

Review

DENTAL IMPLANTS DISPLACED INTO THE MANDIBULAR CORPUS: A MINI-REVIEW

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ABSTRACT

Although dental implant surgery is considered a somewhat predictable procedure, unforeseen accidents can occur, particularly in the posterior areas where the trabecular density is lower than the anterior. In the posterior mandible, poor bone density, loss of cortical engagement, and differences in bone quality between alveolar and basal bone could undermine the success of the treatment, resulting in a subsequent implant migration to the medullary bone marrow. Inadequate surgical technique/planning, overworking of the implant bed, improper management of implant procedures along with systemic disease (osteopenia or osteoporosis), as well as the presence of lesions or cysts, can contribute to the development of the complication. To maximize bone engagement avoiding implant displacement, several precautions have been proposed. Treatment varies according to the depth of the displaced implant. In the case of superficial displacement above the inferior alveolar nerve, the crestal approach is the treatment of choice. When encountering deep displacement, a lateral approach is recommended as it provides better visibility and an improved operation field for implant retrieval.

KEYWORDS: *displaced implant, mandibular corpus, complication, focal osteoporotic, bone marrow defect*

INTRODUCTION

Nowadays, implant rehabilitation is a relatively highly predictable procedure. However, especially in severe horizontal or vertical bone resorptions, the success of such a treatment can be jeopardized by several complications, such as bleeding, nerve damage, mandibular fractures, damage to adjacent teeth, lack of primary stability, displacement or migration of implants (1-3).

Implant displacement is a rare complication in implantology. It may arise either during the surgical procedure or shortly after that. Maxillary sinus (4) and sublingual (5) spaces are the main locations interested in migration, and acute

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symptomatology is generally accompanied by chronic infection derived from an immune response to the contaminated implant migrated in such areas. The medullary component of the mandibular corpus seems to be hardly involved, and compared to other locations, milder symptoms are reported when such a complication occurs. However, the inferior alveolar nerve can be severely compromised by both the displacement itself and by the subsequent implant retrieval surgery.

The objective of this mini-review was to highlight the clinical characteristics of patients who reported implant displacement into the marrow space, define potential risk factors, and provide insight into preventive measures and treatment strategies.

MATERIALS AND METHODS

To conduct this literature review, PubMed database was searched using the string ("Dental implants displace and mandibular corpus " OR " Dental implants" OR " mandibular corpus ") AND "osteoporotic focal".

The titles and abstracts of each paper obtained from the results were listed, and full-text manuscripts were retrieved using online resources.

RESULTS

The Keyword “dental implant displaced” shows 907 results, “mandibular corpus” shows 585 results papers twenty-three papers were detected when using Dental implants and mandibular corpus as keywords, then focal osteoporotic shows 10 papers.

DISCUSSION

Implant migration due to inadequate surgical technique, inexperienced operator or anatomical variations can occur intraoperatively or be delayed in a short time.

In the edentulous maxilla, the limited amount and/or poor quality of bone available, along with pneumatization processes of the maxillary sinus, play a key role in the genesis of the complication (6). In the case of maxillary implant displacement, functional endoscopic sinus surgery (FESS), intraoral approach, or a combination of both are planned for the implant retrieval (7).

When mandibular posterior areas are considered, several authors reported lower volume and fewer trabeculae patterns of the basal bone compared to the alveolar bone (8). The presence of such a loose structure with lower volume and thin trabeculae, accompanied by local resorption of crestal bone, could greatly facilitate implant displacement into the medullary component.

Operator-dependent procedures such as inadequate surgical technique/planning and overworking the implant bed are recognized as other main causes of implant displacement. Several case reports suggested that improper management of implant procedures, such as tightening of the healing screw (9), the use of the hand wrench (10), or placement of a driver to the healing screw (6), could lead to the loss of cortical bone engagement and a resulting implant displacement towards the zone of lesser resistance. Even attempting to remove the implant may result in a worsening of the condition with further displacement (9), along with nerve damage. Other not operator-dependent features such as systemic diseases (osteopenia or osteoporosis) and the presence of lesions or cysts can contribute to the development of the complication.

Although osteoporosis does not seem to be a risk factor for osteointegrated dental implants (11), alterations of the trabecular pattern observed in patients' jaws with osteoporosis (12) may represent a potential obstacle to the primary stability (13). Furthermore, using resonance frequency analysis (RFA), lower primary stability was recorded in patients with skeletal osteoporosis and osteopenia, suggesting a plausible impact of such conditions on alveolar bone density and implant stability (14).

Also, focal osteoporotic bone marrow defects (FOBMD), reported as radiolucent areas in edentulous jaws, often found in the posterior mandible of middle-aged women, seem to be correlated to the risk of implant migration. The pathogenesis of this condition remains unclear; nevertheless, certain factors, such as abnormalities in bone regeneration after tooth extraction or dental implant placement (15, 16), as well as the persistence of fetal marrow or marrow hyperplasia in response to increased demand for erythrocytes (17) are hypothesized to be relevant. Clinically, FOBMDs often appear as an isolated or multifocal radiolucency from several millimeters up to centimeters in diameter with ill-defined borders (18) and fine central trabeculation.

