

CONCEPTS ON THE RESISTANCE OF ACRYLIC TEETH, PMMA

Anca BEJAN ¹, Dana BACIU^{2,*}, Dorin Ioan COCOȘ^{1,*}, Alina-Ramona DIMOFTE ¹

¹ Faculty of Medicine and Pharmacy, Department of Dental Medicine, University “Dunarea de Jos” Galati, Romania.

² „Dimitrie Cantemir” University, Faculty of Medicine, Târgu Mureș, România

Abstract

Artificial acrylic teeth, also known as dentures, are a common solution for replacing missing or damaged teeth. Wear of artificial acrylic teeth can be influenced by several factors, such as: if dentures are utilized and worn every day, they can suffer from gradual wear over time. Mastication and friction against other hard surfaces can lead to a gradual deterioration of artificial teeth. It is very important how artificial acrylic dental compositions are made, but more importantly it seems that it is the stratification that is of particular importance when we talk about wear resistance. The studies performed so far are quite relative because each tooth lining can withstand depending on the component of the constructive elements.

Keywords: PMMA; acrylic teeth; resistance; wear resistance.

Introduction

Artificial acrylic teeth, also known as dentures, are a common solution for replacing missing or damaged teeth [1-3].

The wear of artificial acrylic teeth can be influenced by several factors, such as: if dentures are utilized and worn every day, they can suffer from gradual wear over time. Mastication and friction against other hard surfaces can lead to a gradual deterioration of artificial teeth [1-3].

Artificial acrylic teeth on high-quality materials are more resistant to wear than lower quality ones. The materials used to make teeth can vary, and some artificial teeth are more durable than others [3-4].

If you do not take proper care of dental prostheses, such as regular and correct cleaning, they may suffer or wear faster. Using abrasive toothpaste, hard-to-hair toothbrushes or aggressive chemicals can help damage artificial teeth [3-6].

Activity that involves rubbing artificial teeth against hard surfaces, such as chewing ice or hard objects, can cause faster wear and lifestyle needs to be knotted [5-7].

Artificial acrylic teeth have a limited lifespan. Finally, they can be used and may need to be replaced [6-8].

The lifespan of artificial teeth may vary depending on the factors mentioned above and how they are used and cared for [8-10].

To prolong the life of artificial acrylic teeth, it is important to take proper care of dentures [8-10].

Make sure that you clean the artificial elements regularly and correctly, products and techniques recommended by your dentist. It is also important to maintain good oral hygiene and avoid habits that can cause premature wear of artificial teeth [9-10].

Results and discussion

Nawshad Muhammad and collaborators studied 5 brands and 5 groups of artificial acrylic teeth, they tried to demonstrate that the chemical components of the teeth are important for creating resistors and reducing artificial dental abrasion [11].

Table 1. The respective brands and groups of PMMA selected artificial teeth [11].

Sr. No	Brand	Group	Composition
1	Artis	A	Acrylic
2	Well bite	B	Acrylic
3	Crisma	C	Acrylic
4	Pigeon	D	Acrylic
5	Vital	E	Acrylic

Several stairs and tests are used for compression:

In Figure 1. Demonstrate the deformation / compressive stress curve of groups A – E. Sample B showed the largest effort/deformation curve. Resistance of acrylic elements to compression and their module. In Figure 5 Group C compression pre-oointment has an increased resistance and a maximum of 88.6 Mpa modular and 1654 Mpa respectively. Groups D and E showed a lower value of 70-75 MPa [11].

