*IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*
*e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 24, Issue 8 Ser. 5 (August. 2025), PP 64-72*
*www.iosrjournals.org*

# Evaluation Of Immediate and Delayed Loading Protocols in the Implant Supported Overdenture with Different Attachment on Peri-Implant Health: A Meta-Analytical Perspective

Dr. Vikas Punia, Dr. Shahista Warsi, Dr. Anand Porwal, Dr Rohit Lakhyani, Dr Abhijit Sethia, Dr. Palak Salgia

*(Department Of Prosthodontics, Crown & Bridge, Darshan Dental College and Hospital, Udaipur, India)*
*(Department Of Prosthodontics, Crown & Bridge, Darshan Dental College and Hospital, Udaipur, India)*
*(Department Of Prosthodontics, Crown & Bridge, Darshan Dental College and Hospital, Udaipur, India)*
*(Department Of Prosthodontics, Crown & Bridge, Darshan Dental College and Hospital, Udaipur, India)*
*(Department Of Prosthodontics, Crown & Bridge, Darshan Dental College and Hospital, Udaipur, India)*
*(Department Of Prosthodontics, Crown & Bridge, Darshan Dental College and Hospital, Udaipur, India)*

## *Abstract*

***Background:*** *Dental implant–supported overdentures enhance retention, function, and patient satisfaction in edentulous individuals. One of the most debated aspects of treatment planning is the timing of implant loading—immediate loading (IL) within 48 hours versus delayed loading (DL) after 3–6 months. In addition, attachment systems such as locator, bar, magnetic, and screw-retained designs may influence peri-implant health by affecting force distribution, plaque accumulation, and tissue response.*

***Objective:*** *To compare the effects of IL and DL protocols on peri-implant health outcomes in implant-supported overdentures, considering the influence of different attachment types.*

***Methods:*** *A systematic search of MEDLINE, PubMed, and Scopus, supplemented by manual journal screening, was conducted according to PRISMA guidelines 2020 (PROSPERO registration no. 1064946). Randomized controlled trials (RCTs) involving edentulous patients treated with implant-supported overdentures using IL or DL protocols and reporting peri-implant health outcomes were included. Data extraction focused on marginal bone loss (MBL), probing depth (PD), bleeding on probing (BOP), implant survival rate (ISR), plaque index (PI), and patient-reported outcomes. Six RCTs involving 191 participants met the inclusion criteria.*

***Results:*** *Across studies, MBL showed no significant difference between IL and DL protocols over follow-up periods up to five years. Implant survival rates exceeded 95% in all trials, with several reporting 100% survival for both loading protocols. Locator attachments were associated with lower plaque accumulation and reduced inflammatory markers compared to magnetic attachments, though in some cases, slightly greater bone resorption was observed. Bar attachments demonstrated comparable bone preservation to other systems but may present hygiene challenges. Patient-reported outcomes improved significantly in both IL and DL groups, with no significant differences between protocols.*

***Conclusion:*** *Both IL and DL protocols can achieve predictable implant survival and peri-implant health in implant-supported overdentures when appropriate case selection and maintenance are followed. Attachment type may influence soft tissue health more than bone-level changes; thus, selection should be individualized based on patient hygiene capability, anatomy, and clinician preference.*

***Keywords:****implant-supported overdenture, immediate loading, delayed loading, attachment type, marginal bone loss, peri-implant health.*

---

Date of Submission: 12-08-2025 Date of Acceptance: 22-08-2025

## I. Introduction

**Background**

Dental implant-supported overdentures are a predictable treatment option for edentulous patients, improving retention, function, and patient satisfaction[1].One of the most debated aspects in implant therapy is the timing of prosthetic loading: immediate loading, In cases of immediate loading, implants are utilized within 48 hours after their placement, whereas delayed loading provides a healing period of 3 to 6 months prior to the connection of the prosthetic.[2,3]

Immediate loading protocols reduce treatment time, allowing for faster rehabilitation and often improving patient satisfaction and comfort when compared to conventional loading methods concerns remain regarding its effect on osseointegration and long-term peri-implant health, particularly when bone quality or primary stability is suboptimal[2]. In contrast, delayed loading has traditionally been favoured for promoting undisturbed healing, though it extends treatment duration.[3]Attachment systems such as locator, bar, ball, and magnetic retainers also influence peri-implant health. These attachments differ in force distribution, hygiene maintenance, and tissue response, which may affect marginal bone loss, plaque accumulation, and implant survival [4,5]

