

# Biomechanical Reliability and Biological Outcomes of Single-Unit Implant Crowns: A Comparative Analysis of Screw-Retained vs. Cement-Retained Systems in the Era of CAD/CAM Ti-Base Abutments

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## Abstract

**Background:** Screw-retained and cement-retained implant restorations present distinct biological and mechanical limitations, with no absolute system established. Residual cement poses significant peri-implant risks, while screw-retained designs introduce structural and positional challenges.

**Objective:** This narrative review analyzes outcomes of screw-retained versus cement-retained restorations as CAD/CAM Ti-base abutments redefine modern implant prosthodontics.

**Methods:** A narrative review of peer-reviewed literature was conducted using PubMed/MEDLINE, with no date restriction. Search terms included "screw-retained implant crown," "cement-retained implant crown," "Ti-base abutment," and "angulated screw channel." Included studies reported on single-unit implant crowns with outcomes encompassing biological complications (peri-implant inflammation, marginal bone loss), biomechanical performance (screw loosening, fracture resistance) and prosthetic retrievability. Systematic reviews, randomized controlled trials, prospective cohort studies and *in-vitro* studies were prioritized.

**Results:** Both systems show comparable survival rates yet differ in complication profiles. Cement-retained restorations carry higher biological risks, peri-implant inflammation and bone loss driven by residual subgingival cement. Screw-retained systems eliminate cement-related complications and support better tissue stability, though screw loosening is more frequent. Cement-retained crowns offer greater fracture resistance; screw-retained designs are more prone to ceramic chipping. No implant connection configuration has proven universally superior. Ti-base hybrid abutments offer favorable biological outcomes and precise fit via CAD/CAM workflows, while angulated screw channels expand screw-retained applicability with comparable outcomes to cemented restorations.

**Conclusion:** Cement-retained restorations are associated with increased biological risks and may require invasive retrieval. Screw-retained restorations are more favorable for long-term clinical management, with predictable retrievability allowing effective complication management without compromising the prosthesis.

**Keywords:** Biologic Complications; Cemented; Ceramic; Implant; Abutments; Screw-Retained; Single Crowns; Technical Complications; Zirconia

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## Introduction

Dental implant restorations are widely recognized as a predictable treatment modality for the replacement of missing teeth. The selection between screw-retained and cement-retained designs represents a critical clinical decision with direct implications for biological outcomes, mechanical performance and long-term prosthetic maintenance [1].

Hence, it is important to foresee the “life cycle” of the restoration since it is essential when evaluating these systems. Implant-supported restorations are not stagnant; they stipulate monitoring, maintenance and potential intervention over time [2].

Therefore, considering that these restorations can become either benefactors or malefactors in long-term success, it is important that the clinician regards at what capacity the system will sustain esthetic functionality when retrieving a restoration without the possibility of yielding damage. This train of thought is based on comprehensive evaluations that emphasize minimizing peri-implantitis [1,2].

As we consider these points in literature, it is conveyed that cement-retained restorations are often preferred for their superior esthetics and simplified clinical workflow. Nonetheless, they flaw as they present limitations in retrievability and they increase the risk of biological complications due to residual cement. On the contrary, screw-retained restorations tolerate easier removal and more standard management of aftereffects, making them favorable for long-term maintenance [3].

The aim of this narrative review is to compare screw-retained and cement-retained single-unit implant crown restorations based on current evidence. Outcomes examined include biological risks, biomechanical performance, structural integrity of veneering materials and the role of emerging solutions such as Ti-base abutments and angulated screw channels in expanding clinical applicability [3].

## The Biological Interface: Cement Sepsis vs. Plaque Retention

Implant-supported restorations provide a predictable and effective treatment for patients requiring the replacement of missing teeth. Although implant designs have been optimized to minimize micro gaps, evidence indicates that these gaps still persist, allowing bacterial leakage at the implant–abutment interface [4]. The two primary methods for retaining a crown on an implant abutment are cement-retained and screw-retained systems [5]. Cement-retained system: In this technique, the prosthetic crown is fixed to the implant by direct cementation to the abutment, which is already anchored to the implant [5]. The main limitation of this procedure is the difficulty of controlling the amount of dental cement that can slip below the mucosal margin during the cementation phase, thus making its full removal particularly difficult. Clinical evidence suggests a strong correlation between residual cement and peri-implant inflammation [6].

