

Int Poster J Dent Oral Med 2009, Vol 11 No 1, Poster 433

International Poster Journal

Flexural-strength and E-modulus of hypo-allergic denture base materials

Language: English

Authors:

Dr. Sonia Mansour, Dr. Manar I. Jarkas, Prof. Dr. Jürgen M. Setz, Dr. Arne F. Boeckler, Centre for Dentistry and Oral Medicine, Department of Prosthodontics, Martin-Luther-University Halle-Wittenberg Dr. Christian Bierögel, Prof. Dr. Wolfgang Grellmann, Center for Engineering Sciences, Martin-Luther-University Halle-Wittenberg

Date/Event/Venue:

July 2-5, 2008 86th General Session & Exhibition of the IADR Toronto, Canada

Introduction

Many ingredients of acrylic resins denture base materials are suspicious to cause allergic reactions [1]. Except the complete polymerized PMMA all ingredients in methacrylate based denture resins such as residual monomer or BPO have allergic properties with different potentials. So, alternative products with no or only minor quantities of allergic components were developed. To fabricate these "hypo-allergic" denture base materials different technical and chemical processing's are applied. To serve as a clinically substitute conventional PMMA denture base resins hypo-allergic denture base materials should meet the standards for mechanical-physical properties of conventional denture base resins. Fundamental material properties are flexural strength (ofM) and flexural/elastic modulus (Ef). Flexural strength is equivalent to the maximum flexural stress during a bend test [2]. Flexural or E-modulus represents the relation between flexural strength and flexural strain in the elastic and visco-elastic region. So, it indicates the material's resistance against elastic deformation. High flexural strength and flexural modulus contribute to the preservation of edentulous jaw areas [3]. Flexural strength is an indicator of the load level and clinical work capability of denture materials finally. A high flexural modulus specifies rigidity as well as stiffness and represents denture base material's resistance to elastic as well as visco-elastic deformation.

The aim of this in-vitro study was to evaluate mechanical-physical properties of hypo-allergic denture base materials Additionally the results should be compared to the material properties of established PMMA denture base resins.

Material and Methods

Seven hypo-allergic denture base resins (Tab.1) different in configuration, chemical composition and processing procedure were tested for mechanical-physical properties. According to manufacturers the tested products were free from toxic or potential allergic substances. To evaluate the materials' properties three conventional PMMA denture base resins with different polymerization cycles and processing parameters represented the control group and provided the standard for comparison. To guarantee optimal processing and material quality specimens (Fig 1) were produced by the manufactures or an authorized laboratory.

To prevent the influence of preparation specimens were cut under water cooling (60x10x4mm). Six specimens from each product were tested in the three point bending test according to ISO178:2006 [Center for Engineering Sciences (Director: Prof. Dr. W. Grellmann)].

The distance between the supports was 50 mm. In an universal testing machine (Zwick, Germany, Fig 2) bending force and deflection were measured until break at a constant cross head speed of v=5 mm/min. The data were automatically recorded (software TestXpert 8.1, Zwick). of M and Ef were calculated, analyzed and compared to the control level (T-test, < 0.05).

Hypo- allergic resins	Basis	Processing procedure	Manufacturer
Acetal	polyoxymethylene	Injection	Pressing Dental S.r.l., Dogana, San Marino
Erkocryl	polymethyl methacrylate, partial of buthyl acrylate	Injection- casting	Erkodent Erich Kopp GmbH, Pfalzgrafenweiler, Germany
Luxene	polyvinyl copolymer	Injection	TopDent GmbH, Mühlgraben Germany
Microbase	diurethan diamethcrylate	Injection	DENTSPLY De Trey GmbH, Konstanz, Germany
Polyan	modified methyl methacrylate	Injection- casting	Polyapress GmbH, Altkirchen, Germany
Sinomer	polymethyl methacrylate, polyfunctional oligomers (acrylate/urethane based)	Injection	ALLDENT AG, Ruggell, Liechtenstein

Versio.com	dimethacrylate, polyfunctional methacrylates	Casting	Heraeus Kulzer GmbH & Co. KG, Hanau, Germany
Conventional Resins	Basis	Processing procedure	Manufacturer
Paladon 65	polyfunctional methacrylates	Injection	Heraeus Kulzer GmbH & Co. KG, Hanau, Germany
PalaXpress	polyfunctional methacrylates and copolymer	Plug & press	Heraeus Kulzer GmbH & Co. KG, Hanau, Germany
SR-Ivocap	polyfunctional methacrylates	Injection	Ivoclar Vivadent GmbH, Ellwagen, Germany

. . . .

. .

12.1

. .

. .

Tab 1: Tested hypoallergenic denture base materials and PMMA based denture base resins





Fig 1: Specimens

Fig 2: Three point bending test

Results

• •

All tested hypo-allergic materials fulfilled the basic requirements according to DIN ISO 1567:2000. of M standard of the conventional control group was in the range of 92.8 - 120.2 MPa (Fig 3). The average flexural strength of three tested products was within (100.5 - 116.0 MPa), two products were above (123.9 - 136.1 MPa) and two materials below (65.3 u. 71.4 MPa) the standardized control level.

Flexural modulus gained from the three point bending test characterizes material's stiffness. Ef standard level was between 2431 - 3180 MPa (Fig 4). The average flexural modulus of three products was within (2522 - 3020 MPa), two above (3234 - 3853 MPa) and one material below (2208 MPa) the respective control level.



