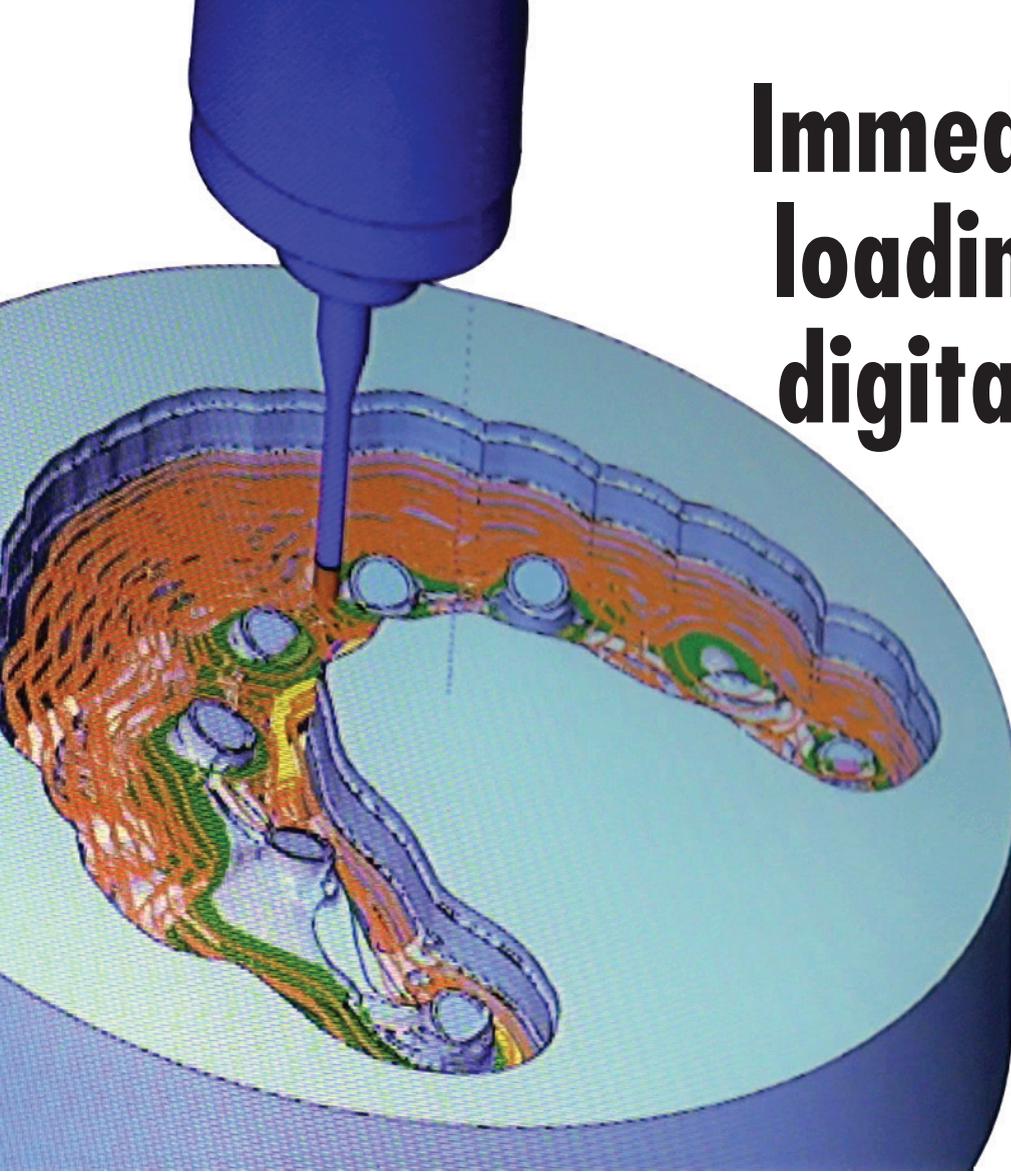


Immediate implant loading backed by digital workflows



Jessica Maguire,
BDS (Lond)

Jessica Maguire looks into incorporating a digital workflow in implant dentistry, and explains why there's no time like the present

Immediate loading – the placement of a prosthesis within 48 hours of implants being placed – has long been a contentious issue within the field of full arch dental implant rehabilitation. However, as our understanding of implants has evolved, so too have techniques; allowing the journey to be much more efficient for patients and clinicians alike. .