There are two main etiopathogenic mechanisms:

In the direct route, both a chemical and a mechanical role can be hypothesized. Based on the relative biocompatibility of these products, cement could be considered an “allergen” capable of first evoking sensitization and then triggering a local reaction [4]. The residual material could instead induce a foreign body reaction capable of releasing proinflammatory cytokines involved in the bone resorption process. The indirect route proposes a bacterial etiology in which cement residues become the cause of adhesion and retention of bacteria, with consequent formation and support of pathogenic biofilms [6].

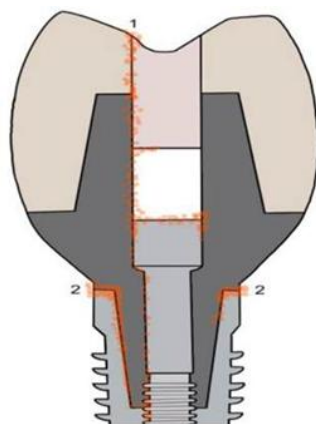
Detecting residual cement remains a clinical challenge. Radiographic examination is widely used; however, its diagnostic reliability is limited due to the low radiodensity of most dental cements. Studies have shown that radiographic detection rates are low and cement remnants located on buccal or lingual surfaces are often missed [7]. Manual probing with an explorer is also limited by operator sensitivity and access. Currently, advanced tools such as dental endoscopy offer a more direct and minimally invasive method for visualizing submucosal areas and identifying residual cement. To reduce this risk, it is recommended to design crown margins at or near the mucosal level to facilitate complete cement removal. Additionally, ensuring proper soft tissue maturation and conducting early follow-up evaluations after prosthesis placement are essential preventive measures (Fig.1) [8].



**Figure 1:** Section of cement-retained implant-supported prosthesis showing reference points used to calculate distances. Cement residue is represented in blue. AC: Apical Cement; IP: Implant Platform; MM: Mucosal Margin; PM: Prosthetic Margin [8].

Screw-retained systems represent an alternative approach for implant-supported rehabilitation. The screw access channel plays a critical role in maintaining biological and mechanical stability [7]. The presence of an access hole introduces a potential pathway for bacterial colonization, making the selection of an appropriate sealing material clinically relevant. An effective sealing material should reduce microleakage, limit bacterial infiltration and preserve prosthesis retrievability [8]. In two-piece screw-retained implant systems, the micro gap at the implant–abutment interface and screw access channel can serve as a pathway for bacterial colonization and biofilm accumulation. This microenvironment facilitates the progressive establishment of Periopathogenic bacteria, which may infiltrate the implant components and contribute to peri-implant inflammation and peri-implantitis [9]. Evidence indicates that periopathogens can colonize the subgingival area within 2-3 weeks after implant placement, with species such as *Fusobacterium nucleatum*, *Porphyromonas gingivalis*, Other associated with peri-implantitis include *Aggregatibacter actinomycetemcomitans* and *Prevotella intermedia*, all of which contribute to the progression of peri-implant disease [10].

Several materials have been proposed for sealing the screw-access channel, including Cotton pellets, Gutta-percha, Polyvinylsiloxane (PVS), composite resin and Polytetrafluoroethylene (PTFE) [8]. Cotton pellets are inexpensive and widely used but may be difficult to remove and can develop unpleasant odors over time. Gutta-percha is easy to manipulate but cannot be sterilized. PVS offers better handling and sterilization properties. Among these materials, PTFE tape is a viable alternative due to its viscoelastic properties, ease of use, biological compatibility and provides superior resistance to microleakage relative to other sealing materials [10]. Peri-implantitis represents one of the most common biological complications, affecting up to one in five implant patients and one in ten implants. Residual cement remains a leading etiologic factor, strengthening the rationale for screw-retained restorations, which eliminate cement-related risks entirely [9]. Effective sealing of the screw-access channel may further support peri-implant health by reducing plaque accumulation and limiting bacterial colonization of prosthetic components (Fig.2) [6].



**Figure 2:** Possible leakage entry and exits of microorganism. (1) Occlusal screw access hole during sealing and/or occlusal function. (2) Implant–abutment junction micro gap [9].

### **Mechanical Failure Modes: Screw Loosening and Fractures**

The long-term success of implant-supported restorations depends not only on osseointegration but also on the mechanical stability of the prosthetic components. Among the most frequently reported technical complications are screw loosening and component fractures, both of which can compromise the integrity of the restoration and the surrounding biological structures [10].

