

“EVALUATION OF SURFACE DETAIL REPRODUCTION OF BD IMPRESS AND NEXUS MEDODENT THERMOPLASTIC IMPRESSION MATERIALS” - AN IN VITRO COMPARATIVE STUDY

Dental Science

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ABSTRACT

Impression making is the primary step in the process of fabrication of prosthetic restoration. Dimensional stability, Surface detail reproduction, and compatibility with gypsum products is an essential prerequisite for a successful restoration. Clinically, the accuracy of impressions depends on two major aspects: 1) Ability to flow and adapt intimately to the relevant surfaces while making the impression, and 2) the wetting of the polymerized impression material by the gypsum. The purpose of this study is to evaluate and compare the surface detail reproduction of BD Impress and Nexus Medodent impression material. The results showed significant difference in surface detail between the two thermoplastic impression materials with p-value <0.05. It was observed that comparison of mean scores obtained by BD Impress and Nexus Medodent impression material are 2.7556 and 2.2222 respectively. The materials with minimum mean score value is considered as the material with good surface detail reproduction. Thus one can conclude that Nexus Medodent thermoplastic material has the good surface detail reproduction compared to BD Impress thermoplastic material.

KEYWORDS

Surface detail reproduction, Nexus medodent, BD impress, Thermoplastic impression materials.

INTRODUCTION

Accurate reproduction of edentulous arch or prepared tooth is of critical importance in the fabrication of removable or fixed restorations.[1] The production of prosthesis requires an intimate contact between the fit surface of the appliance and the oral structure.[2] For better accuracy of an impression, both the material and techniques are important. It is necessary to use a material that can faithfully reproduce the contours of the surface and be dimensionally stable.[3]

A good impression material should be easy to handle, ability to pour multiple cast from a single impression and good surface reproduction.[1] Impression compounds (modeling plastics) had been developed and introduced, one by Charles Stens of England in 1857 and the other by S.S.White in 1874, the use of these materials dates from the contributions of J.W.Greene, P.T.Greene, and Rupert hall. Greene brothers, about 1900, introduced modeling plastic, a method for manipulating it, and a technique that is said to have been the first to utilize all the surfaces of the mouth to advantage for denture retention. Rupert Hall, in 1915, perfected the first moderate-heat modeling plastic for making individual impression trays and introduced the correctable modeling plastic-plaster technique that almost immediately became standard method for making impressions.[4]

Most of the elastomeric impression materials that are commercially available show good surface detail reproduction. While now recently, new thermoplastic impression materials (BD IMPRESS and NEXUS MEDODENT) are available with no information on the properties of surface details. Therefore, efforts are made to know about the surface detail reproduction of these newly introduced impression materials.

While now recently, new thermoplastic impression materials (BD IMPRESS and NEXUS MEDODENT) are available with no information on the properties of surface details. The purpose of this study is to evaluate and compare the surface detail reproduction of a new commercially available BD IMPRESS and NEXUS MEDODENT impression material.

LITERATURE SURVEY

In 18th century, Beeswax was apparently the material first used in making impressions in the mouth. In 1756, Phillip Pfaff, made sectional wax impressions of half of an arch at a time. William Rae, in 1782, said that he “got the measurement of the jaws in a piece of wax

pushed into the gums. In about 1844, plaster of Paris was first used as an impression material. In 1862, Franklin described the first corrected impression. In 1870, Wescott described a similar plaster wash technique, using oversized wax trays. The Greene brothers, about 1900, introduced modeling plastic, and first to utilize all the surfaces of the mouth to advantage for denture retention and first to teach the closed mouth all-modeling plastic technique in detail. In a variation of the method, S.G. Supplee introduced a hot water heater designed for working with modeling plastic. Rupert Hall, in 1915, perfected the first moderate-heat modeling plastic for making individual impression trays and introduced the correctable modeling plastic-plaster technique that almost immediately became a standard method for making impressions. Historically, wax was one of the first thermoplastic impression materials used to make impressions of the edentulous arch. The first commercially available “mouth temperature” waxes appeared in the 1930s.[5]

After that was the introduction of many elastomeric impression materials. Much advancement in the elastomeric impression materials has come to improve the impression efficiency and also there are many studies conducted on the properties of elastomeric impression materials to find which is the best of all.