The current advantages that immediate loading has include:

- Fewer surgical interventions
- Reduction in overall treatment time
- Reduced soft and hard tissue loss
- Psychological satisfaction of the patient (Singh et al, 2015).

At Evodental, we carry out full arch immediately loaded solutions every day. We are vertically integrated with our lab, allowing us to prepare for any eventuality, but planning is still key to success, as every case needs to be immediately loaded in a predictable manner.

A comprehensive assessment and treatment plan is essential to an immediate loading protocol. A detailed medical history is obtained to ensure the patient can undergo a surgical procedure safely.

Our multidisciplinary team meetings form a part of this and allow us to consider both the biological and biomechanical aspects, enabling us to provide the best course of treatment for every patient.

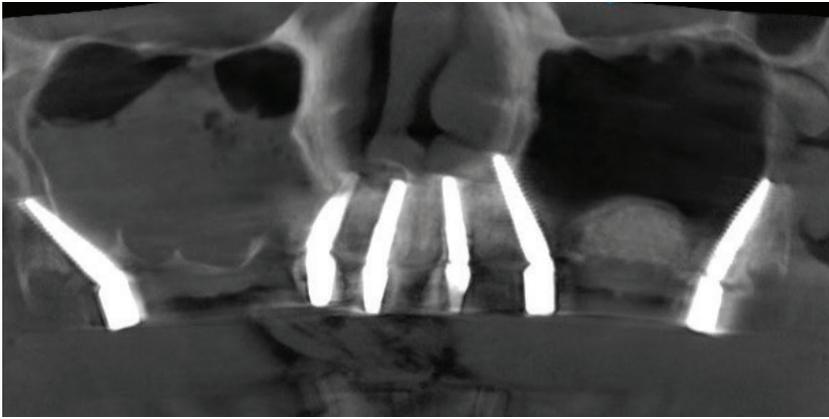


Fig. 1 — Radiograph demonstrating bicortical fixation with sinus or nasal floors

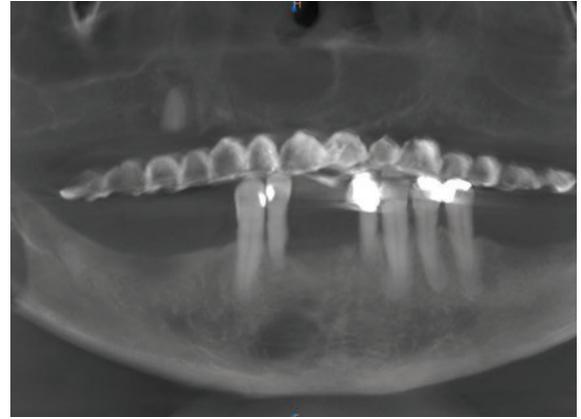


Fig. 2a — A patient with soft bone, before treatment



Fig. 2b — A patient with soft bone, after treatment

Biological implications

The most important criteria for success are obtaining and securing the stability of the implants. Implant stability is categorised into two phases:

- Initial stability (which is a mechanical phenomenon)
- Secondary stability (which is a biological phenomenon created by osseointegration) (Miri et al, 2017).

Primary stability must be achieved to allow for immediate loading to be carried out.

During the planning stages, we use 3D imaging to assess and ensure our implants can be bi-cortically fixated: this is where the implant is engaged in the cortical bone on the alveolar crest and also on the sinus or nasal floors.

Studies show that having the implant apex in contact with, piercing, or breaking through the sinus floor cortical bone benefits the implant stability, especially in immediate loading.

In 2019, Ragucci et al carried out a systematic review that concluded the overall survival rate of implants into the sinus cavity was 95.6% without statistical differences according to the level of penetration.

The penetration depth of polished implants with cortical engagement into the maxillary sinus or the floor of the nose does not negatively affect implant survival, the success rate of the treatment, nor peri-implant soft-tissue health. It does not provoke the development of sinusitis either (Awadalkreem et al, 2020).

Planning continues with an assessment of bone density using cone beam computed tomography (CBCT). Patients who present with soft bone – in particular D3/D4 – would previously not have been considered for an immediate loading protocol.

However, at Evodental, the majority of our patients have soft D3/D4 bone. Under loading, bone behaves as a structure with material and architectural properties, as well as a biological system. Functional loading of the implants within the bone greatly affects the maturation of the bone and therefore an increase in the bone density as time goes on (Misch, 2014).

Our drilling protocols create lateral compression of the bone, which further improves primary stability.

