BROKEN DENTAL IMPLANT SCREW RETRIEVAL – A CRITICAL REVIEW

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ABSTRACT

Osseo integrated implants have been widely used for decades with high survival and success rates. Yet, mechanical complications continue to be reported in the literature, and their clinical management can be often very perplexing for the operator while there is no unanimity on the ideal management. The aim of this article is to review the broken abutment screw complication and to identify the most recent methodology used to retrieve it.

I. INTRODUCTION

Abutment screw fracture is a very disturbing event for the clinician.¹ Clinical studies and reports were reviewed that reported on abutment screw fracture. A search of the electronic database PUBMED was conducted including manuscripts published from 2000 to 2021. Study selection: animal studies, narrative reviews, expert opinions and communications/letters were excluded. In this review article the manufacturers manual are also referred to identify the current implant kits available in the market and their methods of screw retrieval.

Materials and methods:

A total of 12 manuscripts were finally included in this review, the articles that addressed a method of broken screw complication were picked and reviewed in the manuscript. Studies show that implant abutment failure occurs when lateral forces exceed 370 N for abutment with a joint depth of at least 2.1 mm and 530 N with a joint depth of at least 5.5 mm.²

The methods employed to grasp the broken fragments or screw is determined according to the location of the fracture abutment-above or below the head of the implant. If an abutment screw fractures above the head of the implant, an explorer, a straight probe or hemostats might be successful.³ Prosthesis screw fracture was noted almost equally with fixed complete dentures (3%) and fixed partial dentures (5%). The mean incidence was 4% but was found to range from 0.0% to 19%. Of 7094 screws evaluated, 282 fractured.³
Table 1: Technique used in Literature to address the broken screw complications

<table>
<thead>
<tr>
<th>Reference article</th>
<th>Title</th>
<th>Year of publication</th>
<th>Technique used to address the broken screw</th>
<th>Mechanical complications With the method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contemp Clin Dent. 2014 Apr-Jun; 5(2): 264–267. JR Gooty 2014</td>
<td>Noninvasive method for retrieval of broken dental implant abutment screw</td>
<td>2014</td>
<td>Using a ¼ round bur in a high-speed hand pieceto make a 1 mm deep pit on the occlusal portion of the broken screw. Using ultrasonic scaler with no 3 tip placed in the pit prepared moving in anticlockwise direction</td>
<td>Bur can inadvertently jump into the implant body</td>
</tr>
<tr>
<td>J Oral Implantol (2012) 38 (6): 747–750. Walia, M. S 2012</td>
<td>Removal of Fractured Dental Implant Screw Using a New Technique: A Case Report</td>
<td>2012</td>
<td>An access hole was made occlusally through the crown by a Tri Hawk carbide bur (Tri Hawk Corporation, Massena, NY) to access the screw head and retrieve the crown along with the abutment at a point which is not the center. scaler tip engaged in the notch</td>
<td>Severing of internal threads of the implant with the bur</td>
</tr>
<tr>
<td>J Prostheth Dent 2010;104:212-215 Maalhagh-Fard, A</td>
<td>Retrieval of Damaged Prosthetic Screws: A Case Series of Multiple Techniques</td>
<td>2010</td>
<td>a trough between the abutment screw head and the internal aspect of the implant using a high-speed handpiece with a no. 2 round rotary cutting instrument (Brasseler USA, Savannah, Ga) under copious irrigation</td>
<td>abutment screw interface were not easily discernible</td>
</tr>
<tr>
<td>Clin Case Rep . 2019 May 10;7(6):1204-1210 Rawaa Y Al-Rawee</td>
<td>Salvage of fractured abutment screw by transfer cap screw replacement (original study)</td>
<td>2019</td>
<td>Implant retrieval kit and an ultrasound scaler was used to retrieve the broken screw.</td>
<td>Screw if jammed difficult to retrieve by this method</td>
</tr>
<tr>
<td>JProsthodon t.2014 Jul;23(5):402-5 Ceyhun Canpolat</td>
<td>Management of a fractured implant abutment screw:a clinical report</td>
<td>2014</td>
<td>converting the screw chamber into a dowel space and constructing a dowel-core and crown restoration</td>
<td>fractured screw was very small, far from the implant neck, and almost impossible to remove</td>
</tr>
<tr>
<td>J Int Oral Health.2013 Oct;5(5):120-3</td>
<td>A Simple and Cost-Effective Method used for Removal of a Fractured Implant</td>
<td>2013</td>
<td>retrieval of the screw was planned using a spoon excavator instead of using a sophisticated and costly retrieval kit. During the</td>
<td>damaging the internal anatomy of the implant</td>
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<td>Name</td>
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<tr>
<td>Parth Satwalekar</td>
<td>Abutment Screw: A Case Report</td>
<td>2013</td>
<td>procedure the spoon excavator was modified by cutting working end of the instrument perpendicularly</td>
<td></td>
</tr>
<tr>
<td>J Oral Implantol</td>
<td>A technique for removal of a fractured implant abutment screw</td>
<td>2013</td>
<td>Flame-shaped bur (Komet, Gerbr. Brasseler GmbH, Lemgo, Germany) was modified to prepare a groove on the fracture screw. A handmade screwdriver was prepared from a detrited tungsten carbide bur With an angular-shaped handhold was made of auto-polymerizing acrylic resin (Schutz Weil-Dental GmbH, Rosbach, Germany) to hold and rotate the screwdriver easily</td>
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<tr>
<td>Murat Kurt</td>
<td></td>
<td></td>
<td>Fabrication of screw driver is arbitrary and technique sensitive</td>
<td></td>
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<tr>
<td>Ilser Turkyilmaz</td>
<td>Removal of a fractured locator abutment screw fragment</td>
<td>2013</td>
<td>Not a cost effective option, success rate is not described</td>
<td></td>
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<tr>
<td>J Contemp Dent Pract</td>
<td>An alternative approach for the management of fractured implant abutment screws on a mandibular implant-retained overdenture: A clinical report</td>
<td>2016</td>
<td>Fabricate custom laser-welded Locator attachments to allow continued use of the mandibular denture without sacrificing the implants</td>
<td></td>
</tr>
<tr>
<td>J Prosthet Dent Pract</td>
<td>Technique for Converting A Fractured Implant Locator Abutment to A Custom Implant Cast Post and Core</td>
<td>2021</td>
<td>fractured abutment as a custom cast post and core when an overdenture abutment is fractured and attempts to retrieve the fractured segment fail</td>
<td></td>
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<tr>
<td>Onur Geckili</td>
<td></td>
<td></td>
<td>Post core treatment of the implant was done-mechanical interlocking b/w implant and post</td>
<td></td>
</tr>
<tr>
<td>J Oral Implantol</td>
<td>A Modified Technique for Removing a Failed Abutment Screw From an Implant With a Custom Guide Tube</td>
<td>2012</td>
<td>custom guide tube enables the use of a high-speed air turbine or a high-speed micro-motor hand piece and provides reliable protection of the screw hole against drilling &amp; a narrow screwdrivers may be used to rotate the fractured screw fragment counterclockwise and pick it out of the screw hole.</td>
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<tr>
<td>Yohsuke Taira</td>
<td></td>
<td></td>
<td>Post core treatment of the implant- mechanical interlocking b/w implant and post</td>
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Implant repair kits:
There are some commercially available retrieval tools. Some dental implant suppliers have also created their own implant and screw rescue or retrieval kits for purchase. Many of these kits can be quite expensive. But many of them will carry similar items for the retrieval attempts. Most of these commercially available systems will include a set of drills of different dimensions, shapes and lengths. The goal is to engage the broken fragment and then applying reverse torque to back up the fragment. The kit will also include a set of drill guides or drill “sleeves”. The goal is to align or angulate the drill in proper axial direction to the implant to minimize damage to the internal threads of the implants. Lastly, the kit will usually include a set of re-tapping tools and the goal is to re-thread the internal structure of the implant should there be any damage during the retrieval process. Some of them are described below:

