Implant bone loss and implant failure are growing concerns. In some cases, a possible factor leading to bone loss may be an allergy to titanium (Ti). In this report, the existing literature on Ti allergy as a factor in implant loss is reviewed, and the current views on its potential role in implant bone loss are discussed. A case report of implant loss and retreatment in a patient with a potential Ti allergy or intolerance is presented and clinically analyzed. The subsequent success of a ceramic implant may support the finding of a Ti allergy or intolerance. Unfortunately, the lack of prospective clinical trials and lack of a reliable test for Ti allergy makes it impossible to clinically verify whether Ti allergy plays a part in implant bone loss. Int J Periodontics Restorative Dent 2022;42:783–787. doi: 10.11607/prd.6206

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Allergies to metals are well known but not common. The dermatologic literature reports that 3% to 17% of the population have some form of metal allergy that may result in a dermatologic reaction. The most common metal allergies reported are to nickel, chrome, and cobalt. The dermatologic literature also links allergic responses to other metals, including titanium (Ti), that are found in dental restorations and metals used in orthopedic appliances.

Because of increased usage for both medical and dental applications, there have been concerns about possible allergic or adverse responses to Ti being a factor in peri-implant marginal bone loss, leading to implant failure. In medicine, Ti is used extensively in orthopedic repairs and joint replacement. Prosthetic joint replacement failure has been linked to metallic particles and ions that are shed from Ti “metal on metal” joints and possibly other types of Ti prosthetic appliances. The shed Ti particles and Ti ions from prosthetic appliances migrate into the surrounding connective tissue and induce a localized inflammatory response called metallosis. The exact mechanism by which Ti particles induce inflammation in metallosis is not fully understood. It is uncertain whether the inflammation seen in such cases is an
allergic response to the metal or if it is a reactive foreign body response to the irregular shaped and corroded metallic particles.

Dental uses of Ti include endosseous implants, surgical retention screws, and orthodontic and prosthetic appliances. All medical and dental sources of Ti have the potential to produce metallic particles that are shed either during initial placement, from the wear and stress of function, or due to acid attack from bacterial sources. Any dental or medical sources may potentially sensitize a patient to Ti and set the stage for a subsequent allergic response to Ti. In the case of implants, Ti particles and ions from the implant may also stimulate a reactive foreign body response to the shed metallic particles (metallosis), as seen with some prosthetic joints.

The existing literature on Ti allergy in dentistry is scarce and consists mainly of clinical case reports, case series, and some in vitro data. Several systematic reviews have been published on the existing literature, but the lack of controlled clinical trials makes it difficult to formulate a definitive conclusion that can guide the clinician in the delivery of patient care. Testing for Ti allergy would be beneficial in guiding clinical decisions, but the two available tests are not considered reliable. This lack of information means that the clinician must depend on clinical observations and judgment. The following long-term case report has many hallmarks of an allergic or reactive intolerance to Ti implants, which is ultimately resolved by the placement of a ceramic implant.

**Case Report**

This case report follows a woman of Pacific Island descent who was 36 years old at the onset of therapy. Orthodontic treatment was initiated to upright the mandibular molars and create space for an implant to replace the missing tooth at site 35 (FDI tooth-numbering system). Radiographs were taken at the beginning of orthodontic treatment (August 2007), prior to implant placement (Fig 1). A permanent neck fixation splint was visible, which had been placed to stabilize the neck vertebra following a sports injury. The neck splint uses screws of an unknown metal seated into the neck vertebra. The neck splint was placed approximately 2 years prior to the radiograph.

A NobelActive implant (4.3 × 10 mm; Nobel Biocare) was placed at tooth sites 35 in April 2009. Surgical notes indicate a wide residual ridge with adequate bone and space for implant placement. A bone allograft was placed around the neck of the implant. The implant was noted to have good initial stability. The radiograph view immediately following implant placement shows correct alignment (Fig 2). A CBCT scan was taken in November 2009 to evaluate the bone surrounding the implant, and the implant was considered stable, with adequate bone to use the implant as an orthodontic anchor.
Orthodontic therapy utilizing the implant as an anchor continued from November 2009 to August 2012. A radiograph taken in June 2011 showed approximately 50% marginal bone loss, with four to five of the implant threads no longer in bone (Fig 3). When the implant was evaluated for restoration in August 2013, the implant was mobile and the radiograph showed progressive bone loss. The implant was removed, a bone allograft was placed in the extraction site, and the patient was placed on antibiotics. During healing, the patient was tested for Ti allergy (patch test), and the results were negative.

In February 2014, a NobelReplace implant (5 × 10 mm; Nobel Biocare) was placed at the site. At the time of implant placement, the bone was considered to be type 2 (moderately hard). An allograft was placed around the implant. Postoperative healing was uneventful, and a provisional crown was placed in October 2014. In December 2014 (Fig 4), a radiograph revealed marginal bone loss around the implant neck. The provisional crown was removed, and a healing abutment was placed. The implant was judged to be mechanically stable, and no further restorative treatment was performed.

The patient was seen again in July 2015 with complaints of pain in the implant area. The implant was mobile with exudate (Fig 5). Implant removal was recommended, but the patient did not have the implant removed until September 2016. The site was debrided, and an allograft was placed and covered with a membrane. The area healed well, and in July 2017, a PURE Ceramic Implant (4.1 × 9 mm; Straumann) was placed, making it the third implant in the site (Fig 6). The bone was noted to be type 2, and the implant was stable when torqued to 35 Ncm. Healing was uneventful.

Nine months after placement, the ceramic implant was considered stable, and a crown was placed. The patient tolerated the restorative procedures well. She was seen for routine periodontal maintenance until March 2020, at which time a painful lymph node in the left submandibular area was noted. The implant and radiographs appeared normal, and a biopsy of the lymph node was recommended. The patient was diagnosed with Stage III Mucoepidermoid carcinoma of the left parotid. She underwent surgical and radiation therapy. Following completion of cancer therapy, she was seen for a reevaluation of her implant. At that time (May 2021), the implant was stable with probing depths ≤ 3 mm (Fig 7). At the time the present case report was written, the implant showed no clinical signs of inflammation and no radiographic indications of bone loss. Other than a moderate dry mouth from her cancer therapy, the patient...
is free of symptoms. The radiation therapy does not appear to have adversely impacted the implant, but it may be a factor that influences her long-term dental prognosis.

Case Analysis

It can be theorized that the patient has an allergy or intolerance to Ti. The original 2009 Ti implant initially appeared to be clinically and radiographically stable, as noted by clinical evaluation and posthealing CBCT. However, there was slow progression of marginal bone loss until the implant had to be removed in 2013. The second Ti implant seemed to show a more rapid bone loss despite apparent good initial healing. It is also possible that the screws and splinting used for the cervical vertebra fixation may contain Ti, which may have sensitized the patient to Ti and contributed to the response seen on the implants. The medical records detailing the materials used for the splinting are not available. The patient’s history may also fit a clinical presentation in which the initial implant sensitized the patient to Ti, inclining the site to an allergic response to the second implant. The more rapid bone loss following second implant placement may indicate an allergic response to Ti, but the negative response to a Ti patch test puts this in question.

Conclusions

The patient’s continued tolerance of the ceramic implant appears to indicate a lack of either an allergic response or a reactive intolerance that was seen with the Ti implants. As with most instances of peri-implantitis, it is not possible to give a definite answer to the etiology of the disease.

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References