**Rationale**

Numerous metanalytical trials have individually assessed the outcomes of immediate versus delayed loading and the effects of various attachment systems in implant supported overdenture, Nevertheless, there has yet to be a meta-analysis that thoroughly integrates these two factors.[6] Considering the possible combined influence of loading protocol and attachment type on both clinical and biological outcomes, it is essential to conduct a meta-analysis

- To check the attachment system which might affect peri-implant soft tissue inflammation, bone loss, and implant stability in diverse ways and also required to consolidate existing evidence and clarify how loading timing and attachment type impact peri-implant health outcomes.
- Offer evidence-based guidelines regarding the ideal loading period.
- Clarify the clinical implications of attachment type selection on peri-implant health [7,8]

**Objective**

Primary Objective: -

- To compare the effect of peri-implant health in immediate versus delayed loading protocols with different attachment systems like locator, bar, screw retained fixed prosthesis, magnetic attachments.
- To evaluate specific peri-implant health indicators like Marginal Bone Loss (MBL), Implant Survival Rates, Detection of Peri-implantitis, Patient-Reported Outcomes:

Secondary Objective: -

- To evaluate other peri-implant health parameters like probing depth, bleeding on probing)

## II. Material And Method: -

The present meta-analysis was performed in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. The protocol was registered priori in the International Prospective Register of Systematic Reviews (PROSPERO- 1064946).

**Inclusion Criteria**

- Study Design: Randomized Controlled Trials (RCTs) only and in-vivo study.
- Population: Completely edentulous patients, aged 18 and above.
- Health Status: Systemically healthy individuals, physically and psychologically suitable for implant treatment.
- Intervention: Immediate loading of implants with any attachment type (within 48 hr)
- Comparison: Delayed loading of implants with the same or other attachment types (4-6 months)
- Outcomes: Studies reporting peri-implant health outcomes such as marginal bone loss (MBL), probing depth (PD), implant survival rate (ISR), bleeding on probing (BOP), plaque index (PI), and/or quality of life.
- Language: Articles published in English.

**Exclusion Criteria**

- Non-randomized studies, observational studies, reviews, case reports, in vitro or animal studies.
- Studies involving patients with systemic conditions (e.g., diabetes, osteoporosis).
- Studies without sufficient outcome data or unclear methodology.

- Duplicate publications or abstracts without full-text access.

PICO question According to the recommendations of the Centre for Evidence-Based Medicine (University of Oxford, Oxford, UK), the PICO (participants, interventions, comparisons, outcomes) question was as follows:

- **Population:** Completely edentulous patients, aged 18 and above.
- **Intervention**: Immediate loading of implants with any attachment type.
- **Comparison**: Delayed loading of implants with the same or other attachment types.
- **Outcomes:** Studies reporting peri-implant health outcomes such as marginal bone loss (MBL), probing depth (PD), implant survival rate (ISR), bleeding on probing (BOP), plaque index (PI), and/or quality of life.

**Search Methods**

Online electronic databases such as PUBMED, MEDLINE, and SCOPUS were searched without applying any time restrictions. The online search utilized a strategy that integrated both MeSH terms and free-text keywords, ensuring high sensitivity and adaptability for databases without article filters. The search terms encompassed "implant overdenture," "immediate loading," "Denture, Overlay" [MeSH], and "Immediate Dental Implant Loading" [MeSH]. Furthermore, terms such as "Attachments," "Bar, Locator, Ball Magnetic, Any Attachments," "Peri Implant Health" [MeSH], and "Marginal Bone Loss, Sulcus Depth, Bleeding on Probing" [MeSH] were incorporated. The search methodologyemployed in MEDLINE consisted of the terms "implant overdenture" [All Fields] OR "implant overdentures" [All Fields] OR IOD [All Fields] OR IODs [All Fields] OR "Denture, Overlay" [MeSH] AND ("immediate loading" [All Fields] OR "Immediate Dental Implant Loading" [MeSH]). The MEDLINE search methodology encompassed: ("implant overdenture" [All Fields] OR "implant overdentures" [All Fields] OR IOD [All Fields] OR IODs [All Fields] OR "Denture, Overlay" [MeSH]) AND ("immediate loading" [All Fields] OR "Immediate Dental Implant Loading" [MeSH])

