

Single Implant restoration on 2nd Mandibular molars regarding interproximal contact loss 인접치 접촉 상실을 고려한 하악 제2대구치 단일 임플란트 보철물

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Purpose: Interproximal contact loss (ICL) is one of the most common complications in dental implant prosthetics. According to recent studies, including systematic reviews, the exact cause of ICL remains unknown, but new hypotheses are emerging to shed light on the issue. Further research is needed to support these findings. (*J Korean Acad Esthet Dent* 2024;33(2):42-48)

Key words: interproximal contact loss(ICL), interproximal area, vibration and stress wave

○ Case reports

Studies on how to establish occlusion and design contact with adjacent natural teeth when fabricating single implant restorations have not been sufficiently conducted.

Several years ago, a prosthodontist lost his mandibular second molars in succession after being punched during a boxing sparring session. A fellow dentist placed implant fixtures and restored the implant restorations. As a prosthodontist with extensive experience in implant dentistry, he began to ponder the issue of ICL (interproximal contact loss). After much deliberation, the prosthodontist decided to create a wide contact area between the adjacent tooth and the implant while setting the occlusion so that shim stock film holds when the teeth are fully clenched but pulls through when biting lightly. After two years, no ICL has been observed. (Fig. 1-3)

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Fig. 1,2. single implant restorations, the mandibular 2nd molars.

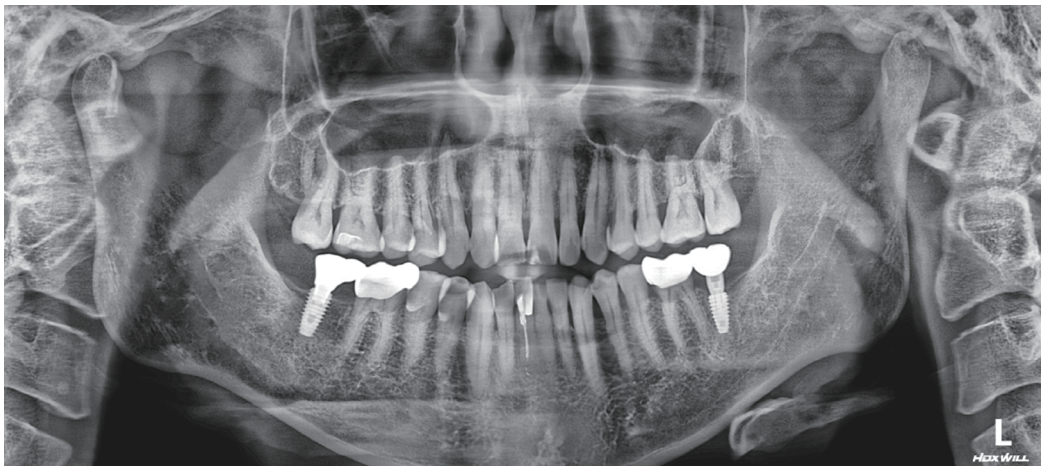


Fig. 3. Postoperative panoramic view of single implant crowns.

Recently, a new hypothesis proposed by Goldstein et al suggest that implant restorations may generate vibrations or stress waves that displace natural teeth.

The author recommend that

‘occlusal contacts provide centralized stability on implant crowns and not be located on any inclined surfaces that transmit lateral forces that could be transmitted to an adjacent tooth and cause ICL or intrusion’^{1,2}

There are previous prospective studies that have produced results supporting the claims of this author.^{3,4} But this theory requires further evidence through extensive research in the future.

Implant occlusion

Before the 2000s, Carl Misch and others introduced the concept of implant-protected occlusion, suggesting that dental implants, lacking a periodontal ligament, have limited capacity for shock absorption.^{5,6} To protect implants from occlusal forces, they proposed setting prostheses so that shim stock film would slip out easily. However, due to insufficient evidence supporting this concept, many dentists later adopted a clinical approach that follows the occlusion of natural teeth. But is there sufficient evidence to support the approach of mimicking natural occlusion? Are there no other alternatives besides these two approaches?

One study reported that setting the occlusion of a mandibular first molar implant prosthesis slightly under occlusal contact caused widening of the periodontal ligament and overloading of the adjacent second premolar. When the first molar implant occlusion was adjusted to contact like a natural tooth, the second premolar recovered.^{7,8} However, in clinical practice, not all natural teeth in front of the implant prostheses with infra-occlusion are damaged. Thus, in terms of evidence, concluding that method A is better than method B does not necessarily imply that method B is inferior to method A.

