
Conclusion: Platform switching seems to reduce peri-implant crestal bone resorption and increase the long-term predictability of implant therapy.


Conclusion: Within the limits of the present study, it was concluded that both CAM and CPS implants revealed crestal bone level changes after 28 days of healing.

The ITI Consensus Statements and recommended clinical procedures regarding esthetic and functional outcomes in implant dentistry (ITI Treatment Guide Volume 1 – Quintessence) have to be mentioned here as the authors wish to avoid raising false expectations that only platform switching (a group of prosthetic and restorative procedures) can lead to predictable results. The authors’ statements in the articles are based on:

1. Long-term results (from evidence to newer surgical approaches)
2. Surgical considerations (from extraction planning to soft tissue stability)
3. Prostodontic and restorative procedures (from standards for esthetic fixed-implant restorations to location of the implant shoulder)
4. Well-executed esthetic risk analysis performed prior to any treatment planning.

Conclusion: The authors would like to end questions raised by DM Gardner in an article in NSDII, from April 2005: Can implants be placed closer than 5mm from an adjacent implant, while still maintaining interproximal height of bone? Can implants be placed less than 1.5mm from an adjacent tooth and still maintain interproximal bone?

• Can implants be placed at or below the osseous crest and avoid bone loss to the first thread after abutment connection?
• Can implant esthetics be improved through “platform switching?”

The authors’ personal experience is of course limited to one manufacturer, but over time the results are encouraging and many more long-term multicentre studies are needed to obtain evidence.

About the author

Gabriela Steier
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Immediate loading of immediate implants

Dr Devorah Schwartz-Arad discusses a preferred solution in the esthetic zone

In the past two decades, immediate implant placement into fresh extraction sites has gained in popularity and is considered a predictable and acceptable procedure.1-6 However, the dimensional changes and aesthetic results are controversial.7-10 The rationale behind immediate implant placement is, in part, based on observations that it may contribute to bone preservation.8,9 Early extraction and immediate placement could lead to a favourable crown-implant ratio, better esthetics, and a favourable interarch relationship.1,11

Fig 1a: In this case, the right maxillary canine was scheduled for extraction due to root fracture. Single-tooth replacement through immediate provisionalisation was chosen as the treatment method.

Fig 1b: A pre-operative CT scan revealed thin buccal plate in the area of this canine.

Fig 1c: The canine was atraumatically extracted, taking care not to damage the buccal plate and the adjacent papillae.

Fig 1d: An implant was immediately placed into the fresh extraction socket without raising a flap.

Fig 1e: An acrylic resin provisional crown without any occlusal contacts was fabricated and placed.

Fig 1f: Healthy soft tissue around the provisional crown is evident at six months.

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In 2001, Garber et al. introduced immediate provi-
sionalisation of immediate im-
plants and described the next
 generation of the immediate
implantation technique, which
 included atraumatic tooth re-
moval with simultaneous root-
form implant placement and
temporisation in one session.
This technique of “Immediate
Total Tooth Replacement” al-
lows for the maintenance of the
bony housing and soft-tissue
form that existed before ex-
traction, while simultaneously
establishing a root-form an-
chor in the bone for an esthetic
restoration.

Diagnosis and
treatment planning
These are key factors in
achieving successful outcomes
after placement and restora-
tion of implants inserted imme-
diately after tooth extraction.13
A socket often presents dimen-
sions that may be considerably
greater than the diameter of
most implants after extraction.
In a histological report, Wilson
et al. stated that the horizontal
component of the peri-implant
defect was apparently the most
final amount of bone-implant
contact.

Botticelli states that small
defects (1-1.25 mm) may heal
with new bone and a high de-
gree of osseointegration and
that the placement of a barrier
membrane after implant in-
stallation does not improve the
outcome of healing. Jung et
al. concluded that the re-
main ing defect, small enough
to be clinically neglected, irre-
respective of gap size within two
mm, does not need any kind of
regenerating procedures.

In 1998, this author examined the hypo-
thesis that imme-
diate implants can succeed
without primary flap closure. A
technique was described that
does not require any incisions
during immediate implant
placement. No barrier mem-
branes were used and the sole
grafting material was autoge-
nous bone chips. Clinical os-
seointegration was achieved
with minimal gingival reces-
sion and papillae preservation.
It was concluded that immedi-
ate implant placement in the
anterior maxilla can be suc-
cessful in replacing a single
tooth even without primary
closure.

