Effect of Serum Vitamin D Levels on the Clinical and Radiographic Outcomes of Unsplinted Mandibular Implant Overdentures

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By

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Introduction

Tooth loss, particularly in the edentulous mandible, remains a major oral health concern that can significantly impact a patient's quality of life. The use of mandibular implant overdentures has become a reliable and widely accepted treatment option that improves prosthesis retention, stability, and masticatory efficiency compared to conventional complete dentures [1]. Among the various approaches, unsplinted implant overdentures, using locator attachments or similar systems, offer the advantages of easier hygiene, reduced cost, and simplified prosthetic procedures [2,3].

The long-term success of implant-retained overdentures relies heavily on the health of peri-implant tissues and the maintenance of marginal bone levels. Multiple factors influence peri-implant outcomes, including biomechanical loading, oral hygiene, systemic health, and notably, the patient's nutritional and metabolic status, especially vitamin D levels [4,5].

Vitamin D plays an important role in calcium-phosphate homeostasis, bone remodeling, and immune modulation. Recent studies have suggested that vitamin D deficiency may adversely affect osseointegration, increase the risk of early implant failure, and accelerate peri-implant bone loss. However, most of these findings are derived from studies on fixed implant restorations, while little is known about its effect in the context of implant overdentures, particularly the unsplinted type [6,7]

Despite the increasing use of unsplinted mandibular implant overdentures, there is limited clinical evidence regarding how serum vitamin D levels influence their clinical and radiographic outcomes. Understanding this relationship may help identify patients at risk, guide preoperative supplementation strategies, and ultimately improve long-term implant success [8].

Therefore, this study aims to evaluate the effect of serum vitamin D levels on clinical (e.g., implant stability, probing depth) and radiographic (e.g., marginal bone loss) outcomes in patients treated with unsplinted mandibular implant overdentures.

Materials and Methods

This retrospective study are conducted at the Prosthodontic Department, Faculty of Dentistry, Mansoura University. Patient records from the department's database were reviewed to identify individuals who had received unsplinted mandibular implant overdentures supported by three implants and retained by locator attachments. Only patients with complete clinical, radiographic, and laboratory documentation were included. This study included about 20 patients for each group. The sample size are limited due to retrospective nature and availability of complete records including serum vitamin D levels.

The patients selected according to the following criteria:

- Patients' age ranged from 40 to 60 years.
- Patients rehablilitated with unsplinted three-implant mandibular overdentures retained by locator attachments.
- Availability of serum vitamin D levels.
- Complete records of follow up clinical and radiographic assessments. Assessment intervals are T0 at prothesis loading, T6 after 6 months and T12 after 12 months of loading.
- All radiographic assessments are performed using standardized imaging protocols. Digital periapical radiographs were taken using the paralleling technique for all patients with an individualized film holder to ensure consistent angulation and image geometry across time points. Images were calibrated based on known implant lengths to allow for accurate bone level measurements

Exclusion criteria:

- Missing or incomplete patient records.
- Patients on medications known to affect bone metabolism.
- History of smoking or alcohol abuse.

This study is retrospective review that involves no direct with patients. All data will be anonymized and coded to ensure confidentiality.

The study is performed after being approved by The Ethics committee of Dental Research in Faculty of Dentistry, Mansoura University, number R250710

- ❒ Patients will be categorized into two groups based on their recorded serum vitamin D levels [9]:
  - Group A – Deficient: < 20 ng/mL
  - Group B – Sufficient: ≥ 30 ng/mL

Patients with borderline values (21-29 ng/mL) will be excluded to avoid classification bias.

- ❒ The vitamin D level is retrieved from medical laboratory results recorded in the patients' files.
- ❒ Marginal bone loss (MBL) is measured from the implant platform to the first bone–implant contact (mesial and distal), using calibrated imaging software. Calibration is based on the actual implant length to ensure measurement consistency.
- ❒ All measurements are performed in millimeters by the same examiner under identical settings. The examiner is blinded to patient's serum vitamin d levels during evaluation to minimize bias.
- ❒ All data are extracted from patient records using a standardized data collection sheet designed for this study, to ensure consistency in clinical and laboratory parameters.
- ❒ Once all data are collected, they will be statistically analyzed.

Statistical analysis

- ❒ Data are analyzed using statistical software (SPSS, version 22.0; SPSS Inc., Chicago, IL). The Shapiro-Wilk test is used to assess the normality of bone loss data. Descriptive statistics are expressed as mean ± standard deviation. Repeated measures analysis of variance (ANOVA) is used to evaluate changes in bone loss over time, followed by the Tukey Post hoc test for pairwise comparisons between time intervals. Intergroup differences are assessed using the independent samples t test. A P value <.05 was considered statistically significant at a 95% confidence level.

References

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Faculty of Dentistry
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Dental Research Ethics Committee

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Ethical Approval for Scientific Research

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✓ Retrospective	Prospective	Retrospective & Prospective
Type of Protocol	In vitro	Clinical
Master (M.S.) Thesis		
Doctorate (D.D.Sc) Thesis		
Philosophy Doctorate (Ph.D.) Thesis		
✓ Research		
Research Project		Clinical retrospective

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رحمة الحسني محمد Date: 1/7/2025

	Name	Signature
Protocol or research is accepted (A)		
Protocol or research need minor correction (M)		
Corrections and revision done		
Protocol or research need major correction (J)		
Corrections and revision done		
Protocol or research is rejected (R)		

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Signature of ethics committee chairman