



Implant Restoration Screw Loosening: Incidence and Critical Factors

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INTRODUCTION

The interface between the implant, abutment, and prosthetic is a complex mechanical system exposed to significant forces. The design of this interface, central to resolving a range of clinical challenges, remains a topic of intense discussion. One universally acknowledged technical complication associated with implant restorations is screw loosening.^{1,2} As the variety of implant-abutment-prosthetic interface designs expands annually, understanding the core factors that contribute to the loss of screw preload is paramount.

OBJECTIVES

The purpose of this literature review is to report on the clinical incidence of implant restoration screw loosening from 2018 to 2023 and identify critical design and clinical factors associated with screw loosening.

METHODS

A literature search was conducted through PubMed of articles published from 2018 to 2023 using search terms *dental implant crown and screw loosening*. Results were limited to clinical studies, clinical trials, and randomized controlled trials yielding 8 results. Studies that did not report number of screw loosening events or provide descriptions of the implant, abutment, and types of restorations/prostheses were excluded from evaluation. A total of 6 articles met these criteria and were used to generate results regarding incidence of implant restoration screw loosening.

A secondary literature search was conducted to identify etiologic factors associated with screw loosening. Using the same search terms, but limiting results to systematic reviews and meta-analyses, yielded 9 results. Studies specifically identifying factors associated with screw loosening were included for evaluation. While all reviews offer valuable reports on incidence of screw loosening, 3 specifically tracked factors associated with screw loosening, and only 2 were able to identify statistically significant contributors.

RESULTS

Table 1 Incidence of Screw Loosening in Implant Supported Restorations

Author	# Prostheses Delivered	# Incidents Screw Loosening	% Incidence Screw Loosening	Follow Up Period (Months)
Anitua et. al. 2022 ³	167	7	4.2	35
Wolfart et. al. 2019 ⁴	56	1	2.6	12
D-Pereira et. al. 2020 ⁵	154	4	1.8	24
Abduo et. al. 2021 ⁶	47	7	15.4	24
Gulje et. al. 2019 ⁷	41	2	2.8	60
Cheng et. al. 2019 ⁸	69	6	8.7	12
Total	534	27	5.1	

Table 2 Connection, Screw, and Prosthesis Types of Loose Screw

Author	Fixture Connection	Screw Type	Prosthesis
Anitua et. al. 2022 ³	Internal	Prosthetic	Single Unit
Wolfart et. al. 2019 ⁴	Internal	Abutment	Single Unit
D-Pereira et. al. 2020 ⁵	Internal	Abutment	3-Unit FDP
Abduo et. al. 2021 ⁶	Internal	1 Abutment 6 Prosthetic	Single Unit
Gulje et. al. 2019 ⁷	Internal	Abutment	Single Unit
Cheng et. al. 2019 ⁸	Internal	Abutment	Single Unit

A total of 534 implant restorations of varying design were referenced across 6 clinical studies performed within the last 5 years. An aggregated 27 incidents of screw loosening were reported; within the limitations of this review, incidence of implant restoration screw loosening can be estimated at 5.1%, regardless of fixture-abutment-prosthesis type. None of the restorations were built on external connection implants. 320 restorations employed a single screw abutment design, while 214 restorations employed a secondary prosthetic screw design; specific incidences for abutment and prosthetic screw loosening was 4.1% and 6.3%, respectively. Of the 27 reported loose screws, 23 were found in single unit crowns, while 4 were found in two three-unit FDPs.

RESULTS: Design and Clinical Factors

Two systematic reviews^{1,2} evaluating implant restorations delivered from 1996 to 2011 provide useful commentary on factors associated with abutment screw loosening. Secondary prosthetic screw loosening was not evaluated. Both identified external implant connections as a predominant risk factor compared to internal connections. Splinted prosthetic designs were identified as less prone to loosening than single units. Restoration position was also mutually identified, though the articles report contradictory information; Katsavochristou¹ identified greater incidence of screw loosening in the posterior mandible, while Pjetursson² identified the same in the anterior maxilla. Other factors identified, though comparably under-evidenced, were:

- Presence of abutment anti-rotation features
- Torque application technique
- Use of original equipment manufacture parts
- Prosthetic fit passivity
- Screw material and design
- Implant-crown ratio
- Cantilever mechanics
- Occlusal force distribution

CONCLUSION

Despite expansion of design options available to clinicians, implant restoration screw loosening persists as a common technical complication. The current literature review provides an estimated incidence of 5.1% of abutment or prosthetic screw loosening across a variety of modern implant-abutment-prosthesis designs. While external implant connections and solitary restorations are indicated as strong risk factors for screw loosening, other suggested factors have failed to reach statistical significance in available literature; though, clinical experience continues to reify their role in the process. Clearly a multifactorial and relatively persistent complication, the need for further evidence regarding screw loosening is clear.

REFERENCES

