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Editorial Message

It is with great pride and enthusiasm that I present the third issue of the *Journal of Integrative Health Research (JIHR)*, the official publication of Sankalchand Patel University, Visnagar, Gujarat. This journal continues to serve as a platform for the exchange of groundbreaking research, clinical studies, and reviews that integrate modern medicine with Indian systems of medicine such as Ayurveda, Homeopathy, and Unani. Our commitment to advancing integrative health research grows stronger with each issue, and we are pleased to see the increasing interest from both researchers and practitioners across multiple disciplines.

Continuing the Journey of Integrative Health

The journey toward integrative health is more relevant than ever in today's complex healthcare landscape. Modern medicine, with its precision diagnostics and advanced treatments, has made remarkable strides in treating acute and life-threatening conditions. However, the importance of preventive care, chronic disease management, and holistic approaches—hallmarks of Indian systems of medicine—cannot be overstated. Integrative health provides a framework to bring these strengths together, offering patients comprehensive care that addresses both immediate and long-term health needs.

In this third issue, we continue to promote the philosophy that modern and traditional systems of medicine are not mutually exclusive, but rather complementary. Our contributors have provided high-quality research that explores this integration in various areas of healthcare, with the ultimate goal of improving patient outcomes and enhancing the quality of care.

Highlights of the Third Issue

This issue features a diverse range of articles that reflect the growing body of research in integrative health. Some of the key topics include:

- **Integrative Approaches to Pain Management**: Chronic pain management remains a challenge worldwide, and this issue includes studies that explore the combined use of modern pharmacological interventions with traditional Indian therapies such as Ayurveda and Yoga. These articles highlight the potential of integrative approaches to reduce reliance on opioids and other pharmaceuticals, promoting more sustainable, patient-centered care.
- **Lifestyle Disorders and Integrative Therapies**: With the rise in lifestyle-related diseases such as diabetes and hypertension, this issue examines the role of traditional practices in conjunction with modern treatments. Research demonstrates how Ayurveda's focus on diet, lifestyle modifications, and herbal remedies can complement conventional medical treatments to enhance patient well-being.
- **Innovations in Collaborative Research**: We also feature collaborative studies that bring together researchers from various healthcare streams. These studies emphasize

the importance of cross-disciplinary research in addressing complex health issues and promoting evidence-based integrative practices.

Looking Ahead

As we move forward, our vision for *JIHR* remains clear: to be a leading platform for high-quality, evidence-based research that supports the integration of modern and traditional healthcare systems. We are committed to encouraging collaboration and dialogue among healthcare professionals, researchers, and academics, ultimately contributing to a more holistic and patient-centered approach to healthcare.

I extend my deepest gratitude to the authorities of Sankalchand Patel University for their continued support, and to our editorial board, reviewers, and contributors for their tireless efforts in maintaining the high standards of the journal. Your dedication is instrumental in making each issue of *JIHR* a success.

As Editor-in-Chief, I invite healthcare professionals, researchers, and students from all disciplines to submit their work to future issues of the journal. Together, we can continue to explore and expand the possibilities of integrative health for the betterment of healthcare worldwide.

Warm regards,
Dr. Vivekanand Kattimani, MDS, Ph.D
Editor-in-Chief, Journal of Integrative Health Research

A Descriptive Study to assess the Knowledge on Ill effects of Junk Food among undergraduate students at selected areas, Kanyakumari (Dt), Tamil Nadu

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Abstract

The consumption of junk foods is one of the primary causes to the rise in prevalence of many diseases in developing countries among teenagers. Junk foods are typically ready-to-eat convenient foods containing high levels of saturated fats, salt, or sugar, and little or no fruit, vegetables, or dietary fibre and are considered to have little or no health benefits. Common junk foods include salted snack foods like chips (crisps), candy, gum, most sweet desserts, fried fast food and carbonated beverages (sodas) as well as alcoholic beverages. Eating junk food on a regular basis can lead to an increased risk of obesity and chronic diseases like cardiovascular disease, type 2 diabetes, non-alcoholic fatty liver disease and some cancers. This study was conducted with the objectives of assessing the awareness, safety perceptions and practices about food preservatives, flavouring agents used in most junk foods. However, it is found that college students consume junk food but do not fully understand the implications on health. This study is aimed at addressing the lack of knowledge that the undergraduate students have concerning junk food and its ill effects. The objective was to assess the Knowledge on Ill Effects of Junk Food among undergraduate students at selected areas at Kanyakumari. Descriptive survey approach was used to collect data from 60 subjects, selected by purposive sampling technique. Undergraduate students require healthy diets to maintain good health. It is therefore a necessity to determine their knowledge so that if inadequate, a practical guidance may be given to them so as to prevent disease and illness.

