

Biomechanical Implications of Replacing of a Missing Single Mandibular Molar Tooth with 2 Implants: A Case Report

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Received: 01 Aug 2023

Accepted: 06 Sep 2023

Published: 14 Sep 2023

J Short Name: AJSCCR

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Citation:

Obiechina N. Biomechanical Implications of Replacing of a Missing Single Mandibular Molar Tooth with 2 Implants: A Case Report. *Ame J Surg Clin Case Rep.* 2023; 6(16): 1-3

Keywords:

Occlusal overload; molar implants; Narrow occlusal tables for implants; Management of molar implants

1. Abstract

The posterior mandible presents with challenges for dentists placing and restoring dental implants due to the role of occlusal forces in that region of the mouth. A number of studies have shown successful implant rehabilitation of molar implants with wide diameter implants for spans of 8-10mm but for wider gaps, the use of two implants for mesio-distal spans that are 12mm or more are recommended. Advantages offered by use of two implants include ability to better distribute occlusal forces, reducing risk for occlusal overload by reduction of cantilever forces, reduction in traumatic non-axial forces on the implant restoration and better support for implant prosthesis. This case report presents on replacing a mandibular molar with space of 14mm with 2 implants for better dispersion of forces and shows that the implants are successful after 3 years of function.

2. Introduction

Replacing molar teeth can present with challenges for dentists due to heavy masticatory forces in the posterior area of the mouth in addition to potential for lateral and bending forces and cantilever restoration designs that can lead to overload of molar implants [1]. While a number of studies have advocated use of wide diameter implants for molar spaces that are 8-10mm in mesio-distal width use of wider implants for spaces that are 12mm and greater can lead to significant cantilever forces and potential for overload of the wide diameter implant [2,3]. Studies have advocated use of two narrow or standard diameter implants to replace molar teeth when space of 12mm or more is present. The advantages to use of two implants instead of one include increased surface area for

osteointegration for the two implants, reduction in lateral forces, reduction in mesio-distal cantilever, and reduction in potential for stress for both implants from more even distribution of forces around the implants [1,3-5].

By increasing the number of implants present to better support the implant restoration, studies have shown long term success and survival for the posterior implants [1]. Additionally, studies have shown that to better improve mechanical factors that affect implants, the goal is to reduce or eliminate cantilever forces and reduce mechanical complications such as screw loosening, implant, abutment or screw fracture by increasing bone to implant contact [6,9]. Use of restorative designs with narrow occlusal tables and flat cusps are also recommended to reduce stress to implants and restorative components [6,9]. A narrow occlusal table also affords the advantage for easier access for home care as well as minimizing cantilever forces to the implant [6,7].

Use of two implants spreads occlusal forces and reduces bending and rotational forces by more efficient replication of natural crown to root ratios [8]. Additionally, two implants can increase surface area for osteointegration which reduces potential for implant overload [8]. The goal of this article is to report on restoring a missing molar with 14mm of mesio-distal space with 2 implants mimicking the mesial and distal roots with the goal that by placing less stress on the implants. We utilized a standard implant for the mesial root and a wide diameter implant for the distal root with the goal of providing better dispersion of occlusal forces, and our results show that after 3 years the implants were still functioning effectively.

3. Case Report

A sixty year old female presented to our periodontal practice with symptoms consistent with Cracked tooth syndrome. CT scan x-rays indicated a mesial root fracture. She was treatment planned for extraction of tooth #30 and immediate placement of 2 implants. For the mesial root, a 3.7mm X 10mm Legacy 2 implant from Implant Direct Company was placed, and for the distal root a 5.2mm X 10mm Legacy 2 implant was placed (Figure 1-4). Her implants were restored by her restorative dentist. At three years, x-rays and clinical pictures showed that the implants are still functioning successfully (Figures 5-6).



