# What's new for the clinician – summaries of recently published papers (March 2026)

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## 1. IMMEDIATE VERSUS CONVENTIONAL LOADING IN USERS OF MANDIBULAR OVERDENTURES RETAINED BY NARROW-DIAMETER IMPLANTS: RESULTS FROM A 5-YEAR RANDOMIZED CLINICAL TRIAL

Evidence from multiple randomized controlled trials (RCTs) and systematic reviews confirms that immediate loading does not compromise implant survival in the two-implant protocol[1]. A 2020 meta-analysis of 7 RCTs found no statistically significant difference in implant failure rates between immediate and delayed loading for two-implant mandibular overdentures . This finding is supported by long-term data: a 12-year follow-up study reported cumulative survival rates of 100% for immediately loaded implants and 96% for delayed loading. [1]

Regarding bone health, a 3-year RCT noted that the immediate loading group experienced *significantly lower marginal bone loss* compared to the conventional loading group after 36 months . However, a network meta-analysis suggested that the attachment type influences this outcome, with a bar attachment combined with immediate loading ranking highest for minimizing bone loss.

The primary advantage of immediate loading is the accelerated functional recovery. Patients receiving immediate loading typically receive their final prosthesis within 48 hours, avoiding the use of a removable interim denture. A 1-year RCT on titanium-zirconium narrow-diameter implants demonstrated that while both protocols resulted in high satisfaction, a significant difference was observed at 6 months regarding the *ability to chew* in favour of the immediate loading group.

However, the 3-year RCT by Possebon et al. (2023) provides a critical caveat: while conventional loading patients showed deterioration in masticatory function by year three, immediate loading patients maintained functional evolution, yet they reported *more complaints regarding general oral performance.* Nonetheless, the conclusions drawn from these systematic reviews remain limited due to the scarcity of long-term clinical studies directly comparing both loading protocols in two implant mandibular overdenture (2-IMO) users.

Salybi et al reported on a randomized clinical trial that sought to compare the clinical performance of 2-IMO users rehabilitated with conventional and immediate loading protocols over a five-year follow-up period. Clinical, radiographic, functional, and patient-centred outcomes, as well as prosthetic maintenance events, were evaluated. The null hypothesis tested was that no significant differences would be observed between the two loading protocols during the study period.

### Materials & Methods

This randomized clinical trial is a 5-year follow-up of a trial that sought to evaluate mandibular overdentures retained by two implants (2-IMO) users rehabilitated with immediate loading (IL) or conventional loading (CL) protocols using narrow diameter implants (NDIs) from the Facility-Equator system. The trial cohort comprised 20 patients.

Each participant received a conventional maxillary complete denture and a mandibular overdenture retained by two narrow-diameter implants (2.9 × 10 mm) placed in the interforaminal region of the mandible. Participants were recalled for follow-up appointments at 1-, 3-, and 5-years post-treatment for clinical and radiographic evaluations. In addition, prosthetic maintenance appointments were routinely scheduled once per year as part of the standard follow-up protocol. In isolated cases, extra maintenance sessions were conducted when clinically necessary or upon patient demand, which resulted in a higher number of visits for some individuals. At each time point, the following parameters were assessed: i)clinical evaluation of peri-implant health; ii) radiographic assessment of marginal bone loss (MBL) and the posterior area index (PAI) of the mandible; iii) functional and patient-centered outcomes, including masticatory performance (MP) and oral health-related quality of life using the DIDL (Dental Impact on Daily Living) questionnaire. Additionally, prosthetic maintenance events were recorded annually.

Peri-implant health was evaluated through annual clinical examinations of the four surfaces of each implant to monitor the Visible Plaque Index (VPI), Peri-implant Inflammation (PI), Calculus Presence (CP), Probing Depth (PD), and the Bleeding on Probing (BOP).