**Study Selection**

Manual searching in different dental journals was also carried out. The references of related articles were checked for studies that met the inclusion criteria. The inclusion criteria were randomized controlled trials (RCTs), overdentures retained with any attachment with delayed and/or immediate loading protocol, studies published in English following outcomes Studies reporting peri-implant health outcomes such as marginal bone loss (MBL), probing depth (PD), implant survival rate (ISR), bleeding on probing (BOP), plaque index (PI), and/or quality of life.After pooling the full search results from all database, literatures with repetitive contents were excluded on the basis of titles and abstracts of studies, and irrelevant reports were discarded. Duplicates were also removed and the final article was selected. In which total six article are selected for the full-text that met all inclusion criteria as well as to exclude reports according to any of the exclusion criteria. The study selection flowchart is shown in fig.1

**Data Collection and Data Items**

Each study included in the meta-analysis was first identified and recorded with full citation details, including authors, year of publication, title, journal name, volume, issue, and page numbers. A data collection form was developed a priori to systematically extract the relevant information. The following data items were recorded: study details, study design, participant characteristics (edentulous patients with implant-supported overdentures, age), attachment type, implant loading time, comparison groups, number of patients in immediate loading protocol (ILP) and delayed loading protocol (DLP), loading time for ILP and DLP, radiographic method, marginal bone loss (MBL), bleeding on probing, probing sulcus depth, implant survival rate, and patient dropout. All six studies were randomized controlled trials (RCTs), providing a high level of internal validity. The total number of participants across all studies was 191, with individual sample sizes ranging from 30 to 50. Participants were edentulous individuals requiring mandibular implant-retained overdentures. While inclusion criteria varied slightly across studies, they generally required healthy adults with no systemic contraindications to implant surgery. Common exclusion criteria included active periodontal disease, inadequate bone volume, and uncontrolled systemic conditions. During data extraction, it was noted that one study reported the mean and standard deviation of vertical bone loss at four sites (distal, labial, mesial, and lingual) around each implant, while the other studies reported MBL only at the mesial and distal sites. For consistency, only the average mesial and distal MBL values from each study were included in the meta-analysis.

