Immediate implant placement and digital workflow

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Introduction

Immediate implant therapy is a clinically validated procedure.¹ In the anterior dentition, success is measured not only by implant survival and stable bone levels, but by long-lasting, aesthetically-pleasing outcomes. This is accomplished by satisfying several biologic and restorative criteria.

Implant position is crucial in terms of developing proper restorative emergence profile and establishing facial and proximal soft tissue levels. Fixtures should be palatally-positioned,² and not in close proximity to the facial bone. This often requires that the implant diameter selected be smaller than that of the root being replaced. This facilitates formation of a clot between the socket walls and implant, leading to modelling and remodelling of native bone. The fate of the facial bone, often consisting of 100 percent bundle bone in its marginal portion, is of great importance. Regardless of surgical approach (such as flap vs. flapless, graft vs. non-graft, membrane vs. no membrane), this aspect cannot be ignored.³ Being a "tooth-dependent" tissue, bundle bone loses its embryologic function of supporting periodontal tissues once extractions are performed.⁴, ⁵ Often, especially in the anterior dentition, this facial bone wall is extremely thin prior to extraction.⁶ Compensation for post-extraction dimensional changes can be critical for long-term aesthetic success.

Some advocate retention of the periosteum (flapless placement) for bone preservation,⁷-⁹ but this...
cannot be assumed to be a predictable technique, especially in sites of thin periodontal biotypes. Augmentation, including flap reflection and facial grafting, can sometimes be advantageous. Materials capable of supporting new hard (osteoconductive) and soft tissue ingrowth and regeneration should be utilized in these cases.

Valenti demonstrated aesthetic success of immediate implants in sites where bone grafting and collagen membranes were utilized at the time of extraction and implant placement.

Soft tissue augmentation in relation to implant therapy, often accomplished with subepithelial connective tissue grafts, has been recommended to enhance the cosmetic appearance. The time involved in procuring and closing the soft tissue and its donor site, along with the increased morbidity associated with this step, may preclude its implementation in therapy. Palatal anatomy may also preclude its use in certain situations. In patients with shallow palatal vaults, the proximity to neurovascular structures can prevent the procurement of soft tissue graft or minimize their dimensions. Also, the increased operating time and morbidity associated with autogenous connective tissue grafting cannot be ignored. Dermal allograft can, in appropriate situations, serve as a viable alternative. Soft tissue augmentation may still be desired, not only for esthetic reasons, but also to preserve marginal bone levels around implants. Formation of biologic width around implants is a physiological “must”. If needed, it will develop at the expense of the marginal bone. It has been demonstrated that implants with “thick” soft tissues maintain more coronal marginal bone levels compared to those with “thin” soft tissues. Dermal allografts have been used to “thicken” soft tissues and eliminate autogenous soft tissue grafts. Consisting of collagen, these grafts may also serve as cell-occlusive membranes, serving the dual function of tissue-thickening agent and guided bone regeneration (GBR).

Provisionalizing immediate implants may enhance esthetics. Preserving soft tissue levels and developing prosthetic emergent profiles can be more efficacious with a provisional crown versus a round, non-anatomically-shaped healing abutment. The retention of provisional restorations may also play a role in the success of therapy. Stability of the restoration and avoiding early removal can be critical for successful osseo-integration as well as not disturbing the initial soft tissue remodelling around the crown(s). Screw-retention, though more technique-sensitive compared to cement-retained fabrication, allows for tightening of the temporary crowns and elimination of possible cement-associated, biologic complications.

Case report

The following case report (Figs. 1–22) demonstrates how a hopeless maxillary incisor is extracted and replaced with an immediate implant simultaneous with tissue augmentation and immediate provisionalization.

Following papilla-sparing, facial flap-reflection, tooth #9 (#21) was carefully extracted. The alveol
lus was debrided with manual and ultrasonic instrumentation.

