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ORIGINAL RESEARCH

Evaluation of Strain produced by Different Implant Supported Prostheses

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ABSTRACT:

Background: Implant supported prosthesis have achieved popularity in last few years. The present study was conducted to assess the peri implant strain produced by different types of prosthesis. **Materials & Methods:** The present study was conducted in the department of Prosthodontics. It comprised of three implant analogues placed in a polyurethane mandibular model at the position of left and right first and second molar. Abutments were fixed to the implant at a torque of 25Ncm. Load application was done ten times for each model and peri implant strain was measured. **Results:** The mean peri- implant strain produced at screw retained splinted prostheses was 630.5 N, screw retained non- splinted prostheses was 712.8 N and cement retained splinted prostheses was 1084.6 N. The difference found to be significant ($P < 0.05$). The mean peri- implant strain produced at screw retained splinted prostheses was 684.5 N, screw retained non-splinted prostheses was 724.2 N and cement retained splinted prostheses was 1094.6 N. The difference found to be significant ($P < 0.05$). **Conclusion:** The mean peri- implant strain produced at cement retained splinted prostheses was higher than screw retained non- splinted prostheses and screw retained splinted prostheses.

Key words: Cement retained splinted prostheses, Force, Peri- implant.

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INTRODUCTION

Implant supported prosthesis provides the best form of functional and aesthetic replacement for missing teeth. Implant supported prosthesis have achieved popularity and also have become the standard of care. A lot of optimization has happened in the selection of materials, design and the related techniques.¹

Fixed implant restorations are totally implant supported, with no transfer of load to denture bearing areas, thus avoiding the possibility of further resorption associated with tissue-borne prostheses. Several studies indicate that implant supported restorations performed using meticulous surgical and restorative skills can provide long-lasting benefits to edentulous patients.

Clinical implant prosthodontics presently focuses on the prognostification of individual and splinted crowns, as well as cemented and screw retained crowns. Specific superiority of each is not explored in detail, especially in the strain profile.²

Advances in implant designs, materials, and techniques have led to predictable success in their application, and several types of implants are now available for use in rehabilitation of different clinical problems. The patient's function when wearing a conventional complete denture prosthesis maybe reduced to 60% of that formerly experienced with natural dentition. Implant prosthesis offers a predictable treatment course than the traditional restorations.

Minimum peri-implant strain is one of the criteria for long term survival of any implant prosthesis. Peri-implant strain more than 4000 micro strain leads to pathologic fracture of the bone. Therefore, while selecting the type of prosthesis for a given clinical situation, along with the esthetics and function, peri implant strain generated in the surrounding bone should also be considered to ensure the long term success of the prosthesis.³ The present study was conducted to assess the peri implant strain produced by different types of prosthesis.

The present study was conducted in the department of Prosthodontics. The study protocol was approved from institutional ethical committee. It comprised of three implant analogues placed in a polyurethane mandibular model at the position of left and right first and second molar. Abutments were fixed to the implant at a torque of 25Ncm. Two such models were made. Three different prostheses were placed on abutment of each model i.e screw retained splinted, screw retained non splinted and cement retained splinted. Strain gauges were attached on the model, of each implant. Static load of 400N was applied on the prosthesis using universal testing machine. Load application was done ten times for each model and peri implant strain was measured. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

MATERIALS & METHODS

RESULTS

Table I: Peri- implant strain produced at first molar region

Prostheses	Screw retained splinted	Screw retained non-splinted	Cement retained splinted	P value
Mean	630.5	712.8	1084.6	0.01

Table I, graph I shows that mean peri- implant strain produced at screw retained splinted prostheses was 630.5 N, screw retained non- splinted prostheses was 712.8 N and cement retained splinted prostheses was 1084.6 N. The difference found to be significant (P< 0.05).