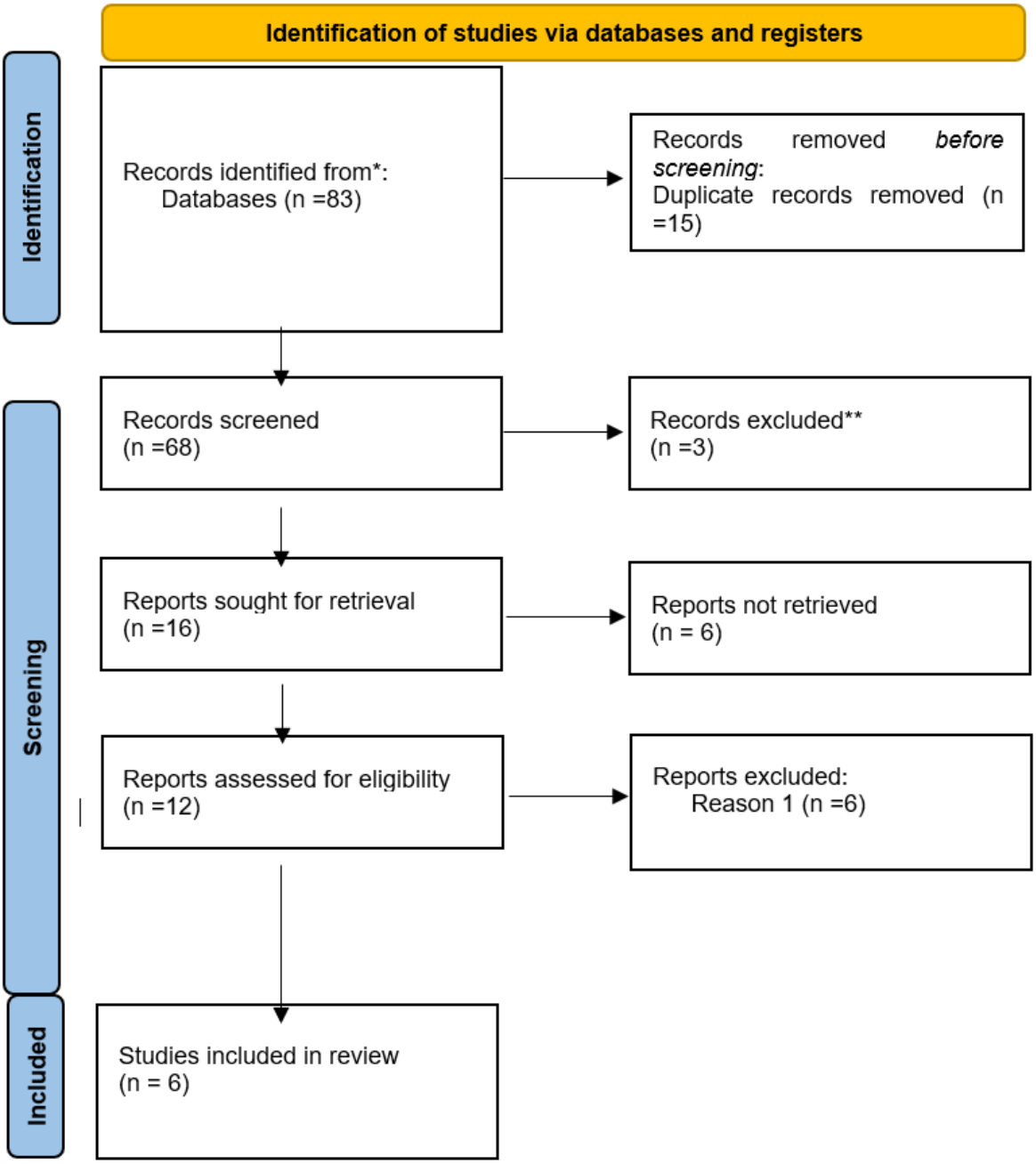


***Fig.1 Prisma Flowchart Study Selection***

| *Study (author, year)* | *Sample size* | *Loading protocol compared* | *Attachment type* | *Key outcome* | *Immediate loading (mean ±SD)* | *Delayed loading (mean ±SD)* | *Conclusion* |
|---|---|---|---|---|---|---|---|
| Elsyad et all | 32 | Immediate vs delayed | Locator vs magnetic | Plaque index at 2 months | 0.25±0.05mm | 0.33±0.05mm | Locator attachment led to better peri implant tissue health then magnetic attachment |
| El-Sheikh et all | 30 | Immediate vs delayed | Bar attachment | Marginal bone loss at 1 year | -0.50 ±0.73mm | -0.54±0.65mm | no significant difference found |
| Malo et all | 50 | Immediate vs delayed | Fixed screw retained | 1 year marginal bone loss | -0.57± 0.53mm | -0.70±0.58mm | no significant difference found |
| Ye et all | 49 | Immediate vs delayed | Not specified | Marginal bone loss | 0.85± 0.22mm | 0.83±0.26mm | no significant difference found |
| Enkling et all | 32 | Immediate vs delayed | Bar attachment | Marginal bone loss | -0.96± 0.89 mm | -1.28±0.99mm | ΔIBL significantly smaller in IL when baseline is implant placement (p=0.017); no significant when baseline implant loading (p=0.084) |
| Salman et all | 30 | Immediate vs delayed | Locator attachment | Marginal bone loss | 0.18±0.41mm | 0.89±0.74mm | Significant difference in MBL at 60 months (p<0.05); no difference in implant survival (100% in both groups) |

**Table-1 Summary of Implant Loading with Different Attachment on Peri-Implant Health of Included Studies**

## III. Results

**Screening And Selection**

An electronic search yielded 83 relevant articles. 68 were excluded for being off-topic or not published in English. Trough removal of repetitive records of the remaining 16 articles, 6 RCTs[9,10,11,12,13,14] met the inclusion criteria and were included in the current review involved 599 participants receiving 1,198 dental implants (Table 1). The remaining 9 studies were excluded, with reasons, Fig. 1 shows the flow diagram of study screening and selection.

