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AWARENESS ABOUT RECENT MATERIALS USED IN MAXILLOFACIAL PROSTHESIS AMONG UNDERGRADUATE DENTAL STUDENTS IN NADIAD - A CROSS SECTIONAL STUDY

Dr Archana M. Shah[1*], Dr Krati Nath[2], Dr Keya Parikh[3], Dr Meha Modi[3], Dr Shaikh Oves[5], Dr Vishwa Desai[6]

[1]Senior Lecturer, Dept of Prosthodontics, Faculty of Dental Science, Dharmsinh Desai University, Nadiad.

[2-6]House Surgeon, Faculty of Dental Science, Dharmsinh Desai University, Nadiad.

Corresponding author:

Dr Archana M. Shah, Senior Lecturer, Dept of Prosthodontics, Faculty of Dental Science, Dharmsinh Desai University, Nadiad. Email: archanapray@gmail.com.

Abstract:

Aim & Background: The purpose of this study was to gauge dental students' knowledge of new developments in materials used in maxillofacial prostheses.Patients find maxillofacial abnormalities unsightly, and they may have detrimental effects on their physical and physiological well-being as well as significant social, familial, and mental health issues. The quality of life of the patient is impacted by maxillofacial prosthesis. Multiple materials, methods, and clinical strategies have been employed in the field of maxillofacial prosthesis.

Materials & Methods: A set of 10 questionnaires was created and an online survey was conducted among Faculty of Dental Science students. A statistical analysis was conducted on the survey responses, which were completed by 100 students.

Results: 57% of students did not know about the latest developments in maxillofacial prosthesis materials, according to the data. Though 57% of students were unaware of its qualities, 59% of them were aware of silicone block polymer. Of the students, 53% were not familiar with polyphosphazenes. A-2186 (Factor 11) and silphenylenes were unknown to 56% of respondents. The creation of new materials is deemed necessary for the future of maxillofacial prostheses by 78% of students.

Conclusion: The study highlights this fact, highlighting the students' ignorance of recent developments in the materials used in craniofacial prostheses. More awareness must be raised about new developments in maxillofacial prosthesis through seminars, CDE programs, and interactive lectures.

Keywords: Polyphosphazenes, Silphenylenes, Maxillofacial prostheses, Recent advances

Introduction: According to Anusavice, Shen, and Ralph Rawls (2014), prosthetic replacements made of a variety of materials have been used since the sixteenth century to restore any surgical flaws. Maxillofacial prosthetics is a subspecialty of prosthodontics that deals with the replacement and repair of the stomatognathic and related face structures, either with or without

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their removal, using artificial substitutes (‘The lexicon of prosthodontic terms’, 2005). It includes prosthetic restoration for patients who have lost teeth or facial appendages, which can be acquired normally or because of illness or trauma. Many readily available materials have been used to create maxillofacial prostheses.

Wood, wax, metals, and, more recently, polymers are included in them. Contemporary maxillofacial prosthetic reproduction is based on polymers and elastomers (S et al., 2015). Materials that are strong, biocompatible, shade stable, and easily manipulable have been sought after; polymethylmethacrylate, polydimethylsiloxane, and polyether urethanes have all been explored and used (Lontz, 1990). Alongside these disappointing shortcomings, the new materials have demonstrated some excellent qualities. We haven't yet created a substance without undesirable properties. In an attempt to improve their shortcomings, a lot of effort has recently been put into considering the materials that are currently available.

The characteristics of the material used for that reason will determine how well the prosthetic rehabilitation of the facial defect proceeds (Alqutaibi, 2015).Several materials are frequently used to construct facial prostheses, such as silicone elastomers, vinyl polymers, acrylic resins and their copolymers, and polyurethane elastomers. Regretfully, none of these materials perfectly meet the specifications needed to create a prosthesis that is satisfactory (Alqutaibi, 2015). Generally speaking, the perfect material for an additional oral prosthesis should be biocompatible, meaning it shouldn't irritate the surrounding tissues, but it should also be transparent, lightweight, easy to process, and manageable before processing (Maller, Karthik and Maller, 2010). It should be resistant to various substances such as ether and oils and to sunshine, heat, and cold (Taylor, 2000).