Dentists have attempted to explain the issue of space developing between implant prostheses and adjacent natural teeth using concepts like the anterior component of force (ACF)^{9,10}, mesial drift of natural teeth¹¹, adult facial growth¹² or force vectors¹³. However, these explanations have struggled to clearly elucidate the mechanism or account for the complexity of all clinical situations. For instance, this issue of interproximal contact loss (ICL) can sometimes be observed in certain patients within just 1-2 months or even as early as 2-3 weeks.

The following panoramic view and clinical photographs are of a patient in whom ICL was identified less than a month after the implant restoration was placed. (Fig. 4-7)

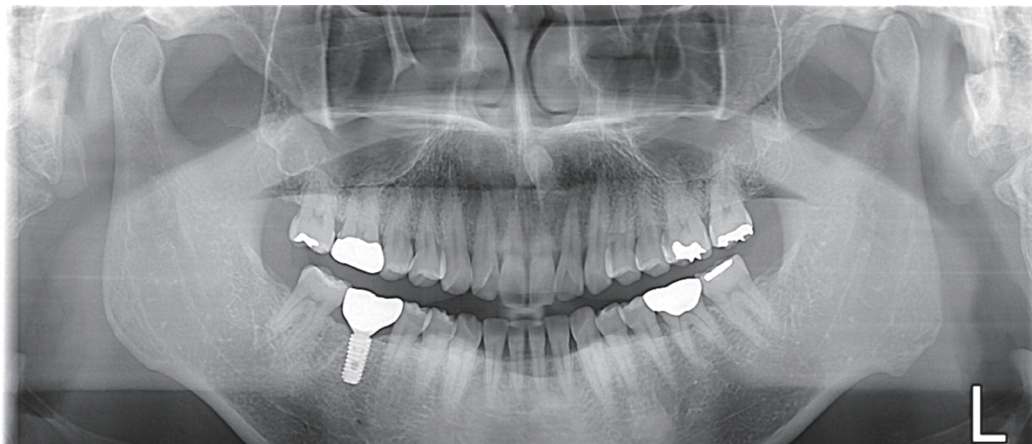


Fig. 4. Postoperative panoramic view of a single implant restoration.



Fig. 5,6. ICL is observed between the implant crown and the adjacent natural tooth. A large mandibular torus is observed in the clinical photograph.



Fig. 7. Composite resin was added on the distal surface of 2nd premolar to compensate ICL.

Interproximal contact area

Many dentists attempt to find the cause of ICL in factors such as the shape and size of the proximal contact surface, but research on this topic is insufficient. It is also unclear whether this is related to the cause or merely a result of the phenomenon. However, considering a proximal contact area design that may better prevent food impaction¹⁴, one might first think about whether to make the contact area larger or smaller. Those who advocate for bucco-lingually wide approximal contact area emphasize the perspective of stable contact. On the other hand, recent journal discussing the perspective related to vibration suggest that a wide contact area may be disadvantageous in implants due to excessive force transmission to natural teeth.

Discussion

The prevalence of ICL varies widely across studies, which either indicates our lack of understanding of this phenomenon or suggests that studies have not been conducted in controlled environments. For instance, while the majority of studies report that the mesial side is more frequently affected than the distal side^{15,16}, some studies claim no difference. Similarly, although many studies suggest no significant differences between upper and lower arches or that the mandibular arch is more commonly affected, others report a higher prevalence in the maxillary arch^{17,18}. Several studies suggest a higher incidence in the posterior region, yet there is one study that found the anterior region to be more frequent.¹⁹ According to a recent review study, a major confounding variable is occlusion^{1,2,20}, which appears to be one of the most significant factors.

Conclusion

There is growing evidence that factors such as mesial drift or other individual circumstances alone are not the sole causes of ICL. Different types of occlusion in implant prostheses can further complicate the contributing factors. Further controlled clinical studies and also in vitro studies are needed on the location and size of occlusal contact points, as well as the design of interproximal contact areas.

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인접치 접촉 상실을 고려한 하악 제2대구치 단일 임플란트 보철물

인접치 접촉 상실(ICL)은 임플란트 보철물 수복시 가장 흔히 나타나는 합병증이다 systematic review를 포함하여 최근 연구들에 따르면 ICL을 유발하는 정확한 이유는 알려지지 않았으나 이를 설명할 수 있는 새로운 가설들이 대두되고 있다. 물론 이 가설들을 뒷받침할 수 있는 추가적인 연구가 필요하다.

키워드: 인접치 접촉 상실, 인접면 형태, 진동충격파