Chapter 7

Implant-Supported Fixed Prostheses

Gizem Erdaş[1]

Abstract

Implant-supported fixed restorations have become a widely accepted treatment modality in contemporary prosthodontics, offering functional and esthetic solutions for partially and fully edentulous patients. Two main retention methods—screw-retained and cement-retained restorations—are commonly used, each presenting specific clinical advantages and limitations. Screw-retained prostheses allow retrievability and reduce the risk of peri-implant inflammation due to excess cement, while cement-retained options often offer superior esthetics and occlusal control. The choice between these techniques depends on various factors including implant angulation, interocclusal space, esthetic demands, and maintenance considerations. This text provides a comparative overview of both systems, highlights indications and contraindications, and discusses current materials, design principles, and long-term outcomes based on clinical experience and literature.

Overview of Implantology

According to its literal definition, an implant is an organic or inorganic substance that is inserted between living tissues to restore a function that has been lost. Branemark introduced us to the fundamental idea of oral implantology in dentistry, known as osteointegration, in 1952. He published the first osteointegrated implant cases in 1969. Numerous implant designs have been created since then, and the idea of osteointegration has advanced. Alongside these advancements, implant-supported prostheses have evolved and are now widely used in contemporary dentistry with good success rates. The prosthetic restoration phase begins either without waiting for the osteointegration process of implants to be finished or after it is finished. The measurement step is the initial stage of prosthetic repair.

1 Asst.Prof. Dr, Kafkas University, Turkey, gzmerd123@gmail.com 0009-0000-2984-7713

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1.İmpression Technique

Impression copings, also known as impression posts, enable the accurate transfer of implant placements from the jawbone to the working model. These components ensure accurate transfer of implant positioning and facilitate passive compatibility of the implant prosthesis, provided that the appropriate impression technique is employed. Impression posts are non-standard. Each manufacturer may possess a distinct imprint post for every implant style. There are three types: open tray impression post, closed tray impression post (transfer type impression), and digital scan body. This categorization can also be differentiated based on the designs of implant manufacturers. For instance, there exist shorter impression posts for application in the posterior region, as well as larger or narrower impression posts according to the preferred gingival emergence profile. Indexed impression posts are intended for single-unit restorations, whilst non-indexed impression posts are utilized for multi-unit restorations.

Short copings and short keys have been developed specifically for obtaining posterior arch measurements in patients with restricted mouth opening.

Impression procedures must be accurately selected based on the specific circumstance. Nonetheless, it must be acknowledged that there is no singular truth. Multiple impression techniques may be appropriate for a given scenario.

Impression methodologies encompass open tray impressions, closed tray impressions, press-fit impressions, and intraoral scanning. The press-fit technique is seldom favored due to its limited precision. Implant-supported restorations are classified into two primary categories: screw-retained and cement-retained. Each possesses distinct limitations and advantages. Aggregated data from clinical investigations indicate 5-year survival rates of 96.03% for cement-retained restorations and 95.55% for screw-retained reconstructions. (Buser et al., 2012)

Both retention techniques have been utilized for single, multiple, and cross-arch fixed dental prostheses. Long-span prosthesis should ideally be screw-retained for enhanced maintenance efficiency. The literature indicates that long-span restorations are associated with an increased risk of problems. (Salvi & Bragger, 2009)

This should also pertain to cantilevered FDP designs, as these prostheses require increased care and servicing. (Aglietta et al., 2009; Shadid & Sadaqa, 2012)

It might also be easier to achieve sufficient retention for compensation of the leverage of the extension.

Nevertheless, if the implant is not positioned in a prosthetically optimal location, with the future access hole of the intended crown situated below the planned incisal edge, cement retention frequently becomes the sole treatment alternative. Consequently, meticulous treatment planning and prosthetically guided implant placement must be obligatory for implant therapy. (Wittneben & Weber, 2012) The clinician is required to make a decision that is based on the specific case, taking into account the benefits and drawbacks of cement-retained and screw-held restorations. The requisite decision tree for this is presented in Fig.1