Figs 2a and 2b: Immediate provisionalisation of multiple adjacent im-
plants in a partially edentulous arch. The patient was referred for extrac-
tions and immediate implant placement in the sites of all six anterior
maxillary teeth.

Fig 2c: Teeth were extracted atrau-
matically and a surgical guide
was used for implant placement.

Fig 2d: Four dental implants were
placed into the fresh extraction
sockets of the two central incisors
and canines.

Fig 2e: A prefabricated provisional
fixed partial denture was inserted,
taking care to avoid occlusal load-
ing.

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The esthetic zone
Preservation of the buccal bone crest after tooth extraction is of major importance in achieving esthetic results and long-term implant survival. However, controversy exists in the literature regarding immediate implantation benefits for preserving the morphological ridge contour. A marked reduction of the buccal bone following implant placement in fresh extraction sockets has been shown in animal studies. For example, Araújo et al. concluded that the bone-to-implant contact established during the early phase of socket healing following implant installation was partly lost when the buccal bone wall continued to resorb, and that implant placement failed to preserve the hard tissue dimension of the ridge after tooth extraction.

The buccal and lingual bone walls were both resorbed. The surgical procedure included mucoperiosteal full-thickness flaps that were elevated to disclose the buccal and lingual hard tissue wall of the ridge. The same surgical procedure conducted by Botticelli et al. also concluded that the height of the approximal socket walls may be retained and the reduction of the crestal bone will be limited to the buccal walls of the recipient site.

Bone preservation
The controversy regarding bone preservation has been discussed in several studies. Fickl et al. have shown that the resorption rate of the extraction socket decreases when the periosteum remains in place. A significant lower resorption rate was found in the “flapless groups” with and without the socket-preservation techniques. Furthermore, the flapless technique implementing bone augmentation materials preserves the socket volume better. In their study on dimensional changes of the alveolar ridge contour after different socket preservation techniques, Fickl et al. were not entirely able to compensate for the alterations after tooth extraction. Yet, incorporation of BioOss collagen seems to have the potential to limit but not avoid post-operative contour shrinkage. Treatment of the extraction socket with BioOss collagen and a free gingival graft is beneficial in limiting the resorption process after tooth extraction.

A pilot study in which buccal bone augmentation after immediate implantation, using a flap or flapless approach in mongrel dogs was evaluated, has shown that the flapless approach reduces the buccal bone height loss for immediate post-extraction implants. A reasonable explanation could be the preservation of the periosteal vascular network. Immediate post-extraction implants also have a high percentage of bone-to-implant contact.

Immediate loading of immediate implants
The objective of immediate provisionalisation or loading of dental implants is to combine tissue preservation with bone preservation. (Total Volume Preservation) that follows immediate placement. This will preserve proper volume and shape of the hard and soft tissues. Immediate provisionalisation also results in fewer surgical interventions and a simpler solution for the patient.

Immediate loading of immediate implants does not impair osseointegration of an immediately post-extraction implant compared to an unloaded post-extraction implant. The key difference between success and failure of osseointegration of the immediately loaded implants is controlling the micromotion, which is reduced through broad anteroposterior distribution of the immediately loaded implants. Anchorage of the cortical bone, especially in the maxilla, may be necessary to increase implant stability. Recently, this author found that after a mean follow-up of 15.6 months, provisionalisation of immediately placed implants proved a predictable procedure with a high implant survival rate (97.6 per cent). Histologic observations from different animal and human studies have shown that immediately loaded implants can have a direct bone-to-implant interface without any fibrous tissue formation. Success in immediate placement and loading of implants is based on several clinical parameters.

Therefore, this treatment concept can be applied to everyday clinical practice in properly selected patients who

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**References**
have good primary stability and sites with a fully preserved extraction socket with no bone dehiscence. Immediate provisionalization should be proposed only if an appropriate initial insertion torque has been applied in the implant.\textsuperscript{10}

Implant placement in extraction sockets combined with immediate function has been widely reported.\textsuperscript{20,23–25}

The esthetic success\textsuperscript{10,26,27} is related to Total Tissue Preservation and to several other parameters, including maintenance or re-establishment of harmoniously scalloped soft tissue lines and natural contours, number of missing teeth, location of missing teeth and the relation to the midline, whether missing teeth are adjacent, etc.