Graph I: Peri- implant strain produced at first molar region

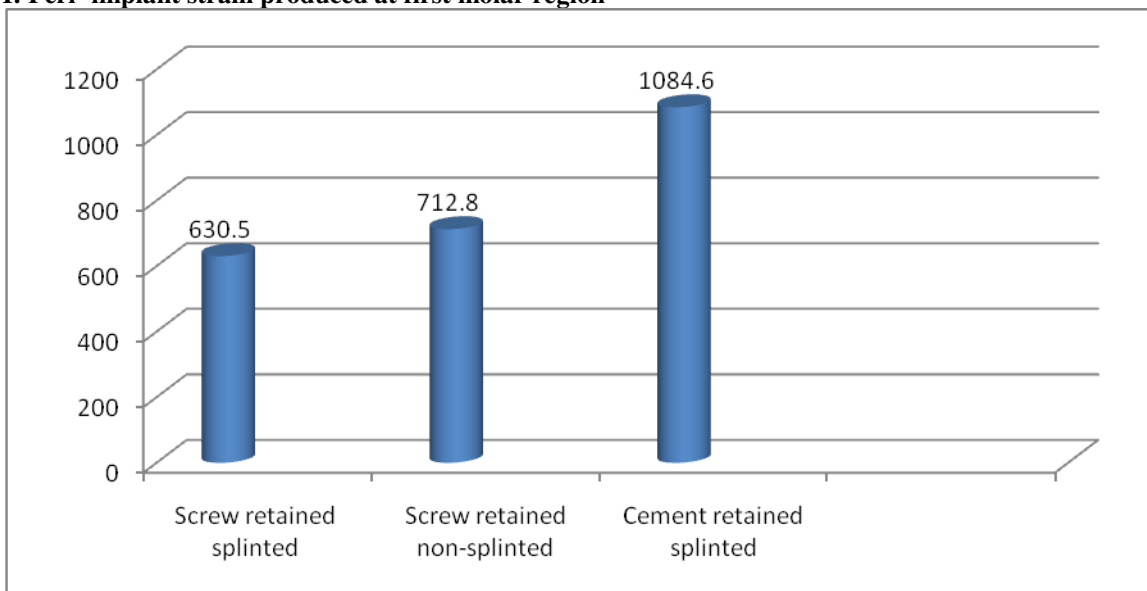
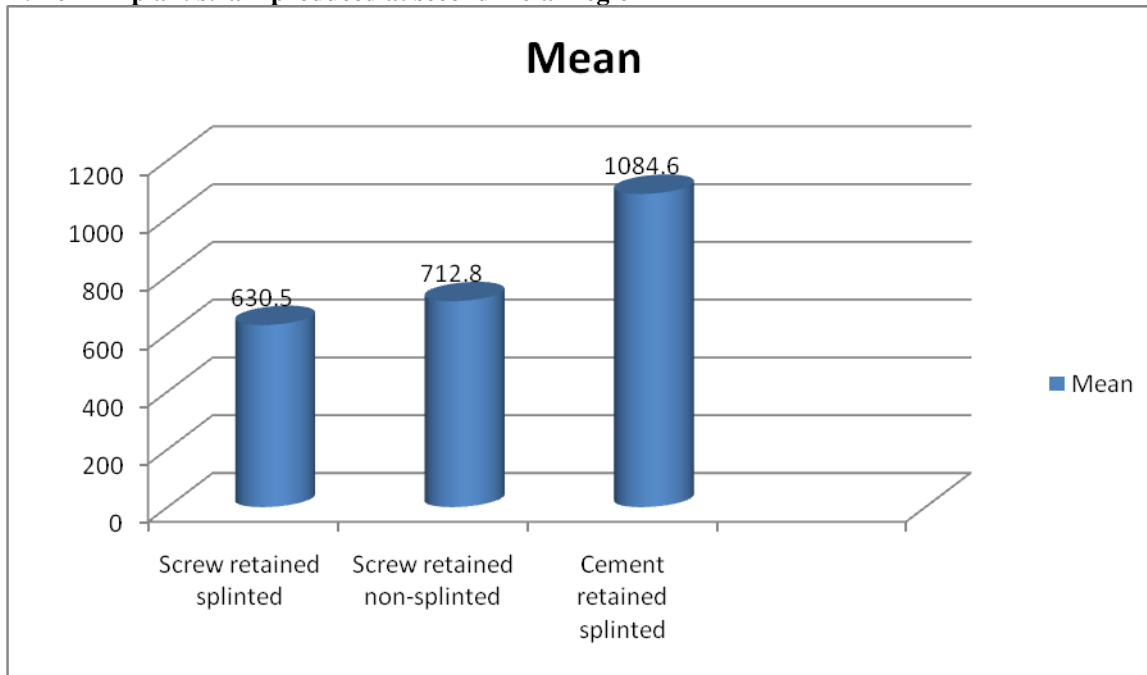


