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Retention Systems in Implant-Supported Maxillofacial Prostheses: A Contemporary Review

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Abstract

Losing an ear, part of the nose or an eye changes how a person is seen and how they see themselves and reconstructive surgery cannot always give it back. For many of these patients, an implant-retained silicone prosthesis is what actually restores a normal-looking face - but only if it stays put reliably, day after day. That comes down to the retention system: a bar and clip, a magnet, an O-ring or in some cases just a good skin adhesive. This review draws on ten studies from 2017 through 2026 - systematic reviews, decades-long follow-up cohorts and clinical case reports - to take stock of where the evidence on craniofacial retention actually stands. The short version: bar-clip designs still win out for ears and for larger nasal or orbital defects, because splinting two or more implants together gives a sturdier result, while magnets tend to be the better fit for the orbit and for cases with only one implant to work with, mainly because they're so much easier to live with day to day. Implants themselves hold up well over time - survival is usually well above 90 percent - though the auricular site consistently does best and prior radiotherapy is the clearest predictor of trouble down the line. Digital planning tools, from CBCT and 3D facial scanning to CAD/CAM fabrication, are becoming routine additions to conventional technique rather than replacements for it and seem to sharpen both planning accuracy and prosthetic symmetry. In the end, choosing a retention system is less about finding the 'best' one and more about matching the system to the defect, the bone, the radiation history and the patient sitting in front of you.

Keywords: CBCT, Craniofacial Retention, 3D facial, Radiotherapy

Introductions

A defect of the ear, nose or orbit is never just a cosmetic problem. Patients describe the toll it takes on how strangers react to them, on their confidence, on whether they feel comfortable in a room. Surgical reconstruction using the patient's own tissue is often the first choice, but it isn't always possible - the defect may be too large, the

patient too frail for another operation or the tissue simply not available after previous surgery or radiotherapy. In those situations, an implant-retained prosthesis has become the go-to alternative and has been since osseointegrated craniofacial implants were first introduced in the late 1970s.

Getting the implant to integrate with bone is really only half the job, though. What actually determines whether a patient wears their prosthesis confidently every day - or leaves it in a drawer - is the retention system connecting the two: a bar and clip, a magnet and keeper, an O-ring and ball or when implants aren't in the picture, a skin adhesive [1,9]. This review pulls together ten studies from 2017 to 2026 - a mix of systematic reviews, long-running retrospective cohorts, and clinical reports - with the aim of giving clinicians a current, practical picture of how these retention options actually perform.

Where These Implants Go and Why It Matters

Craniofacial implants are placed in three main areas: the mastoid bone behind the ear, the nasal floor or glabellar region for nasal prostheses and the periorbital bone around the eye socket[1,3]. Each site behaves differently. The mastoid is dense and forgiving, which is probably why auricular reconstruction has the best track record of the three, while the nasal and orbital sites - especially once they've been irradiated - are considerably less predictable [3,8,9]. That difference in bone quality and history shapes almost every decision that follows, including which retention system makes sense.

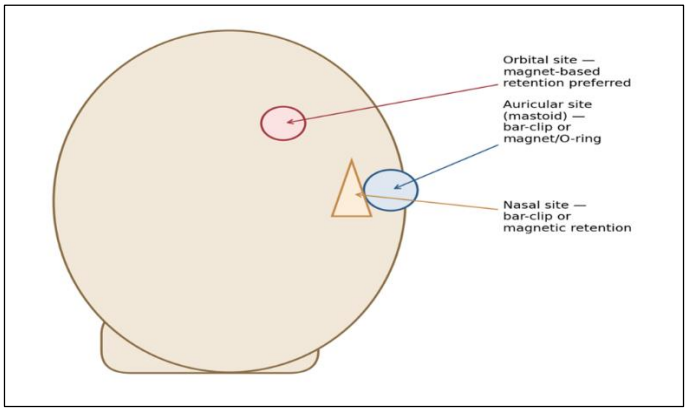


Figure 1: The three main sites for craniofacial implants, and the retention systems typically chosen at each.