PROBLEM DEFINITION

The introduction of the BD IMPRESS and NEXUS MEDODENT (photo1) are newly available materials that have been introduced in the field of dentistry which falls under the group of thermoplastic impression materials. These materials states to be good in for the use of bite registrations, anterior bite stops, custom impression material, custom impression trays, bleaching trays, build walls of impressions, border molding, orthopedic appliances. The thermoplastic impression materials are not superior in properties compared to elastomeric impression materials and don't have enough studies conducted to appreciate its properties. So this study is conducted to is to evaluate and compare the surface detail reproduction of a new commercially available BD Impress and Nexus Medodent impression material.

METHODOLOGY

Stainless steel dies with American Dental Association specification 19 was made (diagram 1).[5] The material was manipulated and samples were prepared using the die to record the three lines X, Y, Z with width 50±8µm, 20±4µm, 75±8µm respectively, and 2 vertical lines AB and CD with width 75±8µm (Diagram 1). This is because studies show that

a good impression material should be able to record and replicate the fine details without any voids or irregularities. A total of 90 samples were prepared for the study using control group as metal die, out of which 45 specimen of BD IMPRESS impression material, and 45 specimens of NEXUS MEDODENT impression materials were prepared (photo 2).

The prepared samples were viewed under Olympus BX43 research microscope(photo 3) to analyze the surface detail reproduction(photo 4) which was calculated using score criteria[3](table 1) and results were subjected to statistical analysis. Statistical analysis was performed using analysis of variance (ANOVA) and pair-t test for comparison among groups at 0.05 level of significance. After statistical analysis of data results were obtained and analyzed for interpretation.

RESULT

The results shows significant difference between the surface detail reproduction between the two thermoplastic impression materials with p-value <0.05. It is observed that comparison of mean scores obtained by BD IMPRESS thermoplastic material and NEXUS MEDODENT thermoplastic material are 2.7556 and 2.2222 respectively. The materials with minimum mean score value is considered as the material with good surface detail reproduction. Thus one can conclude that NEXUS MEDODENT thermoplastic material has the good surface detail reproduction compared to BD IMPRESS thermoplastic material.

DISCUSSION

Impression making is the primary step in the process of fabrication of an indirect prosthetic restoration. Precision of the impression material in terms of dimensional stability, surface detail reproduction, and compatibility with gypsum products is an essential prerequisite for a successful restoration.[6]

The surface detail reproduction of impression materials plays a major role in determining how accurately various indirectly produced appliances and restorations may be constructed. Clinically, the accuracy transferred by impressions from the intraoral structures to the final restorations depends on two major aspects: 1) the ability of the impression mix to flow and adapt intimately to the relevant surfaces while making the impression, and 2) the wetting of the polymerized impression material by the gypsum when pouring the impression. The international standard for dental elastomeric impression materials states that a light body impression material must reproduce a line 0.020 mm in width.[7] As matter of fact, with the exception of very high viscosity putty materials, all polyvinylsiloxane products can achieve this requirement. The very low viscosity polyvinylsiloxane can even reproduce lines 1 μ m to 2 μ m wide under laboratory conditions.[8]

In this study, an modified ISO standard metal die was employed to reduce the variables associated with the uncontrollable factors; thus the ability of the impression material to reproduce surface detail was assessed in an approach that was more precise and comparable. A total of 90 samples consisting of 45 samples each for BD IMPRESS and NEXUS MEDODENT were prepared using ADA specification no.19 stainless steel die. The samples were prepared with help of the manufacturer's instructions. The samples were then assessed using the score criteria that were formulated using previous studies.[9,10,11] Each samples was assessed macroscopically checked for areas of pits, voids and roughness over the horizontal lines carefully with single observer.

Therefore, an additional microscopic evaluation of the width of lines may be beneficial and was applied in this study. Samples were calculated as mean $\pm$ SD (standard deviation) and the mean score of the surface detail reproduction of two thermoplastic impression materials is calculated using score criteria.

According to the microscopic evidence, the BD IMPRESS average score values were obtained in the following order: score 1-0 samples, lines reproduced sharply and clearly; score 2-19 samples, lines reproduced clearly more than 50% with a average of 42.2; score 3-18 samples, lines reproduced clearly less than 50% with average of 40; score 4-8 samples, lines with rough, pitted, blemished surface with average of 17.8.(GRAPH 1)

According to the microscopic evidence, the NEXUS MEDODENT

average score values were obtained in the following order: score 1-10 samples, lines reproduced sharply and clearly with average of 22.2; score 2-19 samples, lines reproduced clearly more than 50% with a average of 42.2; score 3-12 samples, lines reproduced clearly less than 50% with average of 26.7; score 4-4 samples, lines with rough, pitted, blemished surface with average of 8.9.(GRAPH 1)

It may be observed that comparison of mean scores obtained by BD IMPRESS thermoplastic material and NEXUS MEDODENT thermoplastic material are 2.7556 and 2.2222 respectively.