Table II: Peri- implant strain produced at second molar region

Prostheses	Screw retained splinted	Screw retained non-splinted	Cement retained splinted	P value
Mean	684.5	724.2	1094.6	0.01

Table II, graph II shows that mean peri- implant strain produced at screw retained splinted prostheses was 684.5 N, screw retained non- splinted prostheses was 724.2 N and cement retained splinted prostheses was 1094.6 N. The difference found to be significant (P< 0.05).

Graph II: Peri- implant strain produced at second molar region



DISCUSSION

The goal of modern dentistry is to restore the normal contour, function, comfort esthetics, speech, and health regardless of the atrophy, disease, or injury of the stomatognathic system. However, the more the number of teeth missing in a patient, it becomes more difficult to achieve this goal with traditional dentistry. Dental implantology is a term used today to describe anchoring of alloplastic material into the jaws to provide support and retention for prosthetic replacement of teeth that has been lost.⁴

Traditionally, four to five implants in the mandible and five to six implants in the maxilla with distal cantilevers has been a popular approach among the implant clinicians. From the biomechanical point of view, this classical protocol may not appropriately address the complex requirements of edentulism. The literature recommends a minimum of four implants for a fixed restoration but more implants should always be placed for biomechanical advantages and to avoid cantilevers. An increase in the antero-posterior spread and more number of supporting implants increase the predictability of a successful outcome.⁵ The present study was conducted to assess the peri implant strain produced by different types of prosthesis. This study comprised of three implant analogues placed in a polyurethane mandibular model at the position of left and right first and second molar. Strain produced at first and second molar region was evaluated. We observed that mean peri- implant strain produced at screw retained splinted prostheses was 630.5 N, screw retained non-splinted prostheses was 712.8 N and cement retained splinted prostheses was 1084.6 N.

Rani et al⁶ in their study found that the mean peri implant strain (\pm SD) generated was found to be highest in non-splinted screw retained (1397.70 ± 44.47 micro strains and 1265.90 ± 42.76 micro strains) and least in splinted cement retained (630.70 ± 31.98 micro strains and 519.60 ± 32.48 microstrains) in both 1st and 2nd molars respectively.

We observed that mean peri- implant strain produced at screw retained splinted prostheses was 684.5 N, screw retained non- splinted prostheses was 724.2 N and cement retained splinted prostheses was 1094.6 N. Koller et al.⁷assessed retrospectively the association among occlusal, periodontal and implant-prosthetic parameters and marginal bone loss (MBL) around implants after prosthetic loading. They concluded that inadequate occlusal pattern guide, presence of visible plaque, and cemented and splinted implant-supported restoration were associated with greater MBL around the implant.

Nisan J et al⁸ in their study of analysis of load transfer and stress distribution by splinted and unsplinted implant supported fixed cemented restorations found mean strain of 756.32 microstrains and 186.12microstrains in non splinted and splinted cement retained prosthesis respectively.

CONCLUSION

The mean peri- implant strain produced at cement retained splinted prostheses was higher than screw retained non-splinted prostheses and screw retained splinted prostheses.

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