Bar-Clip Retention

A bar-clip system ties two or more implants together with a rigid metal bar, which a clip or rider embedded in the prosthesis then clips onto. It's essentially a splinting strategy and the long-term data back it up: a cohort followed for up to 30 years found that bar-retained and similar implant-supported designs held up well decade after decade[5]. A 20-year single-center review told a similar story - of 346 implants placed for ear, nose and eye prostheses, the auricular ones, most of them on bar-clip attachments, came out on top, clearly outlasting the nasal and orbital groups [3]. Even the choice of implant design seems to matter here: a comparison of disk-type versus screw-type craniofacial implants found the more rigid, bar-compatible designs held up better under the demands of extraoral retention [8]. And it isn't only the big cohort studies making this point - case reports keep turning up, including one using AI-assisted planning to fit an auricular prosthesis onto a Hader-bar system, which suggests bar-clip designs remain a going concern even as the surrounding technology changes [10].

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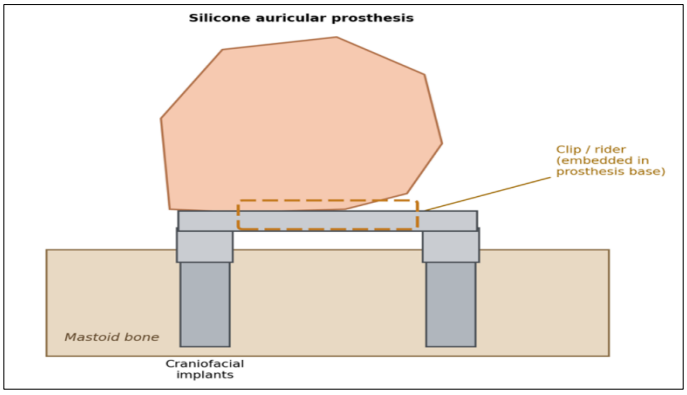


Figure 2: A bar-clip system for an auricular prosthesis: two mastoid implants, joined by a bar, with a clip in the prosthesis base gripping it in place.

Magnetic Retention

Where bar-clip is about splinting, magnetic retention is about simplicity - a keeper sits on the abutment, a magnet sits in the prosthesis and the patient just presses the two together. There's very little to go wrong mechanically and almost no torque gets transmitted to the implant. The long-running Morriston series found this made magnets the natural choice for orbital and nasal prostheses, where ease of hygiene and placement tend to matter more than raw retentive force, while auricular cases still leaned toward bar-clip for the extra stability [3]. An older but still widely cited critical review of retention systems reached much the same conclusion: bar-clip for the ear and larger nasal defects, magnets for the orbit [9].

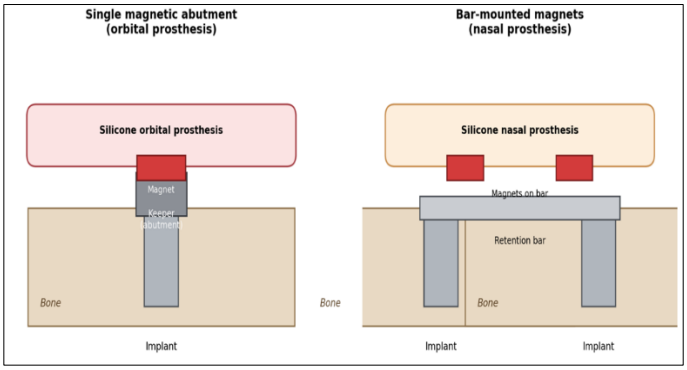


Figure 3: Two magnet-based setups: a single magnetic abutment for an orbital prosthesis (left), and magnets mounted on a bar for a nasal prosthesis (right).