Fig 3: Flexural strength

Fig 4: Flexural modulus /elastic modulus

Conclusions

Flexural strength is an indicator of the load capacity and the resistance against stress cracking. Therefore it also indicates clinical work capability of resin dentures. A high flexural modulus value specifies rigidity as well as stiffness and represents denture base material\'s resistance to elastic and visco-elastic deformation. All tested products fulfilled the requirements of ISO 1567:2000. The flexural strength and flexural modulus of five tested hypo-allergic denture base materials were within or superior to the control levels established by the tested conventional PMMA denture base resins. Microbase exhibited insufficient flexural strength and flexural modulus which indicates brittle material properties. Sinomer showed deficient values for flexural strength and flexural modulus.

Literature

- 1. Wichelhaus A: Allergology in Dentistry. In: Heppt W, Bachart C (Eds) Allergology for ENT-Doctors. Thieme, Stuttgart, New York (1998) 142-147
- 2. Grellmann W, Seidler S (Eds): Polymer Testing. Hanser, Munich, Wien, 2007
- 3. Finger W: Mechanical and dynamic properties of denture base resins. Dtsch Zahnaerzt Z 30, (1975) 665-671

This Poster was submitted by Dr. Sonia Mansour.

Correspondence address:

Dr. Sonia Mansour Martin-Luther-University Halle-Wittenberg Centre for Dentistry and Oral Medicine, Department of Prosthodontics Große Steinstraße 19 06108 Halle (Saale) Germany

Poster Faksimile:

Martin-Luther-University Halle-Wittenberg Germany Centre for Dentistry and Oral Medicine Department of Prosthodontics Director: Prof. Dr. Jürgen M. Setz







Mansour S*, Jarkas M, Bierögel C, Grellmann W, Setz JM, Boeckler AF

Flexural-strength and E-modulus of hypo-allergic denture base materials

Objectives

Many ispective of angle mine derive has material are supices to case allergin models (1). Boot the analysis polynomial PMM of ingredents in metazysta based derara mine sock or marked meaners of 800 hear alonging paystes with different potentials. So, distruites product with no or only miner quantities of allergic compounds want different balancies frame and angle different potentials. So, distruites diment balancies frame and densities framework want the potentiary derarts bases material about provide wan applied. To serve and a clientry alerthic converticed RMM dataset base methods applied and the base material about a most the standards for matcreat physical datase bases material about frame minis. Fundament in material paysets on standard strategis hags and frame/alexit-models applitunes datase bases material strategis hags and frame/alexit-models applitunes datase bases and strategis hags and frame/alexit-models applitunes and wants are and strategis hags and frame/alexit-models applitunes material modula anothers for material material strate datase bases and material modula anothers for material material strate datase bases and material modula anothers for material material strate datase bases and material modula anothers for frameworks indexis want applied on a constrates original datase bases material want of applications and datases material bases. For payment and datases and material want datases and the forders have material want of applications and and effective material forders have material want on applica and material modula material have an and material want of applications and an effective material forders have material want on applications that and endoland material have have an and material want of applications and and want modula material have have an and material have and material and and material material have an and material have and material have and an effective material have base anticidad and material have and material and material have forterated have bas matchidad products and an a

The sim of this in-tito study was to enduate mechanical-physical properties of hypo-allergic denters base materials Additionally the needs should be compared to the material properties of established PMMA denters base ratios

Material and Metho

Seen typochargic detarts toan melas (Fal.)) diffuent in configuration, denaria comparison and processing providers area thind for mathemical physical properties. According to conductants the testing backets ware the term testicar photodel adaptics clusteram. To endent the mathemical properties these connectural PABA dentars bear mains with different physicalities cyclical data photodella parameters are associated and agree and proceeding a parameters proceeding as and another and motional data sections are associated apriles of proceeding and motional quality spectrum (Fig. 1) ware proclead by fin mathemicans or an advanced backwarters,
No.1
Normal power of the sector of the sec

86th General Session & Exhibition of the IADR Toronto July 2 - 5 2008







ing test counsing to 50178.2006 (Center for Engineering Sciences actor: Prof. Dr. W. Onellmanni), distance between the apports was 50 mm. In an universal testing mobiles distance between the apports was 50 mm. In an universal testing mobiles distance are set of the set of th

at a constant areas hand speed of v=5 mm/nin. The data were cubanchedly recorded (software Teal/Spet B.1, Zwick), σ_{ab} and E₁ were cubalated, analyzed and compared to the control level (T-teat, p=0.05).

Results

All tender large-allergic materials Milled the basic requirements according to CR SCI 155/2000, eq. etcs/store of the conventional central group was in fits range of 92.81 – 120.22 Mills (Fig. 3), The average fiscand strength of these tents products was while (100.5 – 11.16.0 Mills), two products was released 136.11 Milly and two materials below (55.3 to, 71.4 Mills) the standardized centre tend.

Tilaural moldula gated time fin times point banding but characterius motubil attimes. Epitandard level was between 2431 - 3100 MPe (Rp. 4). The energy Banual modulus of times prodicts more within (2522 - 3320 MPd, time schoo (2234 - 3263 MPd) and one moterial below (2208 MPd) tim respective cavity level.

Conclusion: Namula sharph is an inclusion of the load capacity and the smartureagent shows making. Transform it days inclusion activity of the smarture of the smarture of the smarture shows and the smarture of the attituue of requestion distance lases notatively mainteness to share comand-share adversarial. All head produced Mithel the requestions in distance and requestion distance lases notatively mainteness to share comlocations adversarial and the share of the smarture distance and the smarture and the smarture and the smarture laws and the share and the smarture of Mikh Adversa box more, heads and which incluses the smarture and programs. Second main adversarial shares the smarture days and found works.