



Open contacts adjacent to dental implant restorations

Etiology, incidence, consequences, and correction

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Development of an open contact between a restored dental implant and a contiguous tooth, where initially there was a firm proximal contact, occurs more often than expected (Figures 1 and 2).¹⁻⁵ An interproximal gap can result in a food trap, caries, and periodontal issues and precipitate the need for prosthetic repairs.¹⁻⁵ These untoward consequences are disconcerting for the patient and clinician.

Occlusal forces are transmitted via contact areas, and mesial migration compensates for proximal tooth wear, thereby maintaining intra-arch continuity.¹⁻⁵ Failure to maintain a firm contact after an implant restoration is placed often happens on the mesial aspect of the crown, but it can occur distally (Table).^{2,4} An open contact in an adult dentition adjacent to an implant restoration is usually due to physiological mesial drifting of teeth while the implant remains stationary.^{1,2,4} In this article, we address the etiology, incidence, consequences, and repair of open contacts between dental implant restorations and adjacent natural teeth.

ANTERIOR COMPONENT OF FORCE

There are 4 primary forces that influence the dentition's arrangement: tongue and lips, personal behavior (for example, habits) or orthodontic appliances, periodontal membrane, and occlusal forces.⁶ The last factor provides the major force vector associated with physiological tooth migration.⁷⁻⁹

The main muscles of mastication involved with jaw closure are the medial pterygoid, masseter, superior division of the lateral pterygoid, and temporalis muscles.¹⁰

ABSTRACT

Background. The aim of this investigation was to evaluate the potential causes, clinical significance, and treatment of open contacts between dental implant restorations and adjacent natural teeth.

Types of Studies Reviewed. The authors searched the dental literature for clinical trials in humans that addressed the incidence of open contacts that develop after implant restorations are placed next to teeth.

Results. The authors found 5 studies in which the investigators addressed the incidence of open contacts after implant restorations are inserted next to teeth. Results from these studies indicated that an interproximal gap developed 34% to 66% of the time after an implant restoration was inserted next to a natural tooth. This event occurred as early as 3 months after prosthetic rehabilitation, usually on the mesial aspect of a restoration.

Conclusions. The occurrence of an interproximal separation next to an implant restoration was greater than anticipated. It appears that force vectors cause tooth movement and an implant functions like an ankylosed tooth.

Practical Implications. Clinicians should inform patients of the potential to develop interproximal gaps adjacent to implant restorations, which may require repair or replacement of implant crowns or rehabilitation of adjacent teeth. Furthermore, steps should be taken to check the continuity of the arch periodically. If the clinician detects an open contact, it is prudent to monitor for signs or symptoms of pathosis so that prosthetic repair of the gap can be initiated, if needed. These problems could add to treatment costs and decrease overall patient satisfaction related to implant treatment.

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On mandibular closure, forces created by these muscles are directed in different directions by the teeth's inclined planes. The forward vector is referred to as the *anterior component of force* (ACF), and it drives teeth mesially.⁷⁻⁹ There also is a force that pushes teeth distally, but the mesial vector is 5 times stronger than the posterior force.¹¹ The strength of the ACF increases proportionally to the magnitude of the bite force.^{8,12}

In 1923, Stallard¹³ suggested that the arc of mandibular closure caused an ACF on mandibular posterior teeth that was transmitted via interproximal contacts between the teeth and that this vector drove teeth mesially as the contact points wore because of friction. Subsequently, Conroy¹² subjected all the teeth individually in a mandibular quadrant to a controlled force (a custom bite force transducer was fabricated and connected to a strain indicator) and assessed the magnitude of the ACF. He noted that the ACF was transmitted via the interproximal contacts and that its strength decreased with increased distance from the posterior teeth. In addition, he also confirmed that there was a posterior component of force.