High edge strength, high elongation, high tear strength, softness, tissue compatibility, and translucency are among the ideal mechanical and physical characteristics of maxillofacial materials. Ideal processing characteristics of the maxillofacial materials include Chemically inert after processing, ease of intrinsic and extrinsic coloring with commercially available colorants, long working time, no color change after processing, reusable molds and retain intrinsic and extrinsic coloration during use (Moore et al., 1977). The optimal biological characteristics of maxillofacial materials are resistance to microbial development, non-allergic nature, color stability, cleanability with disinfectants, and inertness to solvents and skin adhesives. (Stansbury and Antonucci, 1992; Chalian and Phillips, 1974).

The patient's face is their interface with the outside world and serves as the foundation for their physical identity. Those who have lost or seriously mutilated parts of their face, or their maxillofacial skeleton, come to us to receive artificial restorations that will give them a normal appearance. Nowadays, it is simple to use a maxillofacial prosthesis to treat oral and facial deformities thanks to advancements in dental knowledge, expertise, materials, and technique.In this study we asked the students about some of the recent improvements in materials such silicone block polymers, polyphosphazenes, A-2186 (Factor 11), silpheniles and their properties to assess the awareness on current advances in materials used in maxillofacial prosthesis among dentistry students.

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Materials & Methods: Undergraduate dentistry students participated in this cross-sectional study between December 2012 and April 2023, comprising 10 questions that were given to a sample size of 100 undergraduate dental students utilizing Survey Planet. Stratification and randomization were used to reduce sample bias.There were one hundred respondents to the poll in total. Every participant was guaranteed to have responded to all ten questionnaire questions, and nobody was disqualified from the study. So, an analysis was done on 100 replies. Students in their preclinical years were not included in the survey; only students participating in clinical rotations were considered.

The study's target participants were third-year, final-year, and intern dental undergraduate students at the Faculty of Dental Science, Nadiad. Pie charts and percentage analyses were used to quantitatively examine the results.

Results: According to the study, 57% of students were ignorant about recent developments in the materials used for maxillofacial prostheses. 59% of students are familiar with silicone block copolymer, whereas 57% were not aware. 53% of pupils did not know about polyphosphazenes. Except for maxillofacial prosthesis, 59% of students were unaware that polyphosphazenes is also utilized as a durable denture liner (Figure 5). A-2186 (Factor 11) was unknown to 56% of the pupils. Sixty-two percent of students were unaware that A-2186 (Factor II) lost its enhanced capabilities when exposed to environmental factors. 56% of students did not know about silphenylenes. Sixty percent of pupils were ignorant of silphenylenes' superior coloring, which makes them feel like skin in maxillofacial prostheses.78% of students concur that the creation of novel materials and methods is essential for the future of maxillofacial prostheses.

Table: 1 Questionnaire

Q1. Are you aware of recent advances in materials used in maxillofacial prosthesis?

A) Yes

B) No

Q2. Are you aware of silicone block copolymers?

A) Yes

B) No

Q3. Are you aware that silicone block copolymers are more tear resistant and have potential to support bacterial and fungal growth than silicone elastomers?

A) Yes

B) No

Q4. Are you aware of polyphosphazenes?

A. Yes

B. No

Q5. Are you aware that polyphosphazens are used as a resilient denture liner besides maxillofacial prosthesis?

A. Yes

B. No

Q6. Are you aware of A-2186 (Factor 11) a recently developed material?

ISSN:0975 -3583,0976-2833 VOL15, ISSUE 01, 2024

A. Yes
B. No
Q7. Did you know when A-2186 (Factor II) when subjected to environmental variables did not retain its improved properties ?
A. Yes
B. No
Q8. Are you aware of silphenylenes?
A. Yes
B. No
Q9 Are you aware of the property of superior coloration of silphenylenes which feel like skin in maxillofacial prosthesis?
A. Yes
B. No
Q10.Do you agree that the future of maxillofacial prosthesis depends on the development of new materials and techniques?
A. Yes
B. No

Discussion: According to this study, 57% of students were unaware of new developments in the materials used to make maxillofacial prostheses.Though 57% of students were unaware of its qualities, 59% of them were aware of silicone block copolymer. It was introduced to address a few of the shortcomings of silicone elastomers, such as their low % elongation, decreased rip strength, and susceptibility to bacterial development (El-Kenawy and Ahmed, 2015). Compared to silicone elastomers, it is more rip resistant and may encourage the growth of bacteria and fungi. Attempts are made to alter the current physical characteristics of conventional silicone by positioning blocks of non-silicone polymers alongside standard siloxane polymers (Polyzois, Winter and Stafford, 1991).

