Removal of crown and its effect on the screw thread of loosened abutment

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Abstract
Abutment screw loosening is one of the most common problem seen in implant dentistry. Crowns cemented on the loosened abutment is removed using a crown remover. In an attempt to remove the crown, the abutment screw is subjected to deformation. This study is an evaluation of that.

Keywords: Loosened implants crowns, Surface changes in the screw.

Introduction
Abutment screw loosening is one of the common problems associated with implant restoration. It accounts for 7% of implant failures. In order to tighten the abutment screw, the restoration has to be removed using conventional methods which make use of impact forces. While removing the crown, the abutment will be in a loosened condition and the application of the crown removal forces can deform the threads. The objective of the present study was to evaluate the changes that occur in the threads of the abutment screw while attempting to remove a cemented crown using impact force.

Methodology
MIS Implant analogue of dimension 3.75 x 13mm was embedded in an acrylic block and an abutment was fixed on it (Fig 1). A crown was fabricated in nickel chromium and which had a hole at the centre of the occlusal surface (Fig 2). The hole allowed access to the abutment screw. Two loops were attached to the occlusal surface through which a wire loop could be passed to engage operating tip of a crown remover (Fig 3). Surface morphology of the abutment screw was observed under stereo microscope and photographs were taken (Fig 4). The abutment screw was tightened on to the implant analogue by applying a torque force of 30 Ncm. Crown was cemented over the abutment using zinc phosphate cement and a load of 5 kg was applied till the cement was set. The assembly was then placed in distilled water for a period of 24 hours. Cement from the occlusal access hole was removed to gain access to the abutment screw. To simulate the condition of loosened abutment, the screw was loosened by two 360 degree turns using a hex drive. To facilitate this, a reference marking was done on the acrylic block (Fig 5). After this, the whole assembly i.e., the acrylic block with the loosened abutment and crown was stabilized in a customized apparatus (Fig 6). This apparatus had a wooden base that was fixed on a
table using two C clamp. The wooden base had two vertical L shaped bars which had holes to allow the passage of a bolt. The acrylic block also had a drilled hole and the passage of the bolt connected the acrylic block with the wooden base. Automatic crown remover (SS white) was used to remove the crown. Duration of crown removal was standardized – three sessions of 15 seconds. After this the screw was retrieved using the hex drive. Screw was again analyzed under stereo microscope to check for changes and photographs were taken (Fig 7).

**Result**

On comparison of the screw surface before and after removal significant amount of surface changes were observed viz. burnishing, grooving in between the threads and debris accumulation on the thread surface (Fig 8).

**Discussion**

Screw loosening is a frequently reported complication in implant dentistry. Repeated tightening and loosening of the screw causes the loss of force produced when
screw is being tightened (preload) and opening torque. Guzaitis KL et al studied the effect of repeated insertion and removal cycles on reverse torque as well as its effect on surface morphology changes and found that with increase in number of screw insertion cycles there was a decrease in torque and surface changes showed debris accumulation between the thread surface.

In a similar study by Kim H et al they found that as the number of closing and opening increased, the wear or distortion of screw threads was seen and all the tested screws showed decrease of width in the crest of the screw thread.

In the present study when the loosened implant crowns were removed using crown remover, it was observed that they caused severe surface changes to an extent to that the same screws could not be used again. To overcome these problems we can use crowns that have an access hole for easy removal of loosened crowns. Stronger cements should not be used for final cementation of implant crown so that they can be removed easily or another alternative to crown removal on loosened abutment is to cut the crown.

**Conclusion:**
Crown retrieved from a loosened abutment with a crown remover causes deformation of the screws. Hence, screws need to be changed after removal of crowns.

**References**