Based only on clinical and radiographic findings, three cases of implant displacement into FOBMD have been reported by SC Lee et al. (17). However, histological analysis is mandatory to differentiate this condition from other similar radiolucent lesions of the jaws, such as traumatic bone cyst or fibrous dysplasia. Garcia et al. (16), reporting a case of FOBMD associated with a dental implant, showed the presence of monocytic, erythroid, granulocytic, and lymphocytic series as well as megakaryocytes and fatty cells in hematopoietic marrow a typical feature and histopathological analysis must be integrated with clinic and radiographic signs for the final diagnosis.

Preoperative panoramic radiographs could not efficiently diagnose radiolucent appearances derived from traumatic bone cysts (19) or FOBMD (6). Analysing the removal of cancellous bone from posterior areas of mandibles, Bender and Seltzer (20) hardly found alterations of the radiographic appearance of the trabeculae. Therefore, in most cases, these lesions remain undetected (21), and only preoperative CBCT can be a reliable approach.

Surgical procedures such as countersinking, especially in type III and IV bone, decrease the cortical bone thickness, undermining the primary stability (22). Thus, avoiding countersinking may be fundamental in cases of low-density bone. Choosing wide diameters (22), undersized preparations (23), or securing the healing screw in the implant body before the placement (17) could be other effective proposals to avoid implant displacement. Regarding treatment, an accurate radiological analysis should be carried out to select the best removal approach due to the potential damage to the inferior alveolar nerve.

A crestal approach (9, 10, 17) offers a limited vision and smaller operation field, so hole enlargement is often required to engage the fixture. Moreover, further displacement could occur (with a higher risk for the nerve), and the additional bone removal could invalidate the future new implant fixation. Even with important limitations, this technique is recommended when the implant is not deeply displaced above the inferior alveolar nerve. A wider operation field is required in deeper implant migration, and a lateral approach to create a bony window is indicated (Fig. 1) (24). Osteotomy with piezoelectric devices was shown to be more effective than the rotary instruments, with minimal injury to the local alveolar bone so that fixation of the bony lid is often unnecessary after implant retrieval (13).

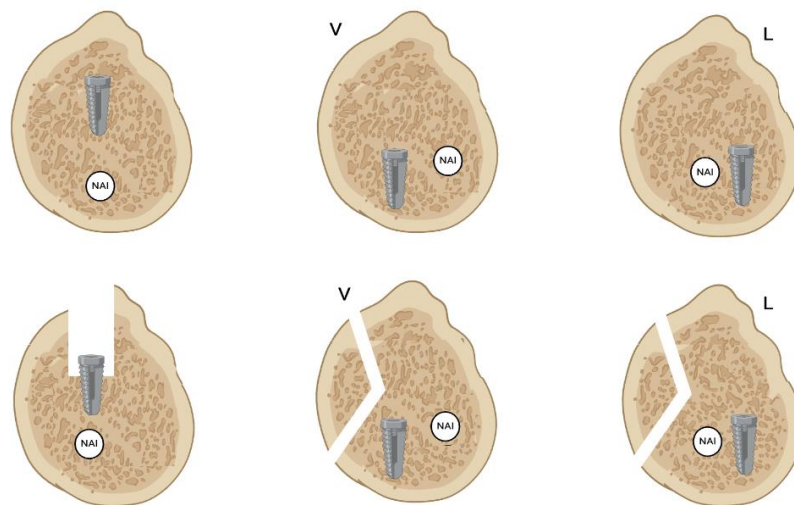


Fig. 1. Approaches for implant retrieval into mandibular bony marrow. For superficial implant displacement above the inferior alveolar nerve (NAI), a crestal approach through enlargement of the implant hole is recommended. For deep displacement (vestibular or lingual to NAI), creating a bony lid enables a wider operation field and better visibility.

Clinicians should be aware of preoperative radiographic limitations. As Theisen et al. (9) reported, large medullary components should be suspected when the location of the inferior alveolar nerve cannot be detected on a panoramic radiograph. Especially when treating patients with a history of osteoporosis/osteopenia or for patients whose molar teeth were extracted much earlier in their life (particularly among postmenopausal women), a careful evaluation through CT imaging is highly recommended (10) to avoid the risk of implant migration into the medullary component of the mandibular ramus.

CONCLUSIONS

Even if implant displacement into the mandibular might not be a serious complication, without all the sequelae reported by the dislocation in the maxillary sinus or in the sublingual space, immediate removal is mandatory to avoid possible complications derived from bone healing (21). Particular care must be taken when retrieval surgery is performed.

Preventive measures such as avoiding countersinking, selecting wider diameters, undersizing preparations, or securing the healing screw in the implant body before the placement can be effective in cases of low-density bone to avoid implant migration and should be considered.

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