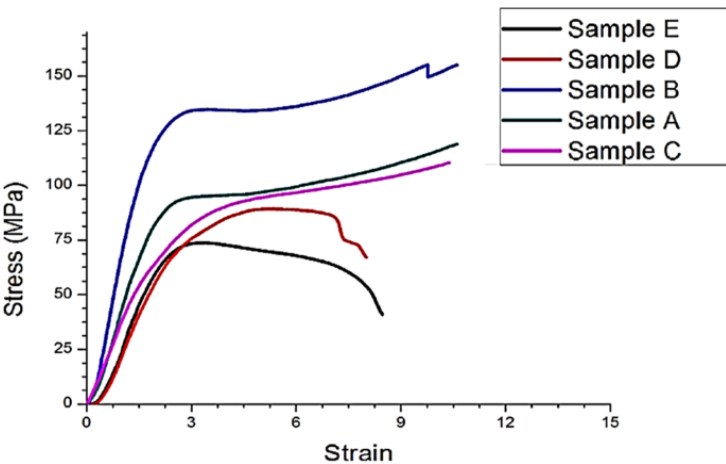


Fig. 1. Typical stress deformation curves and values

of the final compressive resistance of artificial tooth samples [11].

Elena R.B [12]. and the collaborators tried to measure the behavioral properties of acrylic teeth wear. The teeth were chosen from the resins. Or used forces of 20 N or 30 N.

It is very important how artificial acrylic dental compositions are made, but more important it seems that it is the stratification that is of particular importance when we talk about wear resistance [12].

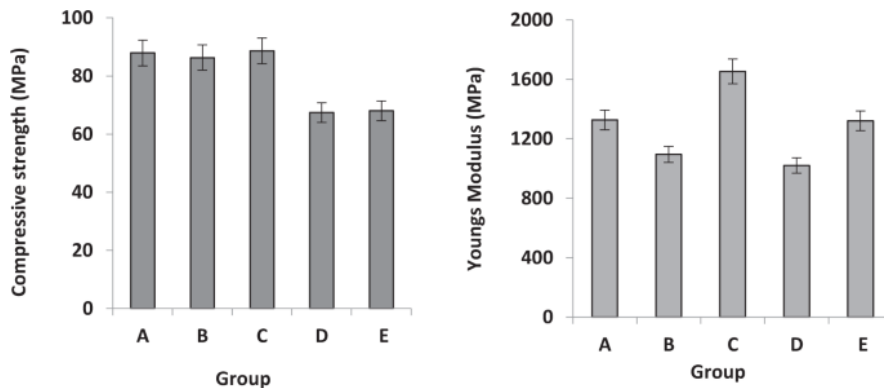


Fig. 2. Resistance to compression events (MPa) and module (MPa) Group data from A – E [11].

Table 2. Selection of artificial tooth linings according to the merchant manufacturers [12].

Commercial product	Manufacturer	Main features
Acry Rock	Ruthinium	<ol style="list-style-type: none"> 1. High aesthetic effect due to the two superimposed layers and the cut of the incisal edge. 2. High physical and chemical resistance achieved by using the best quality materials. 3. A wide variety of shapes and shades makes the tooth adaptable to all prosthetic requirements.
Eray Deluxe	Eraylar	<ol style="list-style-type: none"> 1. Acrylate in 3 layers. 2. Dentures with 6, 8 and 28 teeth. 3. Available in 34 shades. 4. 20 shapes available for the jaw, 6 shapes for the front mandibular area and 6 shapes for the back area.
Acry Plus	Ruthinium	<ol style="list-style-type: none"> 1. 4 layers. 2. High chemical and physical resistance achieved by using PMMA cross-linked. 3. A wide variety of shapes and 19 color shades.
Quint	Vertex- Dental BV	<ol style="list-style-type: none"> 1. 1x6 frontal teeth group; upper or lower. 2. 5 layers, PMMA cross-linked. 3. Available colors: A1, A2, A3, A3.5, A4, B1, B2, B3, B4, C1, C2, C3, C4, D2, D3, D4 4. Basic shapes: triangular, square, round.

The use of 20 N and 30 N forces for acrylic teeth corresponding to the commercial products Acry Rock and Eray Deluxe has similar values. Low values resulted in Acry Plus commercial products ($F = 20\text{ N}$) and Quint Plus ($F = 30\text{ N}$) [12].

Table 3. $F = 10\text{N}$, 20N and 30N , mass losses [12].