O-Ring and Ball Attachments

Somewhere between the splinting strength of a bar and the simplicity of a magnet sits the O-ring/ball attachment (Figure 4) - a reasonable middle-ground option for smaller defects or when only one or two implants are available. The evidence here is honest about its own limits: a systematic review looking specifically at survival rates across bar-clip, magnet, and O-ring systems found that all three can work well, but the studies are small and inconsistent enough that no single system can be crowned the winner. The more useful takeaway is that the choice should follow the defect - its size, how the implants are distributed and what the prosthodontist is most comfortable working with [1]

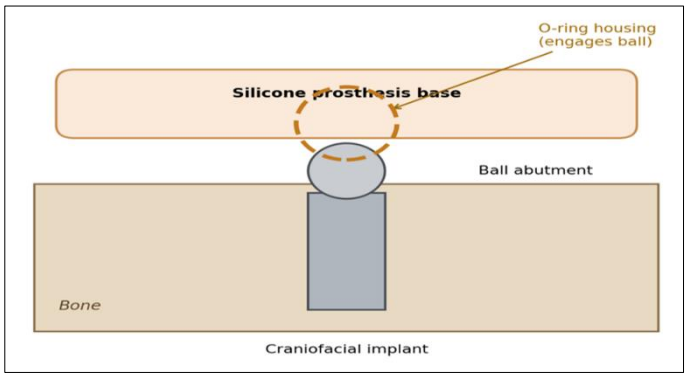


Figure 4: An O-ring/ball attachment: the ball sits on the abutment, and a resilient O-ring housing in the prosthesis snaps over it.

Putting It Side by Side

Table 1: lines up the main systems discussed above - where each tends to be used, what it's good at and where it tends to fall short.

Retention system	Preferred site(s)	Key advantage(s)	Key limitation(s)
Bar-clip	Auricular; larger nasal defects	Splints multiple implants; strong, stable retention; suits larger prostheses	More laboratory work and cost; needs inter-implant space; hygiene access trickier [8,9,10]
Magnetic (keeper + magnet)	Orbital; nasal; small/medium auricular	Easy in and out; forgiving of implant divergence; low load on the implants	Older designs retain less strongly and can corrode; inserts may need replacing [9]
O-ring / ball	Small auricular or nasal defects, few implants available	Straightforward to fabricate and maintain; low profile	Retention wears down with time; less rigid than a bar [1,9]
Adhesive-retained (no implant)	Any site when implants aren't an option	No surgery; inexpensive; works when bone or health rules out implants	Weaker, shorter-lived retention; skin irritation; needs frequent reapplication [9]

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How Long Do These Implants Actually Last?

The honest answer is: usually a long time, but it depends heavily on where the implant sits and what the bone has been through. Survival above 90 percent overall is a fair summary of the long-term cohort data, with the auricular site again leading and the nasal and orbital sites trailing behind [3,5]. Radiation turns out to be the single biggest factor working against success - one retrospective review of implants placed for orbital, nasal, and auricular reconstruction found that prior radiotherapy and surgery to the underlying bone significantly raised the odds of implant loss [4], and the 30-year cohort found the same pattern: excellent survival overall, but noticeably worse in irradiated bone[5]. A separate review focused on nasal reconstruction went a step further, looking at timing - it found that implants placed at the same time as the original ablative surgery tended to do better than those placed after radiotherapy had already been completed, suggesting that when the implant goes in matters almost as much as where [7]. Figure 5 sketches out this general pattern - it's illustrative rather than pooled data, but it captures the shape of what these studies keep finding.

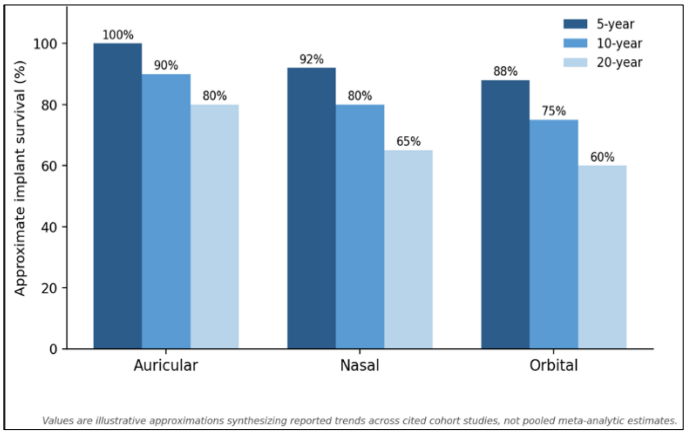


Figure 5: A rough illustration of how implant survival tends to decline over time by site - auricular holding up best, orbital and nasal falling off more steeply.