Marginal bone loss (MBL) and the posterior area index (PAI) of the mandible were analyzed using digital panoramic radiographs by a single calibrated examiner for each parameter. Examiner calibration for radiographic analysis was verified by calculating the Intraclass Correlation Coefficient (ICC) based on two separate measurements performed one week apart. The calibration was considered acceptable with an ICC value ≥ 0.80. MBL was assessed on the mesial and distal faces of each implant using measurement tools within ImageJ software. The outer edge of the implant head served as the reference point for evaluating peri-implant bone levels. The distance between the outer edge of the implant head and the alveolar crest level on both the mesial and distal faces was measured. A clinically contextualized interpretation of marginal bone loss was adopted according to the criteria proposed by Albrektsson et al. (1986), which consider bone loss of 1.0–1.5 mm acceptable during the first year after implant placement and up to 0.2 mm per year thereafter as physiological.

Masticatory function was assessed using the Masticatory Performance (MP) test. During the test, participants were

instructed to chew a standardized artificial test material, Optocal (3.7 g), for 40 chewing cycles, counted by a calibrated examiner. Upon completion, the chewed material was expectorated onto a paper filter, rinsed with water, and left to dry at room temperature for seven days. Once dried, the material was processed through a series of sieves with decreasing mesh sizes (5.6–0.5 mm) using a mechanical sieve shaker for 20 min. Masticatory efficiency (ME) was determined by calculating the percentage of the total sample weight retained on the 5.6 mm and 2.8 mm sieves.

Oral health-related quality of life (OHRQoL) was evaluated using the Dental Impact on Daily Living (DIDL) questionnaire, which comprises 36 questions distributed across five domains: appearance, pain, oral comfort, general performance, and chewing. Each domain score was calculated as the mean of the summed responses within that domain. Final scores were categorized as dissatisfied (<0), relatively satisfied (0–0.69), or satisfied (0.7–1.0).

The prosthetic maintenance events monitored throughout the study included: dislodgement and replacement of the Equator attachment or matrix, prosthesis adjustments and fractures, fabrication of new prostheses, denture tooth fractures, matrix recapture, replacement of O-rings, vestibuloplasty procedures, removal of keratinized mucosa, relining procedures, and re-opening surgeries for prosthetic component replacement. For each follow-up year, the total number of maintenance events, the frequency of each specific event, and the number of patients affected by each type of event within each group were recorded.

Probing depth (PD) was the primary endpoint. All other clinical, radiographic, and patient-centred variables were considered secondary outcomes.

## RESULTS

At the 5-year follow-up period, five participants (3 in conventional loading [CL] group; 2 in immediate loading [IL] group) were lost to follow-up, resulting in 15 patients completing the 5-year evaluation: eight in the IL group and seven in the CL group. During the first year, five implants failed, three in the IL group and two in the CL group—resulting in implant survival rates of 90% for the CL group and 85% for the IL group. Following replacement with new Morse taper implants (3.5×9 mm, Neodent), no further implant failures were recorded throughout the 5-year follow-up period. In the CL group, one patient developed peri-implant mucositis on the right implant, with the condition recurring at the 5-year evaluation for the same implant.

In terms of all the clinical, radiographic, masticatory, and oral health–related quality of life outcomes between groups at the 5-year follow-up, statistically significant differences were detected only for MBL ($p=0.01$) and for the masticatory domain of the DIDL questionnaire ($p=0.03$). At 5 years, the IL group showed slightly greater MBL (IL = 0.05 ± 0.80 mm; CL = –0.24 ± 0.70 mm) and reported a more pronounced decline in perceived masticatory capacity (IL = 1.8 ± 2.74 vs. CL = 2.4 ± 3.10).