Occlusion is of paramount importance, especially when parafunction is present as it can intensify mechanical stresses and strain on the implants. Controlling the occlusion is therefore at the forefront of our minds when assessing the patient as well as during our prosthetic planning.

All of our prostheses have canine-to-canine occlusion in the initial healing stage. This is gradually increased by the final prosthesis over a period of six to eight weeks.

A shortened dental arch is present in most cases to ensure minimal or no cantilevers are present. Where small cantilevers are required, there will be no occlusal contacts. Unevenly distributed occlusal contacts can result in failure and should be evaluated at every visit. Soft diet protocols are in place to prevent overloading during the early phase of the restorative process.

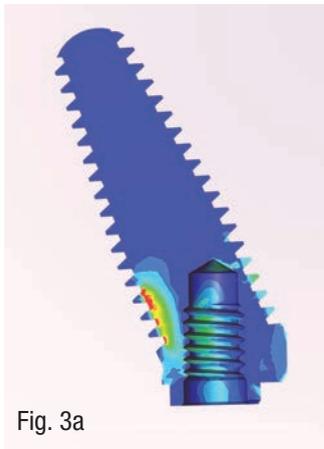


Fig. 3a

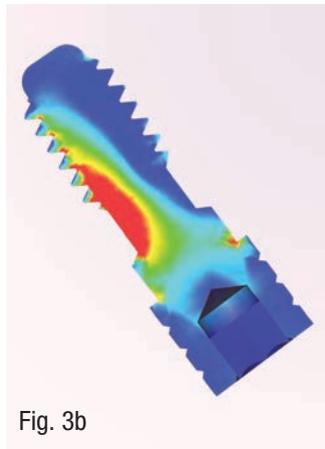


Fig. 3b

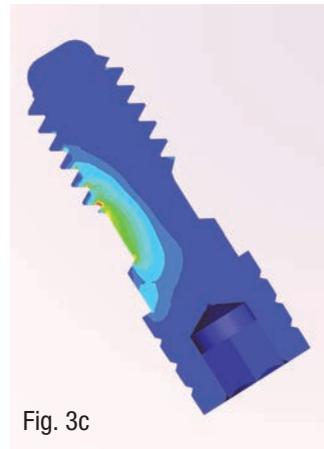


Fig. 3c

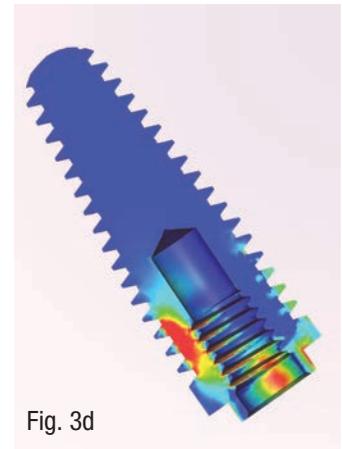


Fig. 3d

Figs. 3a - d — Illustrations showing plots of first principal stresses (tensile stress) in the implant and screw in a Co-Axis versus straight implant, obtained from a finite element analysis with identical loading conditions. The stress plots show that the tensile stress in the straight implant and corresponding screw are up to 1.7 times the magnitude of the tensile stress in the Co-Axis implant and screw

