the implants are placed in situ and fully integrated, we then have a choice of conventional wet impression techniques versus digital intraoral scanning. For the majority of cases, intraoral scanning is extremely predictable and reliable—more so than conventional techniques—with milled (and lately printed) models having excellent properties and less accumulation of processing errors. However, deeply placed implants relative to adjacent teeth are very difficult to scan and pick up. Straumann tissue level implants offer a very straightforward restorative platform to scan from.

With greater numbers of implants and fewer teeth to act as reference points, intraoral scanning becomes less reliable—particularly across the arch—so we need to exercise caution and be aware of its limitations. We have used composite flow stuck to the soft tissue to increase reference points for our scanners, increasing their ability to stitch images more accurately together. With this in mind, we cannot assume the scan is accurate and any framework fabricated would be non-passive; therefore, we must use other methods to verify the scan’s accuracy. We have found locking temporary abutments within a composite framework introrally the easiest and most reproducible way to do this. It then allows us to design and mill a truly passive framework by Createch and a temporary acrylic bridge.

Conclusion

There are many opportunities to opt in and out of using technology regarding the digital implant workflow. For anyone considering capital investment, the most important question to ask is, how will or can this improve the outcomes I provide to my patients, and then determine whether this warrants the expenditure. Too often are we subjected to sales pitches of the next biggest thing by company sales representatives and gadgets and gizmos end up by the wayside.

Acknowledgements to Andy Morton and Ian Murch, the fantastic laboratory technicians at Borough Crown and Bridge that I work closely with.

Fig. 9: Surgical placement of LL67 implants
Fig. 10: Scanbodies in situ
Fig. 11: Tissue-level implants
Fig. 12: Crowns on printed model
Fig. 13: Implant crowns in situ
Fig. 14: Scanbodies with composite flow material to increase scan accuracy
Fig. 15: Verification jig locked in situ to gain implant passivity
Fig. 16: Createch framework fit surface
Fig. 17: Finished screw-retained bridge in situ

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Editorial note:

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Astra Tech Implant System and Atlantis Case report

By Prof. Clark M. Stanford, USA & Ass. Prof. Gustavo Avila-Ortiz, USA

Single tooth immediate placement using the Astra Tech Implant System EV and Atlantis Abutment. The patient presented with a fractured maxillary right lateral incisor (42) with a dislodged endodontic post. Due to crown-to-root ratio and short remaining root, extraction and immediate implant placement was elected. Care was provided with an OsseoSpeed EV’s 6.0-diameter implant placed towards the palate following the 3x2 rule. Following eight weeks of healing, stage-II was performed and the final restoration completed within six weeks using an Atlantis Abutment in gold-shaded titanium with concave emergence shape selected. The final crown was an all-ceramic zirconia crown.

Fig. 1: Clinical pre-treatment situation: Root fracture on maxillary right lateral incisor.

Fig. 2: Radiographic image of the pre-treatment situation.

Fig. 3: Immediate implant placement after tooth extraction starting with the Twist Drill EV Ø1.9.

Fig. 4: Direction Indicator EV showing the forthcoming position of the implant.

Fig. 5: Implant placement using Implant Driver EV 3.6.

Fig. 6: OsseoSpeed EV 3.6 S x13mm placed in the correct position.

Fig. 7: Radiographic image after implant placement showing the OsseoSpeed EV 3.6 S x13mm placed epicrestally with a Cover Screw EV 3.6.

Fig. 8: Stage-II was performed after eight weeks of healing. A triangular HealDesign EV 3.6 Ø5-3.5mm is placed in the implant.

Fig. 9: The triangular design pre-shapes an esthetic profile for the final restoration.

Fig. 10: The self-guiding Implant Pick-Up EV 3.6 is used for impression taking.

Fig. 11: Implant Replica EV 3.6 is connected to the Implant Pick-Up in the impression material.

Fig. 12: An Atlantis Abutment in gold-shaded titanium is ordered through Atlantis WebOrder.

Fig. 13: Atlantis Abutment in situ after six weeks of additional healing. The one-position-only indexing feature simplifies the abutment placement.

Fig. 14: Radiographic image after placement of the Atlantis Abutment and the crown.

Fig. 15: All-ceramic crown (ZrO₂) after three months.

Fig. 16: Anterior incisal plane and final clinical appearance three months after installation.
Astra Tech Implant System®

Simplicity without compromise

The design philosophy of the Astra Tech Implant System EV is based on the natural dentition and supported by flexible surgical protocol and a simple prosthetic workflow for increased confidence and satisfaction for all members of the treatment team.

- Unique interface with one-position-only placement for Atlantis patient-specific abutments
- Self-guiding impression components
- Versatile implant designs
- Flexible drilling protocol

The foundation of this evolutionary step remains the unique Astra Tech Implant System BioManagement Complex.

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