Keywords: *Junk food, undergraduate students, awareness, ill effects, knowledge*

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Introduction

In today's society, the average person has at least encountered junk food once in their lifetime. It is served in our homes, sold on the street and advertised on media streams. The term 'junk food' means low –cost foods which are heavy in calories from fat or sugar but low in fibre, protein, vitamins and minerals. According to Zimmer & Ben 2010, the word junk food has been in use since the early 1950s. Many people believe that these things do not have immediate negative consequences when combined

with a diet with well-balanced but the fact that experts have shown that eating junk foods can have a negative impact on health (Singh, Dey & Dey, 2021). Eating a lot of 'junk food' led to public health campaigns and a ban on advertising these kind of foods(WHO,2015). Junk foods are typically ready-to-eat convenient foods containing high levels of saturated fats, salt, or sugar, and little or no fruit, vegetables, or dietary fibre and are considered to have little or no health benefits.

Maintaining a diet that is both healthful and balanced may be challenging for teenagers who lead busy lives. College days are full of educational challenges that require long attention spans and stamina. Poor nutritional habits can undermine these pre-requisites of learning, as well as sap the strength that children need for making friends, interacting with family, participating in sports and games or simply feeling good about themselves. The most effective method for avoiding fast food is to promote a healthy diet that includes a variety of foods that are high in fibre, low in fat, and cholesterol, such as complete grains, vegetables, fruits as well as meals that contain only a moderate amount of sugar and salt. Junk food is linked to obesity, weight gain diabetes and other chronic health conditions because it contains additional fat, carbs and processed sugar. A study by the Scripps Research Institute found that consuming junk food has a comparable effect on the brain as addictive chemicals such as cocaine and heroin. There is an urgent need to educate the community on the aspects of healthy food habits and desired lifestyles to prevent overweight/obesity and its associated ill effects.

Objectives: To assess the knowledge on ill effects of junk food among undergraduate students.

Hypothesis: H1- Students will not have sufficient knowledge about the ill effects of junk food on health.

Assumptions

- College students are the vulnerable group exposed to the health hazardous aspects of junk foods.
- Adolescents have some knowledge regarding health hazards and prevention of junk foods.
- Adolescents have favourable attitude towards junk foods.

Review of literature:

(Saxena, 2022) Shows that any street in North India would be lined with vendors offering a variety of street delicacies, including Aloo Chaat, Papdi Chaat, and the well-known Dahi Bhalla Chaat. They are easy to prepare and are enjoyed by everybody. Chaat, which originated in the streets of northern India, is now renowned worldwide. According to legend, chaat began in Shah Jahan's kitchen. According to legend, when the Mughal emperor grew - ill, his Hakim recommended him to consume foods that were easy on the stomach but rich in spices to strengthen his immune system.

(Sharma, 2015) suggesting that obesity Eating junk food may create severe health issues in the body. For example, junk food raises the risk of obesity because it includes excessive amounts of fat, processed carbs, salt, added sugars, and sweeteners. Obesity causes a variety of health issues that negatively affect your quality of life.

(Harris, 2021) In light of the fact that certain of these components have been linked to major health issues, it is crucial to understand which of them are most common. That is exactly what our intentions were. Five well-known fast food chains, including McDonald's, Burger King, Taco Bell, KFC, and Arby's, had their menus totalled first. We next compared our results to a list of common food components and colours provided by the U.S. Food and Drug Administration. The end result is a list of the top 10 fast food

ingredients, arranged by kind and purpose of item.

Finkelstein et al. (2012) uncover that the problem of obesity and overweight affects individuals in various income levels and regions. Thus, low-income earners in regions such as South Asia and Sub-Saharan Africa, as well as high-income earners in Europe and North America, among other regions, report heightening instances of obesity and overweight as an outcome of poor dietary habits.

A Study conducted in 2015 was aimed to assess the existing knowledge of adolescents regarding the health hazards of junk foods in a selected college and to find out association between selected demographic variables and health hazards of junk foods. 115 engineering students were tested by using non probability convenience sampling technique with structured questionnaire. Majority of study subjects 69.56% samples had Average knowledge while 24.35% samples having Good knowledge, and6.08 % samples having Poor knowledge regarding the health hazards of junk foods. There is a significant association between expense of junk food and knowledge regarding health hazards of junk food.