Digital Planning and Surgical Navigation

Over roughly the last ten years, craniofacial prosthetics has picked up a fairly standard digital toolkit: cone-beam CT, 3D facial surface scanning, mirrored modeling of the unaffected side, and CAD/CAM fabrication. A systematic review of CAD/CAM applications in this space found that going digital tends to improve planning accuracy and the symmetry of the finished prosthesis compared with fully manual methods - the benefit shows up most clearly in complex or bilateral cases, where getting things right by eye alone is genuinely difficult [6]. A six-year case series combining a systematic review with navigated, flapless implant placement came to a similar conclusion, though with an important caveat: digital and navigation-assisted techniques sharpen precision and cut down on surgical morbidity, but well-executed conventional and hybrid workflows still get comparably good results in experienced hands - this isn't a story of old methods being obsolete[2]. One case report even brought artificial intelligence into the design process for an auricular prosthesis retained on a bar-clip system, which gives a sense of where some of this is heading [10].

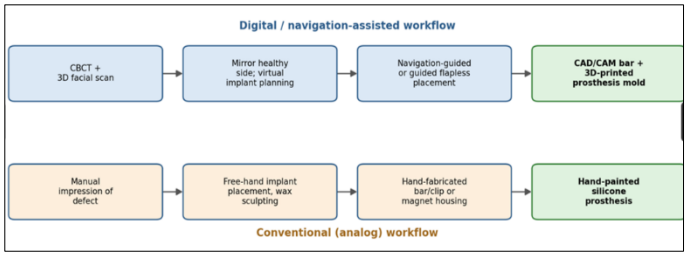


Figure 6: Digital and conventional routes to the same endpoint - a fitted craniofacial prosthesis.

So, Which System Should You Actually Use?

In practice, this decision comes down to a handful of questions asked in roughly this order: which site is involved, how many implants are available and how well distributed are they, has the area been irradiated, is digital planning realistically available, and can the patient manage the attachment day to day. None of these

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questions has a universally right answer - they simply narrow the field. Figure 7 lays out a simplified version of that reasoning as a flowchart.

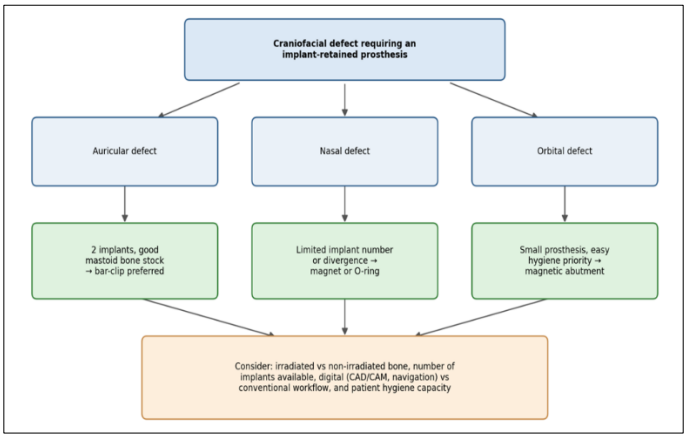


Figure 7: A simplified way of thinking through retention-system choice, site by site.

Conclusion

If there's one overarching message in this literature, it's that no retention system is best in every situation - the right choice depends on where the defect is, how many implants are available, whether the bone has been irradiated, and how well the patient can manage the attachment day to day. Bar-clip designs earn their place for auricular prostheses and for larger nasal or orbital defects, largely because splinting implants together gives a more stable result. Magnets and O-rings tend to suit the orbit and smaller, single-implant cases better, mostly because they're simpler to live with. Across the board, implants at the auricular site hold up the longest, while irradiated nasal and orbital bone remains the biggest risk factor for failure. Digital and navigation-assisted workflows are becoming a normal part of planning rather than a novelty and the evidence suggests they help - though conventional technique, done well, still holds its own. In the end, this is a decision made one patient at a time, weighing the anatomy, the history, and what that particular person can realistically manage.

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