It was then conditioned with doxycycline for about 3 minutes, followed by sterile saline irrigation. Palatal positioning of an OsseoSpeed EV 4.2C x 13.0 mm implant was performed. The OsseoSpeed EV implant has been shown to be significantly stronger than its predecessor (OsseoSpeed TX).20 In a prospective multi-centre study, Stanford, et al21 demonstrated that the Astra Tech Implant System EV performed equally as compared to the previous product lines within the Astra Tech Implant System TX regarding radiographic bone levels, with a subjective sense of greater stability at time of placement.

Obturation of the void between the implant and the socket walls was accomplished with a mixture of approximately 3:1 freeze-dried bone allograft (FDBA) and deproteinized bovine bone mineral (DBBM). A 4.2 Implant Pick-Up EV impression post was tightened and the facial flap repositioned with temporary sutures to protect the underlying tissues during a surgical impression.

The impression was poured with an implant replica in place to facilitate provisionalization at the restorative dentist’s office immediately after surgery.

The site was then reopened and the same bone graft was placed over the facial cortex and covered with a dermal allograft (Symbios PerioDerm GBR), which was adapted via a tissue punch around a HealDesign EV healing abutment. Symbios PerioDerm GBR was selected as the desired material due to its structural integrity, closely resembling that of human tissue. Viable cells and antigens are removed without damaging the remaining matrix, which serves as a framework for cellular infiltration and vascularization.

The flap was then sutured securely around the healing abutment with resorbable sutures. The patient was prescribed amoxicillin 500 mg for ten days, a six-day course of methylprednisolone (Medrol Dosepak), Etodolac 400 mg for analgesia and Chlorhexidine Gluconate rinses bid. He was instructed to avoid all mastication in the anterior dentition for at least six weeks.

Immediately after surgery, the patient reported to his restorative dentist’s office for fabrication and delivery of a screw-retained provisional restoration. A temporary abutment (Temp Abutment EV 4.2) was modified and covered with opaque composite resin prior to addition of bis acryl and flowable composite resin. It was contoured and polished and the facial/incisal screw access channel covered with Teflon tape then flowable composite resin. This restoration was torqued to 15 Ncm and placed out of occlusal contact with the opposing mandibular teeth, and light contact with the adjacent teeth.

The patient was seen for post-operative appointments at ten days and again at eight weeks at the
surgeon’s practice. Soft tissue health was confirmed, radiographic bone levels were relatively unchanged and no mobility of the provisional restoration or implant was noted.

The patient returned to the restorative dentist for the initiation of restorative therapy at about ten weeks.

Removal of the provisional crown demonstrated physiologic development of the peri-implant soft tissues.

Rather than taking an elastomeric impression, an Atlantis IO FLO (scan body) for Astra Tech Implant System EV was placed for digital impression of the implant with an iTero intraoral scanner. Using a CAD/CAM impression system allowed for an extremely accurate impression of both the soft tissue and the implant position to be taken quickly and easily, providing the laboratory with all necessary landmarks to create a very natural emergence profile for the final restoration. Using the iTero impression system also allowed us to have an Atlantis patient-specific abutment fabricated for this case. The unique interface design of the Astra Tech Implant System EV allows for one-position-only placement of Atlantis patient-specific abutments, making the impression-taking and final delivery very easy and uncomplicated.

The Atlantis Abutment was fabricated with the unique combination of four key features called the Atlantis Abutment BioDesign Matrix, which includes Atlantis VAD (Virtual Abutment Design) software that takes into consideration the final tooth shape, the edentulous space and the adjacent teeth in the design of the abutment. The Natural Shape of Atlantis Abutments is the emergence profile based on individual patient anatomy while the Soft-tissue Adapt helps to provide optimal support for the soft tissue. Lastly, the abutment-to-implant Custom Connect provides a strong and stable fit.

The final prosthetic restoration consisted of an all-ceramic lithium disilicate crown (IPS e.max, Ivoclar Vivadent) providing an excellent aesthetic outcome. The all-ceramic crown was cemented with resin cement after tightening of the abutment screw to 25 Ncm and plugging the access with white Teflon tape. Figure 22 shows the nice aesthetic result of the final restoration...