The length of the friction path L_f , [m]	Mass losses, Δm [g] for $F = 10\text{ N}$				Mass losses, Δm [g] for $F = 20\text{ N}$				Mass losses, Δm [g] for $F = 30\text{ N}$			
	Acry Rock	Eray Deluxe	Acry Plus	Quint	Acry Rock	Eray Deluxe	Acry Plus	Quint	Acry Rock	Eray Deluxe	Acry Plus	Quint
$L_0 = 0$	0	0	0	0	0	0	0	0	0	0	0	0
$L_1 = 3000$	0,0038	0,0036	0,0012	0,0015	0,0074	0,0087	0,0054	0,0061	0,0329	0,0301	0,0172	0,0208
$L_2 = 6000$	0,0104	0,0086	0,0038	0,0043	0,0196	0,012	0,0081	0,0097	0,0478	0,0438	0,0246	0,0271
$L_3 = 9000$	0,0127	0,0101	0,0066	0,0078	0,0245	0,0217	0,0134	0,0142	0,0618	0,0669	0,0394	0,0496
$L_4 = 12000$	0,0182	0,0131	0,0093	0,0102	0,0417	0,0397	0,0238	0,0281	0,0826	0,0796	0,0589	0,0632

Conclusions

It is very important how artificial acrylic dental compositions are made, but more importantly it seems that it is the stratification that is of particular importance when we talk about wear resistance.

The studies performed so far are quite relative because each tooth lining can withstand depending on the component of the constructive elements.

Wear of artificial acrylic teeth can be influenced by several factors, such as: if dentures are utilized and worn every day, they can suffer from gradual wear over time. Mastication and friction against other hard surfaces can lead to a gradual deterioration of artificial teeth.

References

- [1] Bolat M., Bosînceanu D.N., Baciuc E.R., Forna Agop D., Bosînceanu D.G., Forna N.C. Partial dentures-success and failures. Romanian Journal of Oral Rehabilitation 2017.
- [2] Caras C., Agop D., Forna N.C. Biomechanical aspects of impressions in partially edentulous. Romanian Journal of Oral Rehabilitation 2017.
- [3] Heintze SD. How to qualify and validate wear simulation devices and methods. Dent Mater 2006.
- [4] Balansea B, Vasluiianu RI, Tatarciuc M et al. Oral rehabilitation methods through the combination different prosthetic techniques. Romanian Journal of Oral Rehabilitation 2019.
- [5] Diaconu D, Vitalariu A, Tatarciuc M, Murariu A. The economic crisis effects on the cross contamination control in dental laboratories. Revista de cercetare și intervenție socială. 2014.
- [6] Rues S, Huber G, Rammelsberg P, Stober T. Effect of impact velocity and specimen stiffness on contact forces in a weight-controlled chewing simulator. Dent Mater 2011.
- [7] Zeng J, Sato Y, Ohkubo C, Hosoi T. In vitro wear resistance of three types of composite resin denture teeth. J Prosthet Dent 2005.

- [8] Vasluianu RI, Ioanid N, Holban Cioloca C et al. Strategies of the treatment plan in order to increase the degree of adaptation of the removable denture. Romanian Journal of Oral Rehabilitation 2019.
- [9] Ogle RE, Davis EL. Clinical wear study of three commercially available artificial tooth materials: thirty-six month results. J Prosthet Dent 1998.
- [10] De Gee AJ, Pallav P. Occlusal wear simulation with the ACTA wear machine. J Dent 1994.
- [11] Nawshad Muhammad ,Zenab Sarfraz ,Muhammad Sohail Zafar ,Saad Liaqat ,Abdur Rahim ,Pervaiz Ahmad ,Abdullah Alsubaie ,Abdulraheem SA Almalki and Mayeen Uddin Khandaker. Characterization of various acrylate based artificial teeth for denture fabrication. Journal of Materials Science: Materials in Medicine volume 33, Article number: 17, 2022.
- [12] Elena Raluca Baci, Roxana Ionela Vasluianu, Nicoleta Ioanid, Alice Murariu, Daniel Pavăl, Cătălina Cioloca Holban, Cosmin Ionuț Crețu, Dana Gabriela Budală. The abrasive wear behavior analysis of the acrylic resins artificial teeth. Romanian Journal of Oral Rehabilitation Vol. 13, No. 1, January-March 2021.

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