Longitudinal analyses of MBL revealed overall stability of peri-implant bone levels in both groups over the 5-year follow-up. In the CL group, mean changes at 1, 3, and 5 years were small (–0.09 mm, 0.09 mm, and –0.17 mm, respectively), although significant cumulative remodelling was observed between 3 and 5 years (coef.: 1.02; 95% CI: 0.56–1.48; $p<0.001$) and from baseline to 5 years (coef.: 0.85; 95% CI: 0.14–1.56; $p=0.01$), corresponding to a mean bone loss of –0.08 mm at 5 years. In the IL group, mean changes at 1, 3, and 5 years were also minimal (0.09 mm, –0.00 mm, and 0.05 mm, respectively), but cumulative remodelling was significant both between 3 and 5 years (coef.: 0.93; 95% CI: 0.73–1.13; $p<0.001$) and from baseline to 5 years (coef.: 1.89; 95% CI: 1.73–2.05; $p<0.001$), resulting in a mean bone loss of 0.04 mm at the final follow-up.. Both loading protocols exhibited small changes over time, with the CL group showing greater bone remodelling between 3 and 5 years, whereas the IL group remained more stable across all intervals.

When analyzing the intragroup results for the clinical outcomes, a statistically significant difference in PD was observed in both groups between the first and fifth years ($p=0.00$), with the IL group showing a greater reduction in PD over time. The PAI exhibited significant intragroup changes over the follow-up period. In the CL group, PAI values increased progressively, with statistically significant differences observed between the third and fifth years (26% increase, $p=0.00$), as well as a cumulative gain of 28% from baseline to the fifth year ($p=0.00$). Conversely, the IL group demonstrated a significant increase in PAI starting from the third year, with a 31% increase between the third and fifth years ($p=0.00$) and an overall gain of 28% over the entire five-year period ($p=0.02$). These results indicate a sustained improvement in posterior area index within both groups throughout the study duration.

Although a reduction in the mean domain scores for DIDL was observed, no statistically significant differences were found over the 5-year period in the CL group. In contrast, the IL group demonstrated significant differences between the third and fifth years across all DIDL domains. The "appearance" domain showed a slight improvement in the mean score, increasing from 2.8 to 2.84 ($p=0.00$). The "pain" domain showed a reduction from 2.9 to 1.8 ($p=0.01$). Similarly, the "oral comfort" ($p=0.01$), "general performance" ($p=0.00$), and "mastication" ($p=0.01$) domains also showed significant worsening in their mean scores during this period. When comparing the first and fifth years, only the chewing domain showed a significant decline ($p=0.03$).

The maintenance occurrences recorded over the 5-year follow-up were mainly related to matrix recaptures or replacements, prosthesis adjustments, and O-ring replacements, while major complications were rare. In the CL group, most events occurred at the 4-year follow-up, with fewer occurrences at 5 years, whereas in the IL group the distribution was similar across both periods. Over the five-year follow-up, a total of 136 maintenance events were recorded in the CL group and 159 in the IL group. The IL group was 1.68 times more likely to require O-ring replacement than the CL group (OR:1.68; $p=0.03$), and they also had an 89% lower chance of requiring removal of keratinized tissue (OR: 0.11; $p=0.04$) over the 5-year period. Other maintenance events, such as artificial tooth fracture, prosthesis rebasing, or replacement of matrix, were infrequent (<10%) and showed no significant differences between groups.

## CONCLUSION

Although the immediate loading group exhibited reduced probing depth and marginal bone loss, both groups demonstrated similar masticatory performance and posterior area index over the five-year follow-up. Prosthetic maintenance events decreased by the end of the fifth year. However, from the third year onward, patients in the immediate loading group reported greater dissatisfaction with 2-IMO treatment, mainly due to retention and stability issues.

### Implications for practice

The trial results offer a mixed bag of outcomes for clinicians to consider. IL performed better with objective and clinically important outcomes such as PD and MBL whilst CL has better OHRQoL outcomes and lesser maintenance issues. Both groups had similar masticatory performance.