An experimental study was conducted in 2011 to assess the nutritional knowledge of adolescents in Hyderabad, India. In this study 164 samples are selected from different schools belonging to eight standards and intervention group is thought about the nutrition importance with audio visual aids. Result of this study revealed that adolescents started to consume vegetables and fruits rather than the junk foods, study suggest that importance of nutrition should be emphasized in future programs.

Research Methodology:

The samples were selected from 60 school children of Sarvothaya gramam village. Descriptive survey approach was considered as appropriate to describe the knowledge of the undergraduate students on the ill effects of junk food. Descriptive research design was used in this study. The tool consists of Section A deals demographic variables such as age, sex, religion, mother's educational status, and marital status and Section B deals with modified structured self-administered questionnaire to assess the knowledge on ill effects of junk food. It consists of 22 questions each carrying four options. Each correct answer carries one mark. No mark was given for a wrong answer.

Results and Discussion

Table :1 Distribution of samples according to their demographic variables

	Demographic variable	N=60	
		Frequency	%
1	**Age in years**		
	a) Above 25 years	2	3.3
	b) 20- 25 years	13	21.7
	c) 18- 20 years	14	23.3
	d) Below 18 years	31	51.7
2	**Gender**		
	Male	29	48.3
	Female	31	51.7
3	**Religion**		
	Hindu	40	67
	Christian	12	20
	Muslim	8	13
4	**Marital status**		
	Married	0	0
	Single	60	100
5	**Mother's educational status**		
	SSLC	16	27.6
	Higher secondary	27	44
	Graduate	17	28.4

The analysed findings in the study reveals that

- Majority of findings 51.7% belongs to age group below 18 years
- Most of them are females and belongs to Hindu

- All are single and many of their mother's educational status were upto higher secondary level.
- The students of 58.3% of them had moderate knowledge regarding junk foods and its ill effects.

Table 2: Assessment of level of knowledge status

	%	Range	Level of knowledge	Frequency	%
1	<50	0 -13	Inadequate	12	20
2	51 – 74	14- 18	Moderate	35	58.3
3	>75	19 – 25	Adequate	13	21.7
			Total	**60**	**100**

Conclusion

The study concluded that majority of them belongs to age group below 18 years; most of them were girls belong to Hindu religion. All girls were single and their mother's educational status was up to higher secondary level.

The students of 21.7% only have adequate knowledge about junk foods and its ill effects. So community health nurse we should plan and conduct health education programme regarding ill effects of taking junk foods in future in a community area. Educate them about serious health risks which threaten the quality of life. So, undergraduate students need to endorse healthy eating habits by controlling the consumption of eating junk foods. Consumption of junk foods among adolescent students was remarkably high in undergraduate students. Regardless of inadequate knowledge on harmful consequences of junk foods, college students are consuming junk foods due to its easy availability and ready-to-use packaging.

References

1. Behar Man RE. Essential of Paediatrics. 4th Edition. Philadelphia: Sounders Company; 2002.
2. Bowden M. Children and Their Families. Philadelphia: W. B. Saunders Company; 1998.
3. Banerjee SR. Community and Social Paediatrics'. New Delhi: Jaypee Brothers Company; 1995.
4. Basavanthappa BT. The Text Book of Child Health Nursing.5th Edition. New Delhi: Ahoja Publishing Hanse; 2008.
5. Gupta S. The Short Textbook of Pediatrics.12 th Edition. New Delhi: Jaypee Brothers Company; 2003.
6. Hocen berry MJ. Essential of Paediatric Nursing. 7th Edition. Missouri: Mosby Publishers; 2005.
7. Kothari CR. Research Methodology Methods and Techniques. 2rd Edition. New Delhi: Wisha Prakashan Publishers; 1996.
8. Maharajan J. Methods in Biostatistics. 6th Edition. New Delhi: Jaypee Brothers Medical Publishers (P) Ltd; 2006.
9. Andrew pesce G. Responsible Television and Internet Advertising Needed to Reduce Childhood Obesity. American journal of paediatrics [Internet]. 2009, 71(1).
10. Anoop misra S. Junk Food Television Advertisements Linked to Child Obesity. Indian express.com. Sep 2011.
11. Bond ME. Taxing Junk Food: Applying the Logic of the Henry Tax Review to Food. Medical Journal of Australia [Internet]. 2010; 193(8).
12. Bowman SA. Fast Food Consumption of U.S. Adults: Impact on Energy and Nutrient Intakes and Overweight Status.
13. Journal of American College of Nutrition [Internet]. 2008 23(2).
14. Dingman DA, Schulz MR, Wyrick DL, Bibeau DL, Gupta SN. Factors related to the number of fast food meals obtained by college meal plan students. Journal of American College Health2014;62(8):562-9
15. Antony M, Bhatti RK. Junk Food Consumption and Knowledge about its Ill Effects among Teenagers: A