When comparing retention modalities, screw-retained reconstructions have consistently demonstrated fewer technical and biological complications than their cemented counterparts. A systematic review by Wittneben, et al., confirmed that, while differences between both systems are not dramatic, screw-retained restorations offer a more favorable complication profile overall [11]. This is further supported by Sailer, et al., whose systematic review found that cemented reconstructions were associated with greater biological complications, including higher rates of marginal bone loss, a finding with significant implications for long-term implant survival [12].

From a biomechanical standpoint, the Implant-Abutment Connection (IAC) plays a central role in determining how mechanical forces are distributed and absorbed. Pereira Freitas highlighted that the external hexagon connection, long considered a standard design, is particularly susceptible to fatigue failure under cyclic loading, especially in cemented implant-supported crowns [11]. This has driven the development of alternative connection geometries aimed at reducing micro-movement and improving joint stability [13].

Among these alternatives, the internal conical connection (commonly referred to as the Morse Taper) has gained considerable attention. Its design features long conical walls that create a friction-locked interface, effectively resisting micro-movements that would otherwise destabilize the joint [10]. El-Gohary, et al., demonstrated that this design significantly reduces micro-gap formation and bacterial leakage compared to traditional external hex configurations, pointing to a clear advantage not only in mechanical performance but also in biological protection [13]. However, the relationship between connection design and mechanical performance is nuanced. Michalakakis, et al., found that the internal hex connection outperformed other configurations when evaluating screw joint stability under varying torque conditions [14]. This suggests that no single connection design is universally superior across all mechanical parameters; rather, the optimal choice depends on the specific clinical demands of the case, including occlusal load magnitude, restoration type and the biomechanical environment [15].

The role of torque itself deserves particular attention. Research has established an inverse relationship between the torque applied at the implant-abutment interface and the degree of bacterial micro-leakage: as applied torque increases, leakage rates decrease [15]. This finding carries important clinical implications, as inadequate tightening of prosthetic screws not only increases the risk of screw loosening but may also facilitate bacterial infiltration at the interface, potentially triggering peri-implant inflammation and bone loss. Proper torque protocols are therefore essential to both mechanical stability and biological health [16].

Taken together, the evidence consistently points to a direct relationship between connection design and implant failure rates. Freitas, et al., confirmed this in their analysis of anterior crowns, demonstrating that both the type of implant connection and the restoration design, whether screwed or cemented, significantly influence the reliability of the restoration and the nature of failure modes observed [16]. Screw loosening and fractures are not random events; they are predictable outcomes when connection design, torque application and restoration type are not carefully matched to the clinical context [17]. Minimizing mechanical failure in implant-supported restorations requires an integrated approach: selecting a connection design that limits micro-movement and leakage, applying appropriate torque values and choosing a retention modality that aligns with the patient's biological and mechanical risk profile [14]. As implant systems continue to evolve, a deeper understanding of these biomechanical interactions will remain essential to achieving predictable, long-term clinical outcomes [17].

### **The Structural Integrity of the Veneering Material**

One of the most clinically relevant, yet often underestimated, differences between screw-retained and cement-retained implant crowns lies in the structural integrity of the veneering ceramic [18]. While the debate between both retention modalities has traditionally centered on biological and mechanical outcomes, the long-term aesthetic survival of the restoration is equally dependent on how each design interacts with the ceramic material at a structural level [19].

Screw-retained crowns, by definition, require an access hole through the occlusal or lingual surface of the restoration. This opening introduces a structural discontinuity in the ceramic layer; whether zirconia, lithium disilicate or a veneered framework; that creates localized stress concentration points. Under cyclic occlusal loading, these areas become preferential sites for crack initiation and propagation, ultimately manifesting clinically as chipping or fracture of the veneering material [19]. This phenomenon, widely referred to as the "chipping factor," represents one of the primary aesthetic and technical complications associated with screw-retained restorations. The direct mechanical consequence of the access hole has been experimentally confirmed: Saboury, et al., demonstrated that the presence of a screw access hole significantly reduced the fracture resistance of implant-supported zirconia-based crowns compared to unperforated controls, introducing a measurable structural liability into the restoration [18].

The clinical significance of this finding extends to broader comparative outcomes. A systematic review by Sherif, et al., found that while overall survival rates between screw- and cement-retained implant crowns were comparable, porcelain fracture was consistently documented as a minor but recurring complication across the included study [19]. Although the review did not establish a statistically significant difference in fracture rates between both groups, the direction of the evidence suggests that structural interruptions, such as the access hole, may predispose the ceramic surface to mechanical failure over time [20].