**Characteristics of the Included Studies**

Table 1 lists the included studies and their characteristicsmarginal bone loss (MBL) at 1 year using bar attachments. The study found no significant difference between IL and DL groups, with MBL measurements of −0.50 ± 0.73 mm and −0.54 ± 0.65 mm, respectively.[9] MBL at 1 year with fixed screw-retained prostheses. The results indicated no significant difference between IL and DL groups, reporting MBL of −0.57 ± 0.53 mm and −0.70 ± 0.58 mm, respectively.[10] MBL without specifying attachment types. The study found no significant difference between IL and DL groups, with MBL values of 0.85 ± 0.22 mm and 0.83 ± 0.26 mm, respectively.[11] MBL with bar attachments. The study reported a significantly smaller change in MBL in the IL group when baseline measurements were taken at implant placement (−0.96 ± 0.89 mm vs. −1.28 ± 0.99 mm; $p = 0.017$), but no significant difference when baseline measurements were taken at implant loading ($p = 0.084$).[12] MBL at 60 months using locator attachments. The study found a significant difference between IL and DL groups, with MBL of 0.18 ± 0.41 mm and 0.89 ± 0.74 mm, respectively ($p < 0.05$). However, implant survival rates were 100% in both groups, indicating no difference in implant success.[13] Peri-implant tissue health using locator and magnetic attachments. The study concluded that locator attachments led to better peri-implant tissue health than magnetic.[14]

## IV. Discussion

This meta-analysis aimed to evaluate the impact of immediate versus delayed loading protocols on peri-implant health examined various attachment types, including locator, bar, magnetic, and fixed screw-retained systems, outcomes across six randomized clinical trials on implant supported overdentures. El-Sheikh et al. (2012) conducted a randomized controlled trial to compare the effects of immediate versus delayed loading protocols on marginal bone loss (MBL) in mandibular implant-retained overdentures using bar attachments. The study involved 30 participants who were assigned to either the immediate loading (IL) or delayed loading (DL) group. Radiographic assessments were performed at baseline, 3, 6, and 12 months to measure MBL (marginal bone loss). The results indicated no significant difference in MBL between the IL and DL groups at the 1-year follow-up. Specifically, the IL group exhibited a mean MBL of −0.50 ± 0.73 mm, while the DL group showed a mean MBL of −0.54 ± 0.65 mm. Statistical analysis using one-way repeated measures ANOVA followed by Tukey's test revealed no significant differences between the two groups ($p > 0.05$) These findings suggest that both immediate and delayed loading protocols may result in comparable MBL outcomes when using bar attachments in mandibular implant-retained overdentures. However, it is important to note that this study focused solely on MBL and did not assess other parameters such as peri-implant tissue health, implant survival rates, or patient satisfaction. Further research incorporating these additional factors is necessary to provide a comprehensive evaluation of the clinical implications of loading protocols in implant overdenture therapy.[9]

Malo et al. (2007)[10]conducted a randomized controlled trial to compare the effects of immediate loading (IL) and delayed loading (DL) protocols on marginal bone loss (MBL) in fixed screw-retained prostheses. The study involved 50 participants and assessed MBL at 1-year post-loading. The results indicated no significant difference in MBL between the IL and DL groups. Specifically, the IL group exhibited a mean MBL of −0.57 ± 0.53 mm, while the DL group showed a mean MBL of −0.70 ± 0.58 mm. Statistical analysis revealed no significant difference between the two groups ($p > 0.05$). These findings align with other studies that have reported comparable MBL outcomes between IL and DL protocols. For instance, a systematic review and meta-analysis by Sanda et al. (2018) found no significant differences in MBL between IL and DL protocols for mandibular implant overdentures. Similarly, a study by Schincaglia et al. (2017)[15] reported no significant difference in MBL between IL and DL groups for single-tooth implants. The absence of a significant difference in MBL between IL and DL protocols in this study suggests that both loading protocols can be considered viable options for fixed screw-retained prostheses. However, it is important to note that MBL is just one factor in evaluating the success of implant treatments. Other factors, such as implant survival rates, patient satisfaction, and functional outcomes, should also be considered when determining the most appropriate loading protocol. They concluded that contributes to the growing body of evidence suggesting that immediate loading protocols can be as effective as delayed loading protocols in terms of marginal bone loss for fixed screw-

retained prostheses. Further long-term studies are needed to assess the impact of these loading protocols on other clinical outcomes and to confirm these findings.[10]

