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Is Prosthetic Index Beneficial in Morse Taper Connection?

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Commentary

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ABSTRACT

The prosthetic index is added in some Morse taper connections aims to ensure a proper fit between the abutment and implant. However, there is ongoing debate about the necessity and benefits of this structure. This commentary aims to explore this issue from a biomechanical perspective whether the prosthetic index is truly advantageous in Morse taper connections.

Keywords: Implant-abutment connection; Morse taper; Prosthetic index; Osseointegrated

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ABOUT THE STUDY

The Morse taper connection is widely recognized for its superior performance in terms of implant survival, success, and marginal bone loss [1]. To facilitate the positioning of abutments in teeth within Morse taper implants, manufacturers have incorporated an additional indexed prosthetic component. Managing the fracture of a Morse tapered abutment in an osseointegrated implant is challenging clinically. However, it remains unclear whether this structure could compromise the mechanical strength of Morse taper implants.

This study provided a significant contribution to the understanding of the effects of prosthetic index on the stress distribution in Morse taper connection implant systems and peri-implant bone. The findings indicated that the Morse Taper connection with Platform Switching (MT-PS) with index will cause higher stress concentration on the abutment neck than those without index, which is more prone to mechanical complications. MT-PS decreases stress within cancellous bone and may help limit crestal bone resorption. This study provided a detailed elucidation of the results of our previous clinical retrospective study that evaluated the cumulative mechanical complications of Morse taper connection with or without prosthetic index over a period of 1 to 9 years from a biomechanical perspective using a 3D finite element analysis, which also indicated that the presence of the index may compromise the mechanical performance and abutments with prosthetic index have a higher incidence of fracture than those without [2]. These findings highlighted the importance of carefully selecting the appropriate prosthetic index to ensure optimal clinical outcomes and reduce the risk of abutment fracture in clinical practice, taking into account both biomechanics and clinical research perspectives.

The results of the aforementioned findings are also consistent with a prior investigation that assessed the impact of a prosthetic index on abutment screw preload values of tapered connection implants, which demonstrated that the use of indexed tapered abutments for single-crown restorations may pose greater biomechanical risk during functional loading, than non-indexed abutments [3]. In addition, an experimental study demonstrated that indexed abutment retaining screws were more susceptible to loosening during reverse torque testing than non-indexed abutments [4]. However, a separate study indicated that that the presence of a prosthetic index did not decrease the implants' resistance to fracture [5]. Furthermore, another study found that no significant difference in bacterial microleakage between the utilization of a prosthetic index and nonindex abutment under static conditions [6]. To date, reports on this topic are currently limited, and there is no unified conclusion on this issue.

Furthermore, current researches in this field mainly rely on 3D finite element analysis, bacterial leakage experiments, and only a limited number of long-term clinical retrospective observation studies. Among these, the utilization of 3D finite element analysis in this study represents a noteworthy strength due to its ability to provide accurate visualization and measurement of stress distribution within the implant system and peri-implant bone. Nonetheless, this study has certain limitations, including the assumption of idealized conditions in the simulations, failure to account for complex mechanical and biological interactions that occur *in vivo*, and the lack of consideration of other factors that can influence stress distribution, such as implant diameter, length, and thread design. It is important to note that there may be multiple other factors involved in obtaining varying results.

Despite these limitations, these findings provided valuable insights into the role of prosthetic index in determining stress distribution in Morse taper connection implant systems and peri-implant bone. Based on current research on this subject, the prosthetic index structure seems to increase the risk of mechanical complications and does not appear to confer substantial advantages. Therefore, clinicians should take into account the prosthetic index when selecting appropriate abutments. Further investigations are necessary to verify these findings and analyze the implications of abutment structures on stress distribution in implant systems and long-term success.

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