Single-tooth replacement

A single tooth replaced by a single-implant restoration is an increasingly popular treatment option, especially among young patients (Figs. 1a to 1f). A high level of surgical and prosthetic success is achieved with the single-implant restoration.\textsuperscript{22} A significant reduction in the number of surgical procedures required, and elimination of the need for a provisional prosthesis between the surgical and prosthetic phases of treatment are among the advantages of the immediate-loading protocol. This procedure has shown predictable clinical success and possible preservation of the existing osseous and gingival morphology. Immediate restoration of implants placed immediately in fresh extraction sites can provide a safe treatment option, with success rates of 94 per cent to 98 per cent.\textsuperscript{20,25}

Atraumatic tooth extraction is essential for successful immediate implant placement and the maintenance of the buccal plate (see Fig. 1c). The most important factors and main prerequisites for immediate loading are sufficient initial implant stability and insertion torque of about 40 N/cm. When a single-tooth implant is immediately loaded, the implant-abutment connection should also be stable; primary stability is fundamental.

Single-tooth replacement does not actually represent immediate functional loading, since clinicians normally prevent any occlusal function of the provisional restoration. Therefore, these types of restorations are classified as immediate provisionalisation only.

A strong advantage of this treatment protocol is immediate placement of the restoration. This eliminates the need for a provisional removable prosthesis and leads to satisfactory esthetic results. Second-stage surgery is unnecessary, and excellent soft tissue healing occurs predictably, with a stable mucogingival junction in relation to adjacent teeth and with preserved interproximal papillae. These clinical outcomes reduce the necessity of further surgical procedures to improve the gingival architecture.

Multiple adjacent implants

Replacement of multiple adjacent teeth with fixed implant restorations in the anterior maxilla is poorly documented. The esthetic results are not always predictable because the mechanism of tissue behaviour in the context of the esthetic outcome is still not fully understood.\textsuperscript{28} The distance of the bone crest from the restoration’s contact point is related to the presence of the interimplant papillae.\textsuperscript{29} This may imply that preservation of this bone crest is imperative for...
interimplant papilla regeneration.6,16

The effect of immediate implants on non-compromised bone shape and quality (for example, in the maxillary premolar and anterior mandibular regions) is less important. However, it becomes a major contributing success factor when bone shape and quality are compromised (for example, in the anterior maxillary and posterior regions of both arches). The preservation of alveolar ridge dimensions immediately after tooth extraction has been documented.11

Immediate loading of multiple adjacent implants in a partially edentulous arch could result in success rates even higher than those for single-tooth replacement20 (Figs. 2a to 2j). This might be due to the distribution of forces among the adjacent implants and the absence of rotational forces that act on a single implant.

As with single-tooth implants, the clinician is advised to eliminate any function of the provisional restoration for the first three to six months, which is the waiting period prior to final restoration.

Tips for success
Several important parameters should be considered for successful implant placement with immediate loading:

• Primary stability is crucial (40 N/cm is recommended). An implant with stability less than 50 N/cm should not be loaded.

• Flapless surgery is preferable in the esthetic zone.

• Gap filling is recommended at the esthetic zone.

• The use of membrane is not necessary.

• Implant placement should be slightly palatal for better esthetics and volume maintenance in the anterior maxilla (with augmentation at the buccal area).

• Rigid fixation is used when more than one implant is involved.

• The provisional crown or fixed partial denture should not be in occlusal contact.

• Strategic extraction should be considered when it allows placement of longer implants, which leads to better prognosis and prosthetic positioning, especially in the esthetic zone.

References are available on request.

Dr Devorah Schwartz-Arad received her DMD and PhD degrees from the Faculty of Medicine, Hebrew University, Jerusalem, Israel. She is a specialist in oral and maxillofacial surgery. She is a member of the Specialty Examination Board for Oral and Maxillofacial Surgery in Israel, has published numerous scientific articles and abstracts and presented more than 100 papers at scientific meetings in Israel, Europe and the United States. She has been awarded several academic and professional awards, including the Israeli Academy of Sciences and the Israel Cancer Association. She has been a lecturer and a senior lecturer for more than 20 years at the Department of Oral and Maxillofacial Surgery, School of Dental Medicine, Tel Aviv University and is a well-known lecturer internationally.

Dr Schwartz-Arad is the owner and senior surgeon of an active Day Care Surgery Center specialising in oral and maxillofacial surgery, qualified by the Israeli Ministry of Health for Surgery and General Anaesthesia with special expertise in orthognathic surgery, bone grafting and dental implantation.

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