The entwining of polymethyl methacrylate into siloxane chains is one instance of this (Tsai et al., 1992). It is reported that elastomeric polydimethylsiloxane (PDMS) coatings have improved in their bioadhesive qualities. The process of adding block copolymers comprising a poly [2-(dimethylamino) ethyl methacrylate] (PDMAEMA) block and a PDMS block in a PDMS matrix can be used to modify the surface in this way. According to observations, hydrophilic groups play a major part in the surface modification of silicone coatings (Kalinova, Mincheva, and Dubois, 2014).

Polyphosphazenes were unknown to 53% of the students. The fluoroelastomerpolyphosphazenes has been created as a robust liner and may find application as a maxillofacial prosthetic material. It might be necessary to alter the elastomers' mechanical and physical characteristics in order to meet the specifications required for the creation of maxillofacial prostheses (Gettleman et al., 1985). A softer rubber with an HDA of 25, comparable to human skin, can be produced by compounding polyphosphazenes with little to no

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fillers and reducing the acrylic to rubber ratio, according to research on maxillofacial prosthesis conducted in New Orleans (Mitra et al., 2014). A-2186 was unknown to 56% of the pupils (Factor 11).

In comparison to HTV silicones and many other RTV silicones, A-2186, which is created by changing the polymer chain, demonstrated higher tear resistance, tensile strength, a higher percentage of elongation, and a softer surface. In the experiments conducted on cell cultures, it likewise showed no cytotoxicity (Polyzois, Hensten-Pettersen, and Kullmann, 1994).According to Sara M. Zayed et al., adding 3% of surface-treated SiO2 nanoparticles improved the mechanical characteristics of the silicone elastomer A-2186 (Zayed, Alshimy and Fahmy, 2014). Of the students, 56% did not know what silphenyleneswere. Siloxane copolymers containing methyl and phenyl groups are known as siphenylenes. They are prepared as a pourable, viscous vulcanizing liquid that is liquid at room temperature. Silphenylene elastomers feel more like skin in real response.Even with fillers made of silica, these polymers remain translucent.

These polymers have many of the desirable characteristics of RTV silicones, such as heat and UV light resistance and biocompatibility. They also have better colorability, a low modulus of elasticity, and edge strength.It feels like skin in a maxillofacial prosthesis because of its superior coloring (Bansal, Khindria and Kansal, 2009; Deba, Yunus and Tamrakar, 2012; Mahajan and Gupta, 2012). 78% of students concurred that the creation of new materials is essential for the future of maxillofacial prostheses.Ideal requisites for maxillo-facial materials are: 1. Materials utilized should be biocompatible.2. Flexibility ought to be adaptable between 4.4°C and 60°C in temperature.3. Color and Translucency: Color ought to be as close to the surrounding skin tone as feasible. The stability of chemicals and the environment. 5. Thermal conductivity: Ineffective heat conductor 6. Simplicity in processing and duplicating. 7. The patient should find the weight to be pleasant, light, and readily maintained in place.(Reddy et al., 2015).

The short-term survey and the fact that only students from one university were included in the study were its limitations. Additionally, there was no correlation found between undergraduate students' academic year and their awareness and understanding of recent advancements in the materials used in maxillofacial prostheses.

Conclusion: This cross-sectional study revealed that students were unaware of the most recent developments in the materials used in maxillofacial prostheses. Raising awareness about latest developments in materials used in maxillofacial prosthesis requires holding seminars, implementing CDE programs, and providing interactive lectures.

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ISSN:0975 -3583,0976-2833 VOL15, ISSUE 01, 2024

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