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study

Immediate implant placement in the maxillary aesthetic zone

Authors:

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Background

Immediate implant placement along with immediate provisionalisation (IP) is favoured by patients needing tooth replacement – especially in the aesthetic zone – as it is less invasive and requires less time to restore function and aesthetics. However, for achieving optimal outcomes we need to consider factors such as primary implant stability, soft-tissue stability, peri-implant bone preservation, and patient satisfaction.

Meticulous surgical planning is necessary to obtain primary stability, which is challenging when using this technique because of limited bone engagement. Soft-tissue stability may be improved by immediate provisionalisation – rather than delayed provisionalisation (DP) – because this supports the soft tissue, reducing the risk of recession of the mid-facial mucosa and adjacent papillae.

Some bone remodelling is inevitable post-extraction. It is therefore essential to preserve as much peri-implant bone as possible, and multiple techniques are available to attempt this.

Despite the technique's popularity, there are few long-term prospective studies comparing immediate implant placement with IP versus DP, with very few studies providing a follow-up of five years or more.

Aim

The aim of this paper was to compare the marginal bone levels of immediately placed implants in the maxillary aesthetic zone, with either immediate or delayed provisionalisation, after 10 years of function.

Materials & methods

- A randomised trial with a 10-year follow-up of 40 single-tooth implant-supported restorations in post-extraction sites in the maxillary aesthetic zone was carried out at the University Medical Centre Groningen in the Netherlands.
- Inclusion criteria: medically fit, minimum age of 18, non-smoker, no evidence of bruxism, no periodontitis in treated or adjacent sites.
- Random allocation to IP (n=20) or DP (n=20).
- Atraumatic extraction followed by grafting with a 1:1 mixture of anorganic bovine bone and autogenous bone prior to the implant placement. The IP group did not undergo any further surgery, the DP group had a cover screw placed and primary closure with a free gingival graft harvested from the palate.
- Both groups received lab-constructed, composite-based provisional restorations made on titanium abutments. Provisional restoration was placed within six hours post-operative in IP group, three months later in the DP group. The provisional phase was three months, followed by a definitive porcelain-veneered restoration on a custom zirconia abutment.
- The primary outcome was marginal bone level (MBL) change proximal to the implant. Secondary outcomes were implant survival, restoration survival and success, peri-implant issue health, mucosa-level changes, aesthetic indices, buccal bone thickness (BBT) changes, and patient satisfaction.
- Mean differences in continuous variables between groups were analysed with analysis of variance (ANOVA). The chi-squared test and Fisher's exact test were used on categorical variables. Median differences between groups were analysed using the Mann-Whitney U test.
- The pre-operative vertical bone defect of the buccal socket wall on the mean change in BBT was tested with analysis of covariance (ANCOVA).

Figure: Representative clinical cases of immediate implant placement with immediate provisionalisation (a) and delayed provisionalisation (b), both at the maxillary right central incisor, after 10 years in function

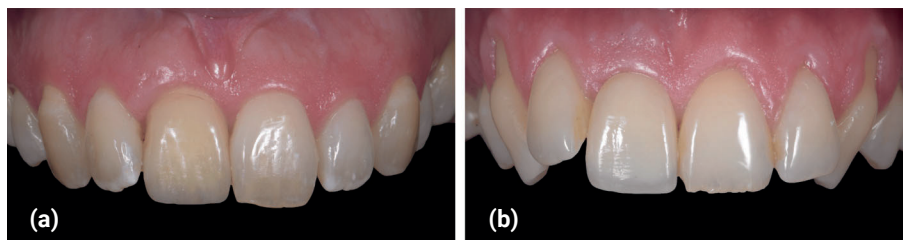


Table: Radiographic marginal bone level change (in mm) (mean values with SD) from implant placement (baseline, T1) to 1 month (T2) and 10 years (T3) after placing the definitive restoration

Outcome	T1–T2			T1–T3		
	IP group	DP group	p-value ^a	IP group	DP group	p-value ^a
MBL change						
Mesial of implant	-0.70±0.67	-0.68±0.64	0.92	-0.47±0.45	-0.58±0.76	0.61
Distal of implant	-0.69±0.71	-0.64±0.63	0.80	-0.49±0.52	-0.41±0.72	0.71

Abbreviations: DP, delayed provisionalisation; IP, immediate provisionalisation; MBL, marginal bone level.

^aOne-way analysis of variance (ANOVA).

Results

- The 10-year follow-up included 18 participants in the IP group and 16 in the DP group.
- Minor changes were noted in MBL from T1-T3 in both groups.
- Implant survival was 100% in both groups at T3.
- Restoration survival: 88.9% in IP group (n=2 veneer fracture), 87.5% in DP (n=1 veneer fracture and n=1 abutment fracture).
- Restoration success: 77.8% in the IP group and 75.0% in the DP group were successful after 10 years in function in accordance with the modified United States Public Health Service (USPHS) criteria.
- Probing pocket depth remained stable, with low plaque and bleeding indices among all participants in both groups over the 10 years.
- The respective prevalence of peri-implant mucositis was 38.9% and 35.7% and of peri-implantitis 0.0% and 6.3% in the IP and DP groups.
- There was no significant difference between the two groups at T3 in relation to the pink aesthetic score and white aesthetic score outcomes, and across both groups only one implant displayed an insufficient amount (≤ 2 mm) of keratinised tissue width.
- At baseline, the mean defect size was 3.4±1.2mm in the IP group and 4.2±1.1mm in the DP group. The difference was statistically significant, but there was no statistically significant mean change in BBT from T0 to T3.
- In three of the six cone beam computed tomography (CBCT) sagittal cross-sections, the BBT was statistically significantly lower in the DP group than in the IP group.
- Patient-reported outcome measures (PROMs) were scored highly.
- In summary: except for BBT, there were no statistically significant differences between the two groups in all primary and secondary outcomes after 10 years.

Limitations

- The lack of observed difference in MBL between groups may have resulted from insufficient participants, as only 18 IP and 16 DP participants were assessed after 10 years.
- The free gingival graft that was used only in the DP protocol is likely to contribute less mid-facial recession.
- The restorative and endodontic condition of adjacent teeth throughout the 10-year follow-up was not mentioned, which may influence the mesial and distal marginal bone levels.
- Scattering from the dental implant on the CBCT may reduce the accuracy of the buccal bone thickness measured.
- Reasons for restoration fracture were not mentioned, and the mesial and distal marginal bone levels can be affected by implant overload during function.
- PROMs may have been affected by the smile line and by the type of interim restoration in the DP group, neither of which were mentioned in the study.

Conclusions & impact

- The paper suggests that no statistically significant differences can be detected in marginal bone levels for both treatment groups (immediate or delayed provisionalisation) in a 10-year follow-up period.
- The prevalence of peri-implant mucositis and peri-implantitis were similar after immediate implant placement with both immediate and delayed provisionalisation.
- Aesthetic outcomes were similar in both groups.
- Patient satisfaction in both the groups was high.

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