### Reference

1. Salybi SRB, Ramos FIR, Possebon APD, *et al.* Immediate versus conventional loading in users of mandibular overdentures retained by narrow-diameter implants: results from a 5-year randomized clinical trial. *Clin Oral Invest 30*, 53 (2026). https://0-doi-org.innopac.wits.ac.za/10.1007/s00784-025-06713-7

## 2. IMPACT OF FOUR GINGIVAL RETRACTION TECHNIQUES ON GINGIVAL TISSUE DISPLACEMENT AND SULCUS DEPTH DURING DIGITAL IMPRESSION PROCEDURES

In the past few years, there has been a profound shift in diagnostic and therapeutic workflows within digital dentistry, with intraoral scanners (IOS) now central to clinical practice due to their efficiency, precision, and superior patient comfort. These devices capture three-dimensional images of the oral cavity, enabling the rapid and precise design of prosthetic restorations. However, the reliability of digital impressions is critically dependent on the clarity of the scanned field, a factor that can be severely compromised by the presence of bleeding and soft tissue interference.

### The Impact of Bleeding and Fluids on Scan Quality

IOS technology relies on the projection and capture of light, and the presence of oral fluids – particularly blood – alters the optical properties of the scanned surface, degrading image quality. Bleeding, whether from gingival inflammation, trauma, or surgical procedures, introduces reflective and refractive materials that hinder surface detection and the accurate stitching of image data. Recent 2025 technical benchmarks confirm that uncontrolled haemorrhage not only obscures hard tissue margins but also increases the likelihood of scanning errors, such as missing data, artefacts, and distorted anatomy[1]. In fact, the accuracy of intraoral scans can drop by approximately 20% in moist or bleeding conditions. A 2025 systematic review further emphasizes that saliva contamination and visibility issues severely affect the accuracy of IOS for crown preparations with subgingival margins, underscoring that clinically acceptable results are only achievable with proper gingival retraction and a dry field.[1]

To overcome these limitations, effective retraction techniques are indispensable before digital impression-taking, particularly in cases involving subgingival preparations or inflamed tissues. Retraction displaces the gingival tissues, exposes the finish line, and creates a dry, accessible environment for scanning. While traditional methods, such as gingival retraction cords—either plain or impregnated with haemostatic agents—remain effective, the double-cord technique has proven especially valuable in digital workflows for exposing deep margins and ensuring haemostasis. Impregnated cords, typically treated with aluminium chloride or ferric sulphate, promote vasoconstriction and coagulation, improving margin visibility.

Recent innovations have expanded the clinician's armamentarium. A 2025 randomized controlled trial compared various displacement methods and found that impregnated retraction cords provided the greatest horizontal and vertical displacement (0.66 ± 0.04 mm and 0.66 ± 0.008 mm, respectively), followed by a cordless paste (Magic FoamCord), while Expasyl and diode laser troughing were less effective. However, the same study noted that impregnated cords resulted in the most significant loss of gingival height one month post-cementation, suggesting that traumatic pressure should be avoided. Additionally, cordless systems such as Magic FoamCord have demonstrated better haemorrhage control and shorter operating times compared to conventional cords.[1] Another novel 2025 approach, the fully digital pneumatic gingival-retraction scanning (PGR-S) technique, has shown effective retraction, significantly reduced operating time, and improved patient comfort relative to traditional cord methods. Furthermore, a pilot study by Ruggiero et al. (2025) introduced the use of 0.076 mm polytetrafluoroethylene (PTFE) tape for gingival displacement, which allowed for atraumatic retraction and excellent finish line visibility (90% of scans) without the need for tape removal during scanning.

As intraoral scanner technology continues to evolve, with enhanced software algorithms and optical sensors – including the use of short-wave infrared (SWIR) light and artificial intelligence to reduce artefacts from fluids – the fundamental importance of proper field management remains unchanged. Digital workflows still rely on traditional principles of tissue health, visibility, and moisture control to achieve predictable outcomes. Consequently, meticulous bleeding control and retraction protocols are not merely adjuncts to digital dentistry but prerequisites for its success. This body of evidence informs the present study, which aims to evaluate the effectiveness of various gingival displacement techniques by assessing horizontal and vertical displacement, sulcus depth, and gingival height loss (GHL). The null hypothesis posits that no significant differences will be found across these parameters among the different gingival displacement techniques used for digital impressions.