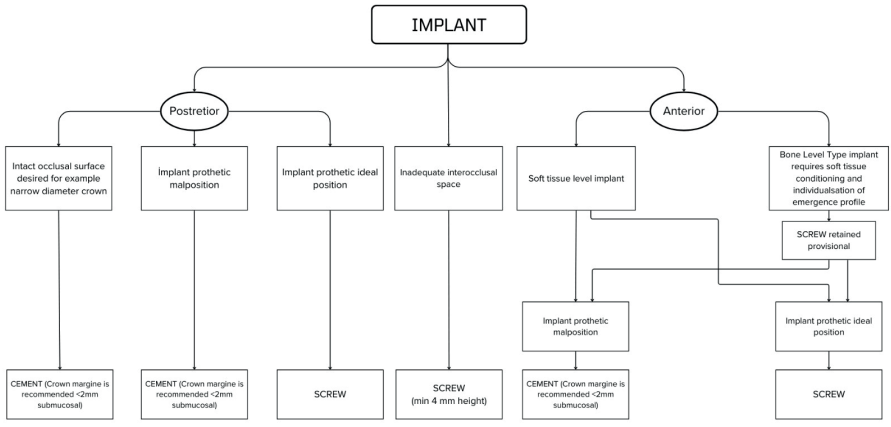

Figure 1. Decision tree for implant-supported prostheses.[11]

2.Screw-Retained Restorations

Screw-retained implant-supported prostheses were originally utilized at the inception of implants, particularly for full-arch prosthesis in edentulous patients following the 'ad modem Branemark' procedure.

This restoration involves an implant abutment and an implant-supported crown that are integrated as a single unit, with the implant and crown secured together by screws. Currently, cement-retained restorations have mostly been supplanted by screw-retained restorations. The lack of cement offers a benefit regarding peri-implant health. Screw-retained restorations necessitate a minimum interocclusal distance. They are more easily removed

than cement-retained restorations when maintenance, hygiene, or surgical treatments necessitate their removal. (Chee & Jivraj, 2006)

The drawbacks of screw-retained prostheses include extended manufacture time and expense for bridge-designed prosthetics, as well as the presence of a screw hole in the occlusal table, complicating occlusal adjustments in the posterior regions. In the anterior region, access to the screw does not significantly influence occlusion; thus, it is unnecessary to restrict screw access for this reason. Research has demonstrated that the chipping rate in screw-retained restorations exceeds that of cement-retained restorations. Screw-retained restorations are preferable in cases of insufficient interocclusal distance, cantilever extensions, extensive edentulous spans, when minimizing the risk of cement residue in the aesthetic zone is desired, and when gingival shaping will be performed with temporary prostheses.

3.Cement-Retained Restorations

The primary benefits of cement-retained restorations include enhanced passive adaptation due to the cement gap between the implant abutment and the restoration, accommodation for misaligned implants, removal of screw access holes in teeth with limited occlusal surfaces, and simplified occlusion in narrow-diameter restorations in the posterior area. Moreover, cement-retained prostheses are more economical than screw-retained alternatives.

The primary drawback is the challenge of eliminating surplus cement that leads to peri-implantitis or peri-implant mucositis. (Linkevicius et al., 2013; Ramer et al., 2014; Linkevicius et al., 2013)

A further drawback of cemented implant-supported restorations is the potential for cementation mistakes. If the prosthesis is improperly positioned and the cement solidifies incorrectly, the prosthesis must be extracted. This may result in the fracture of the prosthesis and harm to the implant or implant spacers.

In addition, if these prostheses need to be removed in any case, they are quite difficult to remove compared to screw-retained prostheses and include the risks mentioned above.

Another risk factor is the occurrence of screw loosening in the absence of decementation. The prosthesis must be detached from the intermediate implant component (abutment), after which the abutment screw should be torqued, and the prosthesis re-cemented, a task that is improbable to accomplish. The prosthesis may be inseparable from the abutment and may require cutting for removal. Cemented restorations may experience loss of

retention and subsequently decement due to microleakage. This poses the risk of aspiration or ingestion by the patient.

Mechanical considerations influence retention in cement-retained implant-supported prostheses. The retention of the prosthesis is influenced by factors like length, diameter, surface roughness, taper angle, number of abutments, position of the abutments inside the dental arch, and the type of cement used. In the fabrication of a fixed cement-retained restoration, a specific cement gap must be maintained between the implant abutment and the internal surface of the prosthesis. The gap can be modified with spacers or digitally within CAD/CAM software. The retention of cement-retained implant-supported restorations, characterized by adequate interocclusal distance and a 6-degree taper angle for optimal cement gap, is 3 to 4 times superior to that of fixed restorations on natural teeth. (Millen et al., 2015)

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