Beyond the access hole itself, the intrinsic vulnerability of the ceramic layer in bi-layered systems plays an independent role in chipping susceptibility. Rodrigues, et al., demonstrated through viscoelastic finite element modeling that residual thermal stresses generated during the cooling phase of veneer firing are a key precursor to clinical fracture in both porcelain-veneered zirconia and porcelain-veneered lithium disilicate crowns [21]. Their analysis showed that differences in elastic modulus and coefficient of thermal expansion between the core and veneer materials generate internal tensile stresses that accumulate at the veneer-core interface; stresses that are further amplified under functional occlusal loading. When a structural discontinuity such as a screw access hole is superimposed on this already stress-susceptible system, the risk of crack initiation increases considerably [22].

Material strategies aimed at improving veneer adhesion and reducing this susceptibility have been explored. Maroiu, et al., conducted a systematic review evaluating the use of lithium disilicate liners and press-on or CAD-on interlayers at the zirconia-veneer interface [21]. Their findings, drawn from *in-vitro* studies, indicated that incorporating such interlayers improved both bond strength and fracture performance compared to conventional feldspathic porcelain layering, pointing to an emerging strategy for enhancing ceramic cohesion, regardless of retention modality [23].

In contrast to screw-retained designs, cement-retained crowns present a monolithic, uninterrupted occlusal surface. Without the structural compromise introduced by an access hole, the ceramic layer distributes occlusal loads more evenly across its entire surface [22]. This homogeneous stress distribution reduces the likelihood of localized crack initiation and contributes to greater long-term aesthetic stability. From a purely structural standpoint, the cement-retained design is inherently more favorable for ceramic integrity, a view supported by *in-vitro* evidence showing that cement-retained implant-supported fixed prostheses consistently demonstrate higher fracture loads than their screw-retained counterparts across both metal and zirconia frameworks [23]. It is worth noting that advances in CAD/CAM technology and the growing adoption of fully monolithic restorations have partially addressed the chipping problem in screw-retained designs [24]. By eliminating the veneering layer entirely, the impact of the access hole on overall structural integrity is reduced, though not eliminated. The stress concentration effect of the discontinuity persists regardless of material and the composite resin plug used to seal the access hole does not fully restore the structural continuity of an intact ceramic surface, remaining a potential long-term liability [23].

In summary, the chipping factor is not merely a technical inconvenience, it is a predictable biomechanical consequence of the design compromise inherent to screw retention. When aesthetic longevity and ceramic survival are prioritized, the uninterrupted surface of cement-retained crowns confers a structural advantage that clinicians should carefully weigh during treatment planning [25].

### **The Ti-Base Paradigm: "The Hybrid Solution"**

Few debates in implant prosthodontics have lasted as long as the one between screw-retained and cement-retained restorations. Screw-retained designs offer retrievability and eliminate cement-related biological risks, but demand near-ideal implant

positioning [25]. Cement-retained restorations are more forgiving with angulation and generally offer better aesthetics, but residual subgingival cement remains a real and well-documented concern. Staubli, et al., found in their systematic review that peri-implant disease prevalence in cemented restorations ranged from 1.9% to 75%, with between 33% and 100% of those cases associated with excess cement; figures that are difficult to ignore in daily practice [26].

The Ti-base paradigm emerged as a practical answer to this dilemma. Rather than forcing a binary choice, it integrates the mechanical reliability of screw retention with the biological control of extraoral cementation. A ceramic crown, typically zirconia or lithium disilicate, milled via CAD/CAM, is bonded to a prefabricated titanium base outside the mouth and the resulting unit is screwed directly to the implant [27]. By moving cementation away from the peri-implant sulcus entirely, clinicians can inspect and remove any excess luting material before the restoration is ever placed intraorally. De Melo Moreno, et al., highlighted in their literature review that this approach maintains the biological advantages of screw retention while preserving the prosthetic flexibility that cement-retained designs have long offered [26].

From a clinical outcomes perspective, the evidence is encouraging. Zhang, et al., conducted a systematic review and meta-analysis evaluating implant-supported single hybrid abutment crown restorations over a minimum follow-up of twelve months [27]. Their analysis found high survival rates and low biological complication rates, with peri-implant tissue health comparing favorably to both conventional retention modalities.

Precision of fit is another area where the Ti-base concept performs well. Fakhr, et al., evaluated the marginal adaptation of hybrid abutment crowns with custom-milled screw channels on titanium bases, finding clinically acceptable marginal gaps across multiple ceramic materials [28]. This matters because marginal discrepancy is a known contributor to cement leakage and long-term biological complications and digital fabrication with extraoral bonding reduces the variability inherent in chairside cementation [29].