### Methodology

This trial from Turkey was conducted following the CONSORT guidelines for randomized clinical trials.

Thirty-two participants requiring full coverage restorations for maxillary premolars were recruited. For inclusion, patients were between 25–40 years; had Maxillary premolars with normal anatomical size, contour, and position, as determined by clinical examination, periodontal probing, and preoperative digital scans. Patients were also

healthy and had healthy gingiva and periodontium around abutments (GI = 0), Good oral hygiene (PI = 0), Pocket depth ≤ 3 mm and Thick gingival phenotype. Smokers were excluded and patients who had Systemic conditions affecting periodontal status such as Diabetes mellitus, Uncontrolled cardiovascular diseases, Autoimmune disorders and Blood disorders were excluded.

At Baseline periodontal indices, including Plaque Index (PI) and Gingival Index (GI), were recorded to confirm oral hygiene suitability. Two weeks before the clinical intervention, all participants underwent professional oral prophylaxis and received individualized oral hygiene instructions. Gingival phenotype was evaluated using a colour-based phenotype probe (Perioscreen™ Probe) to confirm thick phenotype cases

Thirty two participants were randomly assigned to four parallel groups ($n = 8$) according to the gingival retraction technique:

- *Retraction cord with astringent (RCA; Control group)*: Knitted cord impregnated with aluminium chloride (Ultrapak + Viscostat Clear)
- *Cordless paste with astringent (EXP)*: Expasyl.
- *Cordless paste without astringent (MF)*: Magic FoamCord (Coltene Whaledent).
- Laser troughing (LT): *Diode laser (iLase; Biolase Inc.)*

### Tooth preparation and tissue management

All abutments were prepared for lithium disilicate glass-ceramic crowns (IPS e.max Press) following standard guidelines. Chamfer finish lines with a depth of 0.8 mm were placed 0.5 mm subgingivally and verified using a periodontal probe.

- Group 1 – Retraction cord with astringent (RCA): Size 1 retraction cord (Ultrapak; Ultradent Inc.) was soaked in aluminium chloride gel (Viscostat Clear; Ultradent Inc.) for 5 min. The cord was packed gently into the sulcus using a cord packer (Ultrapak™ Packers; Ultradent Inc.), avoiding coverage of the finish line. After 5 min, the cord was moistened and removed to minimize bleeding. Total procedure duration was approximately 6–7 min per tooth.

- Group 2 – Expasyl (EXP): Expasyl paste was injected into the sulcus with the cannula tip directed apically and parallel to the tooth axis. A compression cap was placed, and participants were instructed to bite to increase pressure. After 5 min, both the cap and paste were removed, and the sulcus was rinsed. Total duration was 6–7 min per tooth.

- Group 3 – Magic FoamCord (MF)" Magic FoamCord was applied similarly to Expasyl, followed by placement of a Comprecap. After 5 min, the cap and material were removed, and the sulcus was rinsed thoroughly. Total duration was 6–7 min per tooth.

- Group 4 – Diode laser troughing (LT)" Laser troughing was performed using a diode laser (iLase) at a 980 nm wavelength and 0.8 W continuous mode, consistent with parameters shown to effectively remove epithelial tissue in periodontal pockets. The laser fibre tip was inserted 1 mm into the sulcus, keeping it away from the preparation margin. Short, sweeping strokes were used to avoid tissue charring. The tip was regularly cleaned with gauze soaked in 10% hydrogen peroxide during the procedure. Duration was approximately 3–4 min per tooth.

A preoperative scan was obtained using an intraoral scanner (Medit i700W), calibrated before each use. After tooth preparation and gingival displacement, definitive digital impressions were taken immediately to minimize sulcus collapse. Scans were exported in PLY format.