1. RHEIN 83; BROKEN SCREW EXTRACTOR KIT system

Kit Contains: 1 CLAW REAMER BUR; 1 REVERSE CUTTING BUR, 1 CENTERING DEVICE

Method of broken screw extraction: The reamer bur has a tip designed as a fork to engage the broken screw.

2. Zimmer Biomet Dental Screw Removal Tool Kit


Method of broken screw extraction: Manual reverse drill engages the broken screw and brings it out in counterclockwise rotations. Screw Removal Extraction Tool then engages the partially retrieved screw bit and removes it. Waxing Screw/Guide Pin verify the integrity of the internal threads for placement of the new abutment.
3. Screw removal KIT (OSSVK), OSSTEM Implant System.

Kit contains: Guide/torque handle, removal bur, screw remover

4. Broken Implant Screw Removal Kit - Salvin Dental

Works for most of the commercially available implant systems such as: Astra, Zimer Biomet, Bio horizons, Nobel biocare and others.

Kits contain :( 1) Centering Guide (1) Reversing Drill (1) Screw Removal Tap drills (manual or hand piece reversed)

Method of broken screw extraction: Centering Guides protect the internal walls of the implant from damage, reversing drill works at reverse 1000 RPM to 1 to 2 mm with periodic irrigation and air blasts then place the tap drill and rotate it counter clock wise under light pressure (manually or reverse mode of 50 RPM)
Broken screw removal with Dr SOS, DIO Implants

Kit contains: (1) Internal Guide (1) Remove bar (1) adhesive applicator tip

Method of broken screw extraction: Internal guide is placed inside the implant, through which the remove bar is inserted and rotated counter clockwise with 15 rpm, stix adhesive applicator tip is used to remove the unscrewed broken screw.

II. DISCUSSION

Screw fracture may be the result of occlusal forces, either from functional loading or parafunctional behaviors such as bruxism. To conclude, the most current abutment screw loosening incidence ranges between 7% and 11%, while the abutment screw fracture incidence was found to be 0.6%. The majority reported on fracture of the screw body. Screw loosening or fracture was often located at the first molar restored area, while the maxillary central incisor area was also reported as an area that presented screw fracture. No single abutment screw failure management can be identified as the ideal treatment approach.

REFERENCE