The bond between the ceramic component and the titanium base remains the most technically sensitive element of the system. Surface preparation, primer chemistry and abutment height all influence retention meaningfully. Graf, et al., confirmed that material selection interacts with interface stability in hybrid abutment crowns, reinforcing that the Ti-base is not a one-size-fits-all solution; successful outcomes depend on matching the right material, bonding protocol and abutment geometry to each clinical situation [29]. What makes this concept compelling is how naturally it aligns with where implant dentistry is heading: digital workflows, monolithic ceramics and biologically informed prosthetic design. For clinicians working in esthetic zones or managing angulated implants, the hybrid abutment crown has become a genuine first-line option rather than a compromise [30].

### **Digital Workflows and Angulated Screw Channels (ASC)**

The restoration of dental implants in the aesthetic zone has historically posed a significant aesthetic dilemma in prosthodontics. When an implant is placed with a facial or labial angulation, that is a common consequence of the availability of bone and the anatomy of the patient, the screw access hole often appears on the buccal surface of the crown, which directly compromises the aesthetic result [31]. To resolve this, clinicians used cement-retained restorations which masked the access hole, however, this approach comes with well-documented biological complications because of the risks of residual subgingival cement, like peri-implantitis and subsequent crestal bone loss, furthermore, the complexities associated with the maintenance and clinical retrieval of cemented prostheses has made screw-retained restorations the preferred option. Despite favorable short-term results, current systematic reviews indicate that cement-retained mechanisms possess a persistent biological vulnerability yet to be resolved [32]. The first introduction of the Angulated Screw Channel (ASC) concept in 2015 by Garcia-Gazau, et al., offered a way out of just using cement-retained restorations. Thanks to the advances in CAD/CAM digital manufacturing, ASC abutments that are designed around a titanium Base (Ti-Base), reorient the screw access channel to an optimal location up to 30° away from the facial angulation, making the system biologically safer because of there's no longer need of cement to be placed [33]. By the use of a hexa-lobular screw and a ball-type screwdriver, clinicians can engage the screw at off-axis orientation making screw-retained restorations viable even in cases of unfavorable implant angulation, avoiding the need for intermediate abutments or cement. Clinical evidence confirmed the practical application of this approach: a prospective study of 16 patients restored with integrated ASC abutment crowns in the aesthetic zone recorded a 100% implant survival rate, excellent aesthetic scores and high patient satisfaction at one year of follow-up [34].

Comparative *in-vivo* and systematic evidence demonstrates that ASC restorations achieve outcomes comparable to cement-retained crowns across the key domains of long-term implant survival, marginal bone loss and esthetic performance [35,36]. A systematic review and meta-analysis of 10 studies involving 243 implants found no statistically significant differences in esthetic scores, marginal bone loss or complication rates between ASC and cement-retained groups [37]. A subsequent meta-analysis confirmed these findings, with the additional observation of reduced bleeding on probing in the ASC group [38].

From a biomechanical standpoint, ASC systems exhibit slightly reduced torque transfer efficiency compared to straight-channel configurations. The wider access channel required for angular correction also results in thinning of zirconia in lingual and cervical regions, which may reduce overall prosthesis fracture resistance [30,33].

## Outcomes

The selection between screw-retained and cement-retained single-unit implant crown restorations carries significant implications for long-term biological outcomes, mechanical performance and prosthetic maintenance. Both systems demonstrate comparable survival rates in the literature; however, they differ substantially in complication profiles, retrievability and suitability across clinical scenarios.

Although both systems demonstrate comparable survival and success rates, they deviate significantly in retrievability and long-term prosthetic management. Clinicians must consider not only whether the restoration endures, but how each system performs across its full life cycle, particularly in the context of biofilm accumulation and complication management [44].

One major component to determine between these restoral types lies in esthetics and clinical workflow. Cement-retained schemes allow better esthetic products, whereas screw-retained restorations may display esthetic boundaries for developing peri-implantitis and jeopardize esthetics. Evidence states that cement-retained crowns obviate visible screw access openings and are often characterized as more esthetic and easier to create, while screw-retained crowns may reveal access channels that can arrange appearance, selectively in the anterior region [42]. As a result, cement-retained restorations are, in most cases, of choice when appearance is the main decision of the system, whereas screw-retained restorations may demand more careful implant positioning to achieve an optimal esthetic result. Per this literature, aspects of occlusion, diameter and distance of edentulous space are to be considered [43].