Figure 1A: Clinical picture showing tooth #30 with fractured root



Figure 1B: X-ray showing tooth #30 with fractured root

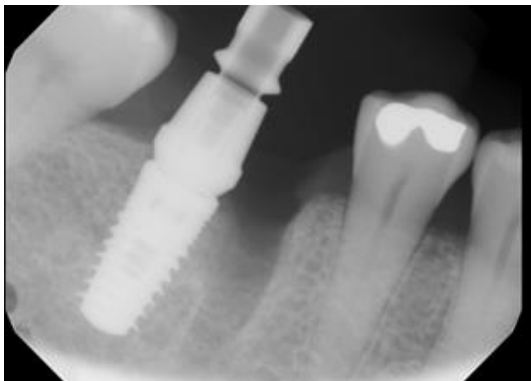


Figure 2: X-ray of extraction site and distal implant placement

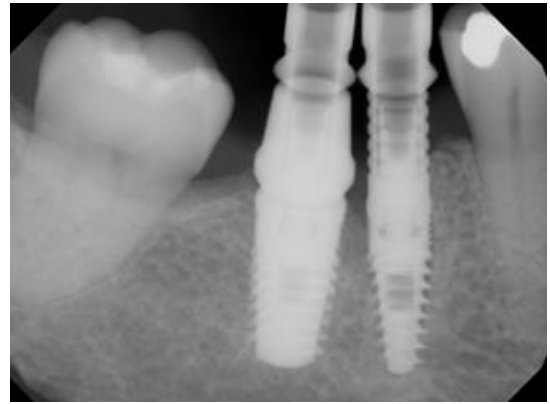


Figure 3: X-ray showing extraction site showing mesial and distal implants

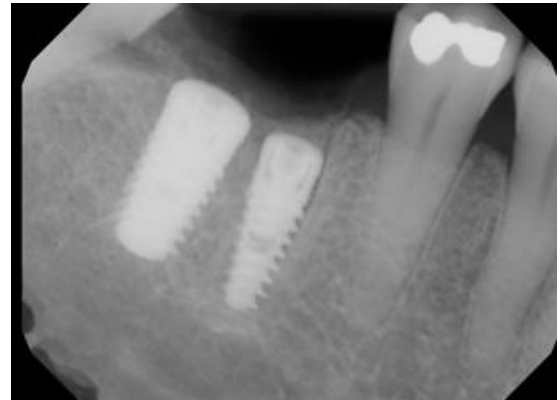


Figure 4: X-ray of both implants

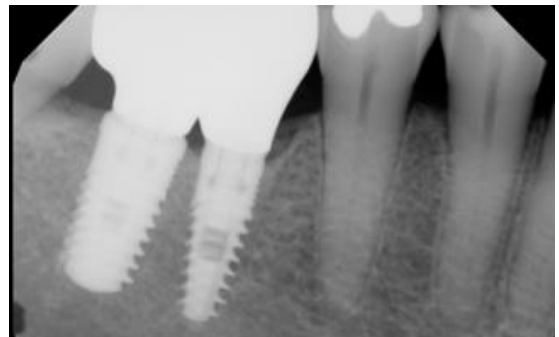


Figure 5: X-rays of restored implants 3 years later



Figure 6: Clinical picture of implants 3 years later.

4. Discussion

The use of two narrow or standard diameter implants to replace molar teeth for edentulous spans with 12mm or more of mesio-distal space has been shown to be effective in reducing cantilever forces, resulting in reduction of non-axial and bending forces to the implants, as well as reducing occlusal stresses to both implants by more efficiently dispersing the forces between both implants. It has been shown by multiple studies to be effective in preventing occlusal overload, reducing mechanical complications and improving implant survival and success for posterior molar implants [1,4,5]. For this case report we evaluated the impact of replacing the molar tooth with 2 implants better mimicking the condition in the mouth of having mesial and distal roots with the goal that it would reduce stress to both implants and allow for better access for oral hygiene. We used a standard implant for the mesial root and wide implant for the distal root and found similar success. This case report showed that for this patient, the approach was effective and resulted in long term implant success.

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