The materials with minimum mean score value is considered as the material with good surface detail reproduction.

Thus one can conclude from the following study, that NEXUS MEDODENT thermoplastic material has the good surface detail reproduction compared to BD IMPRESS thermoplastic material.

Few Limitations In The Present Study :

The impressions were made from a metal die made according to ADA specification no.19 which allowed to assess the surface detail reproduction of the impression specimens only extra orally and hence it did not mimic clinical conditions which includes the use of type of impression trays, adhesives for making impressions and presence of intraoral fluids.[12]

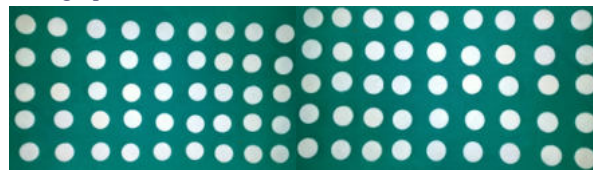
This study examined only the surface detail reproduction using impression specimens and did not include compatibility and wettability properties with gypsum materials while pouring the impressions.

Photograph-1



BD IMPRESS & NEXUS MEDODENT THERMOPLASTIC IMPRESSION MATERIAL

Photograph-2



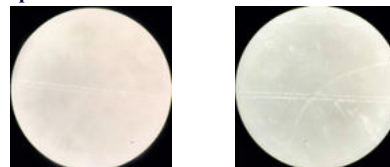
TOTAL SAMPLES PREPARED

Photograph-3



OLYMPUS BX43 RESEARCH MICROSCOPE

Photograph-4



SCORE 1

SCORE 1



SCORE 3



SCORE 4

SCORE CRITERIA

SCHEMATIC DIAGRAM OF STAINLESS STEEL DIE ADA SPECIFICATION NO.19

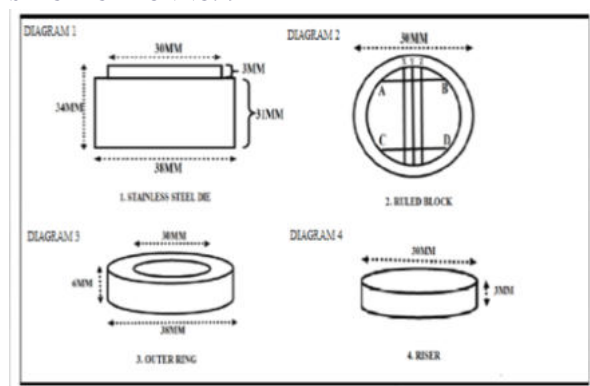


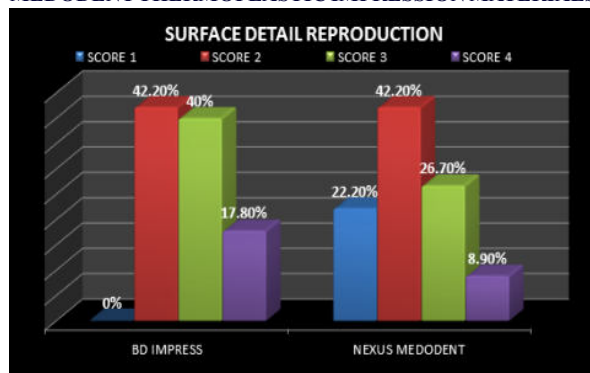
Diagram 1

SCORE CRITERIA

Score 1	The whole line reproduced sharply and clearly between the marks.
Score 2	The line is clear over more than 50% of the length or indistinct for less than 50% or reproduced over the whole length but not sharp.
Score 3	Line clear over less than 50%, or completely visible but blemished and rough.
Score 4	Blemished, pitted or rough and not reproduced over the whole length.

Table 1

THE COMPARISON OF SURFACE DETAIL REPRODUCTION SCORES OF BD IMPRESS AND NEXUS MEDODENT THERMOPLASTIC IMPRESSION MATERIALS



GRAPH-1

CONCLUSION

According to the study conducted and results obtained, we can conclude that NEXUS MEDODENT was superior in surface detail reproduction than BD IMPRESS impression material. Along with the results it was found that BD IMPRESS was showing low thermal conductivity and more adhesiveness during manipulation which was found to be a drawback for this material. Finally, this study only examined the surface detail reproduction of the BD IMPRESS with NEXUS MEDODENT. However, there is a need for further studies to know about other properties of these thermoplastic impression materials to enhance knowledge and for clinical application as indicated by manufacturers.

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