Further, clinically significant differences emerge when retrievability and long-term maintenance are in perspective. A fact determined is that screw-retained rehabilitations allow superior retrievability in comparison with cement-retained rehabilitations [44]. This last statement is supported by studies that analyze that screw-retained prostheses can be removed more predictably for repair, hygiene or evaluation, while cement-retained restorations are more arduous to retrieve once cemented in place [42]. Accordingly, this difference is very important because implant schemes are not unchanging; they often require monitoring and intervention over time. Hence, restorations that can be removed without destruction are more practical for the longevity of the system [43]. The importance of retrievability becomes most evident when evaluating the life cycle of the restoration. Notably, screw-retained restorations allow more conservative management of complications, whereas cement-retained restorations may require invasive intervention. This is supported by the fact that, in the event of porcelain fracture, screw loosening or the need for professional cleaning, screw-retained crowns are typically easy to remove, while cement-retained crowns may require sectioning or destroying the crown, to gain access to the implant [43]. Consequently, screw-retained systems are more adaptable over time because they allow non-destructive maintenance, whereas cement-retained systems may augment treatment cost, clinical invasiveness and loss of the prosthesis during retrieval [44].

On another note, biological and technical aftereffects further differentiate between these two systems. Cement-retained restorations are more strongly associated with biological complications, while screw-retained restorations are usually related with mechanical finishing complications. This is because residual cement has been related as the culprit of initial discomfort for peri-implantitis. As in regarding screw-retained restorations, these are more likely to evidence mechanical issues such as screw loosening of prosthetic complications [38,41]. Although both categories of clinical disparities are important, biological complications may be more harmful in the long term. This major concern can affect peri-implant tissues and bone because of the biofilms that may develop from retained components of the restorations.

Another important variance of this concept is the dichotomy of "silent failure" in cement-retained restorations. Cement-retained restorations may be unsuccessful in gradual increments over time and without immediate detection, more often than screw-retained restorations. The retention of cement-retained restorations depends on variables such as abutment height and the type of cement used. Cement failure can occur over time without being immediately identified [40]. Because these restorations are less retrievable, loss of retention in phases or secluded complications may not be identified quickly, whereas screw-retained restorations, which are governed by physical properties, allow more flexibility when evaluating their evolution and adaptation to edentulous space in time [41].

Amidst these differences, the clinician's appreciation of these schemes is of extreme impact. With all issues thus far discussed, the evaluation of the appropriate system should be guided by the primary principle on how the tissue and bone relate. While the tissue is the issue, the bone sets the tone. Both restoration types can be effective when selected appropriately [42].

Therefore, an assessment of the overall health and of the working site needs to be clear and objective. Neither screw-retained nor cement-retained restorations are universally superior in every clinical situation. Research has put in evidence that cement-retained restorations may be advantageous when implant angulation, passive fit in occlusion or esthetic demands are primary concerns; while on the contrary, screw-retained restorations are often orchestrated around the priorities of future retrievability, maintenance and hygiene access [43]. For that matter, considering the reasoning of prior research, the clinician must carefully determine the best treatment choice. These considerations will depend on the patient's clinical needs. The unbiased decision will be determined by the location of the implant and the clinician's long-term restorative plan rather than on a single fixed rule [42-45].

### **Conclusion**

In conclusion, screw-retained and cement-retained implant restorations have shown research-based results that are geared towards success rates that are overall similar. Yet, it is important to emphasize how both schemes differ significantly in retrieval capability, clinical upkeep and management of adverse outcomes.

The reviewed evidence supports the conclusion that screw-retained restorations are generally more favorable for long-term clinical management. Predictable retrievability allows clinicians to address complications without destroying the prosthesis, while cement-retained restorations may require invasive retrieval and carry greater biological risk attributable to residual cement. Ultimately, when the full life cycle of the restoration is considered, screw-retained systems offer greater clinical flexibility and sustainability, notwithstanding their limitations, cement-retained restorations remain ongoing to offer important esthetic benefits.

### **Conflict of Interest**

The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

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### **Data Availability Statement**

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

### **Ethical Statement**

The project did not meet the definition of human subject research under the purview of the IRB according to federal regulations and therefore was exempt.

### **Informed Consent Statement**

Informed consent was obtained from all participants included in the study.

## Authors' Contributions

All authors contributed equally to this paper.

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