PROXIMAL CONTACTS

Arrangement of interproximal interfaces among human teeth. The size and location of contact areas vary with age, tooth position, biting force, and crowding of teeth.¹⁴ The contour of the contact interfaces is predominantly oval and usually found toward the buccal aspect of interproximal areas. In the incisal region, their outline is more vertical than horizontal, and in the posterior sextants of the arch, the shape of an interproximal contact is more horizontal than vertical.¹⁵ Sarig and colleagues¹⁴ reported that normally the interproximal interface with or without wear decreases in size from molars to incisors. They suggested that larger contact areas are needed in the posterior teeth to resist attrition where there is increased biting force.¹⁴

Over time, the morphology of contact areas changes because of attrition and physiological drifting. The oval contacts often become kidney shaped. This change is associated with flattening of the contact area, which creates room for the dentition to move mesially. To reduce this change, Sarig and colleagues¹⁴ suggested enlarging the interproximal interfaces of restorations to increase tooth position stability.

From another perspective, the contact area between a tooth and an implant restoration needs to be modified after an extraction. Tooth removal results in reduction of the interdental tissue volume because of shrinkage of the papilla and bone loss between the tooth and a future implant restoration. To compensate for a larger embrasure or concave shape of an adjacent tooth, the clinician often needs to use a longer, broader, wider contact in an occlusogingival dimension.

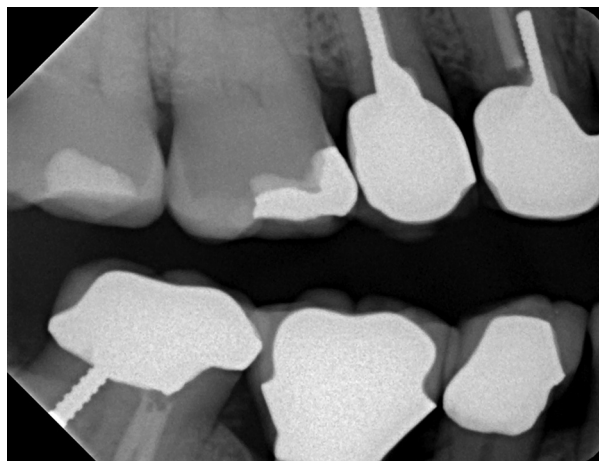


Figure 1. Radiograph showing delivery of an implant-supported restoration at site no. 30 on November 29, 2010. A broad, wide contact was confirmed clinically with floss.

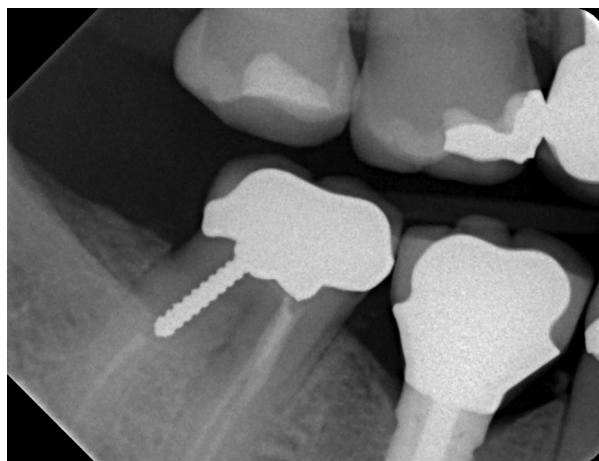


Figure 2. Radiograph showing open contact that developed approximately 1 year after restoration insertion (November 2, 2011) on the mesial aspect of the implant restoration at site no. 30. No interdental pathosis was present.

Reasons for premature loss of contact between teeth. Intact contact areas prevent tooth migration, allow dissipation of ACF, and avoid food impaction. Premature loss of interproximal contacts can occur because of a variety of factors: caries, early loss of a tooth, inauspicious sequence of eruption, ankylosed teeth, congenital issues, and trauma.¹⁴ Loss or alteration of contact areas can result in interproximal black triangles, food impaction, periodontal problems (such as loss of clinical attachment, gingival inflammation, or reduction of interdental bone), and misalignment of teeth.¹⁴

ABBREVIATION KEY. ACF: Anterior component of force.

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