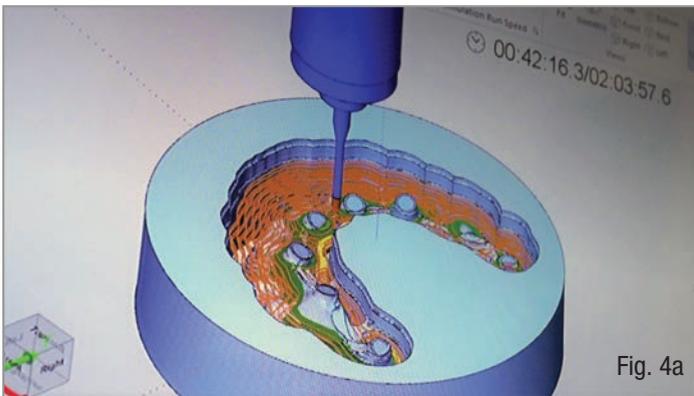


Fig. 4a



Fig. 4b

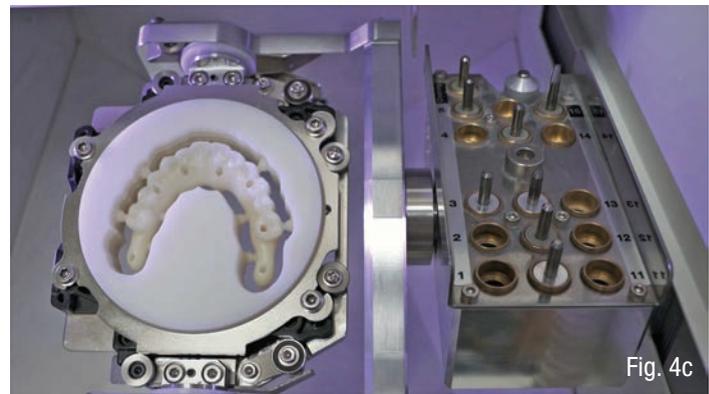


Fig. 4c

Figs. 4a - c — The milling process

Typically, six implants are placed in the maxilla (to include pterygoids) and four in the mandible. The pterygomaxillary region provides an excellent site for implants, particularly in patients with an atrophic posterior maxilla – a common scenario for us at Evodental. Our use of pterygoid implants is another reason why we can immediately load almost every case, as it boosts composite torque value and AP spread; providing combined stability in the implant and great spread of load.

Biomechanical implications

Micromovements are one of the main risks to successful osseointegration. Ensuring our prostheses are passive and our implants are splinted minimises this; splinted restorations are also associated with decreased implant failure (de Souza Batista et al, 2019).

Passivity is vital to maintaining osseointegration and preventing unfavourable complications, which may include:

- Prosthetic fracture
- Screw loosening
- Screw fracture
- Marginal bone loss
- Loss of implant integration
- Pain and discomfort.

At Evodental, we use Co-Axis implants by Southern Implants. This is a threaded dental implant with an angled prosthetic platform connection. It allows us to utilise existing bone while maintaining the restorative platform at an angle that ensures optimal aesthetic results.

In addition, the elimination of an angled abutment frees up valuable restorative space and allows for a more biomechanically FAVORABLE transfer of chewing forces to the implant and



Figs. 5a - b — An example of a patient before and after treatment

surrounding bone. The body of the implant is tapered for better primary stability with immediate loading. Menicucci et al (2012) compared tapered versus straight walled implants and concluded that tapered implants showed better primary stability.

The hygienic design of our prosthetics allows patients to easily maintain their prostheses for years to come. The health of the peri-implant tissues is assessed at every maintenance visit, which includes oral health sessions with our clinical team.

There are differences between a standard denture conversion versus the screw-retained fixed prostheses we provide, with regards to comfort and cleanliness.

The traditional denture conversion fabrication method involves the conversion of a complete denture into a provisional fixed implant-supported prosthesis. The conversion technique has several shortcomings, including:

- Poor structural integrity
- Lack of longevity
- Modification difficulties

The need for a silicone impression. The advantages for implant-supported fixed rehabilitation are:

- Rapid fabrication
- Improved structural integrity and rigidity
- Elimination of all silicone impressions
- Ease of modification; to promote comfort, function, adaptability and favourable aesthetics (Zaninovich and Petrucci, 2019).

Digital workflow

We use a digital workflow for all patients, allowing us to carry out custom designs for every individual. The milling machines we have on site mean we can fit the patient's teeth on the same day as surgery; reducing the number of visits the patient has to make and allowing them to leave later that day, feeling like a new person.

Guided surgery can be carried out within the digital workflow where required, but the outcomes with guided surgery are similar to those expected from conventional techniques (Laleman et al, 2016). Our digital workflow also means that we can complete the design for the 4C individual after the implants have been placed; allowing us to:

- Develop emergence profile
- Improve patient comfort
- Control the design for subsequent prosthetics.

Immediate loading should be considered for full arch dental implant rehabilitation so long as the stringent criteria are met in combination with meticulous planning. Del Fabbro et al (2019) carried out a systematic review showing that survival rates of immediately loaded implants were 97.4%, with long term predictability and success rates. Immediate loading also shows significantly less marginal bone loss.

Of our cases, 99% are immediately loaded but there are a few patients who require a delayed load approach, which we implement if required. Same-day fixed prostheses, however, will always be our method of choice.

When a patient arrives in the morning with failing dentition and leaves in the evening with a new smile, it is clear that they have been given a new lease of life! ■

About the Author

JESSICA MAGUIRE BDS (Lond) graduated from King's College London in 2012. She began her implant journey in 2014, under the mentorship of pioneer Hilt Tatum, before joining Evodental in 2019.