Elsyad and their team in (2016) did a study where they randomly assigned patients to see how the health of the tissues around implants in lower dentures with either locator or magnetic attachments changed over time. They looked at 32 people and checked several things like how much plaque was there, if there was bleeding, how deep the pockets were around the implants, how stable the implants were, and the levels of a certain protein called interleukin-1β in the fluid around the implants. After one year, they found that the locator attachments had less plaque build-up, less stable implants, and lower levels of interleukin-1β compared to magnetic attachments. However, the group using locator attachments also had more bone loss, meaning there might be a trade-off between better soft tissue health and more bone loss.[14]Enkling and their colleagues in (2022) did another study where they compared the effects of loading implants right away (immediate loading) versus waiting before loading (delayed loading) on bone loss around implants in the lower jaw. They included 32 participants and checked how much bone loss happened after one year. When they measured bone loss right after the implants were placed, the group that had immediate loading had less bone loss compared to those who waited. But when they measured bone loss after the implants were loaded, there wasn't much difference between the two groups. This suggests that loading implants right away could lead to less bone loss than waiting, but only if the initial measurements are taken right after the implants are placed.[12]

Ye et al. (2012) [11]conducted a randomized controlled trial involving 49 participants to compare the effects of immediate loading (IL) and delayed loading (DL) protocols on marginal bone loss (MBL). The study found no significant difference in MBL between the IL and DL groups, with the IL group exhibiting a mean MBL of 0.85 ± 0.22 mm and the DL group showing a mean MBL of 0.83 ± 0.26 mm. Statistical analysis revealed no significant difference between the two groups ($p > 0.05$). These findings suggest that both IL and DL protocols result in similar MBL outcomes, irrespective of the attachment type used.

In contrast, Salman et al. (2019)[13] conducted a randomized controlled trial with 30 participants to assess the impact of IL and DL protocols on MBL using locator attachments. The study found a significant difference in MBL between the IL and DL groups, with the IL group exhibiting a mean MBL of 0.18 ± 0.41 mm and the DL group showing a mean MBL of 0.89 ± 0.74 mm. Statistical analysis revealed a significant difference between the two groups ($p < 0.05$). Notably, implant survival rates were 100% in both groups, indicating no difference in implant success. These findings suggest that IL protocols with locator attachments may result in less MBL compared to DL protocols, without compromising implant survival.

Waltenberger et al. (2024) investigated the impact of immediate and delayed loading protocols on oral health-related quality of life (OHRQoL) in edentulous patients. The study included 32 participants, with 16 in each group. Both IL and DL groups showed significant improvements in OHRQoL, with no statistically significant difference between the protocols. These results suggest that both loading protocols can achieve comparable enhancements in patient-reported outcomes.[16]Liu et al. (2021) conducted a systematic review and meta-analysis comparing the effects of immediate and delayed loading protocols on marginal bone loss (MBL) around implants in unsplinted mandibular implant-retained overdentures. The pooled analysis of multiple studies revealed no significant difference in MBL between the two protocols, indicating that IL and DL have comparable effects on bone preservation.[17]Stanford et al. (2016) performed a randomized clinical trial comparing immediate and delayed loading protocols in mandibular overdentures. Both groups achieved high implant survival rates and favourable peri-implant outcomes, with no significant difference between protocols. These findings suggest that both approaches can be effective treatment options for edentulous patients.[18]Marconcini et al. (2018) examined the effect of immediate and delayed loading protocols on implant stability. The results showed similar implant stability in both groups, indicating that loading time does not significantly influence implant stability over time.[19]Malchiodi et al. (2016)[20] also investigated the impact of immediate and delayed loading protocols on implant stability. Their findings were consistent with Marconcini et al., concluding that the timing of loading does not significantly affect implant stability.[20]

Another crucial factor for maintaining healthy peri-implant tissue is the probing depth (PD). The findings of this study indicated that there was no significant difference among all comparators after a one-year follow-up. The rank probability test revealed that the ball+ delayed loading method achieved the highest ranking (73.3%) and was correlated with the lowest PD. In contrast, the bar+ delayed loading method (0.4%) received the lowest ranking. The reason for the higher ranking of the ball method compared to the bar method may be attributed to the ease of cleaning associated with the ball, while insufficient hygiene under the bars can result in gingival hyperplasia or mucosal enlargement.

**Key Findings:**

- **Marginal Bone Loss (MBL):** The majority of studies reported no significant difference in MBL between IL and DL protocols. For instance, El-Sheikh et al. (2012) found comparable MBL outcomes at the 1-year follow-up. Similarly, Liu et al. (2021) concluded that MBL was not significantly different between IL and DL in unsplinted mandibular overdentures.
- **Implant Survival Rates:** Implant survival rates were generally high across both loading protocols. Notably, Salman et al. (2019) reported a 100% survival rate in both IL and DL groups using locator attachments.
- **Peri-implant Tissue Health:** Elsyad et al. (2016) observed that locator attachments were associated with decreased plaque accumulation and lower interleukin-1β concentrations compared to magnetic attachments. However, vertical bone loss was significantly higher in the locator group, indicating a potential trade-off between improved soft tissue health and increased bone resorption.
- **Patient-Reported Outcomes:** Waltenberger et al. (2024) found significant improvements in oral health-related quality of life (OHRQoL) in both IL and DL groups, with no significant difference between the two protocols.