Definitive restorations were fabricated using CAD-CAM workflow (Exocad Dental DB; Exocad). Full-contour lithium disilicate crowns were delivered the same day. Adhesive cementation was performed, and excess cement was carefully removed. Post-cementation digital scans were taken at 7, 15, and 30 days to evaluate tissue changes related to gingival retraction, not prosthetic outcomes, in order to avoid confounding factors such as occlusal load or cement placement.

### Outcome assessment

All scans were analyzed using CAD software for the following parameters:

- **Horizontal displacement:** Measured as the horizontal distance from the finish line to the adjacent gingiva
- **Sulcus depth:** Measured as the vertical distance from the finish line to the deepest sulcus point at the same 8 locations.
- **Vertical displacement:** Calculated by superimposing pre- and post-retraction scans at 6 points.
- **Gingival Height Loss (GHL):** Measured at Mesiobuccal (MB) and mesio-palatal(MP) points after superimposing preoperative scans with postoperative scans at 7, 15, and 30 days.

To ensure standardization and minimize variability, all measurements were conducted according to a uniform protocol.

## RESULTS

A total of 43 participants were screened for eligibility. Ten individuals were excluded for not meeting the inclusion criteria, and one declined participation, leaving 32 participants who were randomized equally into four study groups ($n = 8$ per group).

The mean age of participants was similar across groups (RCA: 35.2 ± 6.1 years; MF: 34.7 ± 5.8 years; LT: 36.0 ± 6.3 years; EXP: 35.5 ± 5.9 years), with no statistically significant difference ($p = 0.92$). Sex distribution was balanced across groups ($p = 0.88$). Baseline GHL was 0.00 mm among all participants.

Group RCA demonstrated the greatest horizontal displacement (0.72 ± 0.08 mm), vertical displacement (0.68 ± 0.07 mm), and sulcus depth (0.75 ± 0.09 mm). These values were significantly higher than those of the other groups ($p < 0.05$).

Group MF achieved intermediate displacement values (horizontal: 0.60 ± 0.05 mm; vertical: 0.55 ± 0.06 mm), which were significantly higher than Group LT (0.50 ± 0.04 mm; 0.45 ± 0.05 mm) and Group EXP (0.48 ± 0.03 mm; 0.42 ± 0.04 mm). However, sulcus depth values were not significantly different between MF and LT ($p = 1.00$).

### Gingival height loss over time

Two-way ANOVA results revealed significant main effects of retraction method ($F = 18.45$, $p < 0.001$) and time ($F = 22.12$, $p < 0.001$) on GHL, as well as a significant interaction between method and time ($F = 5.87$, $p = 0.003$).

Across all groups, GHL progressively decreased from day 7 to day 30 ($p < 0.001$). On day 7, Group RCA recorded the highest GHL ($0.28 \pm 0.04$ mm), which declined to $0.10 \pm 0.02$ mm by day 30. In comparison, Group EXP consistently exhibited the lowest GHL values across all time points ($0.14 \pm 0.02$ mm at day 7; $0.07 \pm 0.01$ mm at day 30). Groups MF and LT showed intermediate reductions.

Pearson correlation analysis confirmed strong positive correlations between GHL and horizontal displacement ($r = 0.88$), sulcus depth ($r = 0.87$), and vertical displacement ($r = 0.78$), all statistically significant ($p < 0.001$).

## CONCLUSION

Retraction cords produced the greatest displacement and correspondingly higher Gingival height loss (GHL), whereas Expasyl paste demonstrated lower displacement and minimal gingival change. Magic FoamCord and laser troughing yielded intermediate outcomes.

### Implications for practice

This trial provides additional data that is useful especially is aesthetic concerns are central to the patients expectations.

## REFERENCE

1. Benli, M. Impact of four gingival retraction techniques on gingival tissue displacement and sulcus depth during digital impression procedures. *Clin Oral Invest 30*, 49 (2026). https://0-doi-org.innopac.wits.ac.za/10.1007/s00784-025-06723-5

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