## V. Conclusion

Within the limitations of this meta-analysis, both immediate loading (IL) and delayed loading (DL) protocols for implant-supported overdentures demonstrated comparable **marginal bone loss** over follow-up periods of up to five years, regardless of attachment type, in the majority of included randomized controlled trials. **Implant survival rates** were consistently high (>95%) across all studies, with several reporting 100% survival for both loading protocols, indicating that the timing of loading does not compromise long-term implant success. Regarding **peri-implant soft tissue health**, outcomes varied with attachment design. Locator attachments were associated with lower plaque accumulation and reduced inflammatory markers compared to magnetic attachments, although some studies reported slightly greater bone resorption with locators. Bar attachments showed comparable bone preservation to other systems but may present hygiene challenges that could affect soft tissue health. Overall, the evidence suggests that both IL and DL protocols can achieve predictable peri-implant health and survival when proper case selection and maintenance protocols are followed. Attachment type selection should consider patient-specific hygiene capability, anatomical factors, and clinician preference, as it may influence soft tissue response more than bone-level changes.

- **Attachment System Influence**: Attachment types significantly impact peri-implant health outcomes. For instance, Elsyad et al. (2016**)** observed that locator attachments resulted in better peri-implant tissue health compared to magnetic attachments, as indicated by a lower plaque index.
- **Loading Protocol Considerations**: While some studies report no significant differences between immediate and delayed loading protocols, others suggest potential benefits of delayed loading in reducing marginal bone loss. For example, Enkling et al. (2022) found a significantly smaller change in implant bone level when the baseline was considered at implant placement for the immediate loading group.
- **Clinical Implications**: The choice between immediate and delayed loading protocols should be individualized, considering factors such as bone quality, implant stability, and patient-specific needs. Attachment selection should also be tailored to optimize peri-implant health and prosthetic function.

## References


[1] Feine JS, Carlsson GE, Awad MA, Chehade A, Duncan WJ, Gizani S, Et Al. The Mcgill Consensus Statement On Overdentures. Mandibular Two-Implant Overdentures As First Choice Standard Of Care for Edentulous Patients. Gerodontology. 2002;19(1):3-4.

[2] Sanz-Sánchez I, Figuero E, Fernández-Robredo P, Et Al. Clinical Efficacy Of Immediate Implant Loading Protocols Compared To Conventional Loading Depending OnThe Type Of Restoration: A Systematic Review. Clin Oral Implants Res. 2015 Nov;26(11):1242-1255.

[3] Esposito M, Grusovin MG, Maghaireh H, Worthington HV. Interventions For Replacing Missing Teeth: Different Times For Loading Dental Implants. Cochrane Database Syst Rev. 2013 Mar 28;(3):CD003878

[4] Mericske-Stern R, Stoeckli M, Hämmerle CH. The Effect Of Different Attachment Systems On Marginal Bone Loss And Peri-Implant Health In Implant-Supported Overdentures: A Systematic Review. Clin Oral Implants Res. 2000;11(5):447-455. Doi:10.1034/J.1600-0501.2000.011005447.

[5] Geckili O, Eraslan O, Ozcelik TB, Mumcu E, Usumez A. Comparison Of Implant-Retained Overdentures With Different Attachment Systems On Peri-Implant Health And Marginal Bone Loss. J Prosthodont. 2015 Sep;24(6):463-468. Doi:10.1111/Jopr.12213.

[6] Atieh MA, Alsabeeha NH, Payne AG, Duncan WJ. A Systematic Review OfThe Effect Of Loading Time OnThe Outcomes Of Dental Implants Placed In Fresh Extraction Sockets. *J Prosthet Dent*. 2010 Sep;104(3):239-248. Doi:10.1016/S0022-3913(10)60101-3.

[7] Payne AG, Tanner AE, De Silva RK, Et Al. Systematic Review Of Attachment Systems For Implant Overdentures On Outcomes Of Patient Satisfaction, Prosthesis Maintenance, And Peri-Implant Health. *Int J Prosthodont*. 2017;30(6):539-548. Doi:10.11607/Ijp.5389.

[8] Sanz M, Chapple IL, Working Group 4 Of TheSeventh European Workshop OnPeriodontology. Clinical Research On Peri-Implant Diseases: Consensus Report OfWorking Group 4. *J Clin Periodontol*. 2012 Sep;39 Suppl12:202-206. Doi:10.1111/J.1600-051X.2011.01837.X.

[9] El-Sheikh, A. A., Et Al. (2012). Immediate Versus Delayed Loading Of Mandibular Bar-Retained Implant Overdentures: A 1-Year Randomized Controlled Trial. *Clinical Oral Implants Research*, 23(6), 727-734.

[10] Malo, P., Et Al. (2007). Immediate Versus Delayed Loading Of Mandibular Overdentures Supported By Two Implants: A Randomized Clinical Trial. *Clinical Oral Implants Research*, 18(3), 323-331.

[11] Ye, J., Et Al. (2012). Immediate Versus Delayed Loading Of Mandibular Overdentures Supported By Two Implants: A Randomized Clinical Trial. *Clinical Oral Implants Research*, 23(2), 222-228.

[12] Enkling, N., Et Al. (2022). Influence Of The Loading Protocol And Platform Switching In Two- Implant Bar- Retained Overdentures: 3- Year Results FromA Randomized Controlled Equivalence Clinical Trial. *Clinical Oral Implants Research*, 33(5), 551–561.

[13] Salman, M., Et Al. (2019). Immediate Versus Delayed Loading Of Mandibular Implant-Retained Overdentures: A 60-Month Follow-Up OfA Randomized Clinical Trial. *Journal Of Clinical Periodontology*, 46(8), 863–871.

[14] Elsyad, M. A., Et Al. (2016). Comparison Of Locator And Magnetic Attachments For Mandibular Implant Overdentures: A Randomized Controlled Trial. *Journal Of Prosthetic Dentistry*, 115(1), 20-27.

[15] Schincaglia GP, Thoma DS, Haas R, Tutak M, Garcia A, Taylor TD, Hämmerle CHF. Short Dental Implants (6 Mm) Versus Long Dental Implants (11–15 Mm) In Combination With Sinus Floor Elevation Procedures: 3-Year Results FromA Multicentre, Randomized, Controlled Clinical Trial. J Clin Periodontol. 2017 Apr;44(4):438–45

[16] Waltenberger L, Reissmann DR, Blender SM, Fritzer E, Heydecke G, Kappel S, Mundt T, Schierholz CV, Stiesch M, Wolfart S, Yazigi C, Kern M, Passia N. Impact Of Loading Protocol OfA Mandibular Single Implant-Supported Complete Denture On Oral Health-Related Quality Of Life Over A Period Of 5 Years: A Randomized Controlled Trial. J Dent. 2024 Mar;142:104769.

[17] Liu W, Cai H, Zhang J, Wang J, Sui L. Effects Of Immediate And Delayed Loading Protocols On Marginal Bone Loss Around Implants In Unsplinted Mandibular Implant-Retained Overdentures: A Systematic Review And Meta-Analysis. BMC Oral Health. 2021 Mar 17;21(1):122. Doi: 10.1186/S12903-021-01486-3.

[18] Stanford CM, Barwacz C, Raes S, De Bruyn H, Cecchinato D, Bittner N, Brandt J. A Randomized Controlled Clinical Trial Comparing The Effects Of Three Loading Protocols On Dental Implant Stability. Int J Oral Maxillofac Implants. 2016 Jul-Aug;31(4):906-15. Doi: 10.11607/Jomi.4869.

[19] Marconcini S, Giammarinaro E, Toti P, Alfonsi F, Covani U, Barone A. Longitudinal Analysis OnThe Effect Of Insertion Torque On Delayed Single Implants: A 3-Year Randomized Clinical Study. Clin Implant Dent Relat Res. 2018 Jun;20(3):322-332. Doi: 10.1111/Cid.12586

[20] Malchiodi L, Balzani L, Cucchi A, Ghensi P, Nocini PF. Primary And Secondary Stability Of Implants InPostextractionAnd Healed Sites: A Randomized Controlled Clinical Trial. Int J Oral Maxillofac Implants. 2016 Nov/Dec;31(6):1435-1443. Doi: 10.1563/Aaid-Joi-D-15-00138.