Descriptive Study. International journal of Science and Research 2015;6(4):1133-1136.
16. Sharma V. Adolescent knowledge regarding harmful effects of junk food. IOSR Journal of Nursing and Health Sciences 2013;1(6):1-4.
17. James C, Gold M. The Salted food Addiction Hypothesis may explain overeating and the obesity endemic. Medical Hypothesis 2009:73:892-899.

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Professional Musculoskeletal Morbidity and Ergonomic Enhancement in Pediatric Dental Practice: An Interventional Study

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Abstract

Background: Dentistry involves prolonged repetitive movements, sustained body postures and stress, all of which can significantly contribute to the development of musculoskeletal disorders (MSDs), psychological stress and fatigue. Pediatric dentists, who frequently work with children, face a heightened risk of MSDs affecting various parts of the body, including postural muscles and both upper and lower extremities. If left untreated, MSDs can lead to severe degenerative and inflammatory conditions.
Objective: This study aims to assist pediatric dental practitioners in addressing common musculoskeletal pain and disorders (MSDs) while exploring methods to alleviate symptoms.
Methods: The study recruited 110 participants and utilized an electronic survey to collect information about their experiences with musculoskeletal pain. Participants were provided with clinically proven exercises to perform during patient intervals. Their responses were collected after 30 days.
Results: Participants who engaged in regular exercise reported significant improvements. These exercises effectively alleviated pain in the head, neck and shoulders without requiring much time.
Conclusion: This short-term study demonstrates that targeted exercises can relieve pain for many working professionals. After 30 days, these exercises are likely to become habitual, helping maintain good posture and empowering individuals to manage their own discomfort using simple techniques.
Keywords: *Musculoskeletal disorders, Pediatric dentists, exercise*

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Introduction

Dentistry is a demanding profession that requires a high level of concentration and precision. Dentists must possess excellent visual acuity, hearing, depth perception, psychomotor skills and manual dexterity, as well as the ability to maintain specific postures for extended periods. A decline in any of these abilities can negatively impact a dentist's performance and productivity. Additionally, factors associated with the profession can predispose individuals to back and neck pain. The narrow visual field of the oral cavity, along with limited movement, increases the risk of developing such discomfort.[1,2]

Pediatric dentists, in particular, experience a higher incidence of musculoskeletal pain

compared to their colleagues in other specialties. Work-related musculoskeletal disorders (WRMSD) are significant issues affecting the musculoskeletal system, leading to workplace challenges that impact occupational health, productivity and career longevity. The World Health Organization defines musculoskeletal disorders as conditions that affect muscles, tendons, joints, inter-vertebral discs, peripheral nerves and the vascular system.[2] Thus, effective ergonomic workplace design is essential for enhancing musculoskeletal health.

Ergonomics seeks to minimize or eliminate stress, injuries and disorders by addressing ergonomic hazards and reducing worker exposure to risk factors associated with WRMSD. However, many of these risk factors cannot be entirely eliminated due to the inherent demands of dental practice, which often involves muscle overuse, repetitive and prolonged movements and unbalanced postures.[2,3]

Ergonomic recommendations for sitting positions provide theoretical guidelines relevant to various dental activities. These guidelines address issues such as muscular stress and muscle overuse resulting from repetitive movements, forced maneuvers, mechanical compression and extended exposure to vibrations. They also take into account factors like forward bending, twisting of the head and torso, uneven weight distribution on the hips and discrepancies in shoulder height, among others.[3-5]

Materials and Method

The electronic knowledge, attitude and practice (KAP) questionnaire was developed and distributed to 110 pediatric professionals.

Inclusion Criteria:

- ✓ Participants included all pediatric dental professionals and postgraduate students who experience pain and are willing to engage in exercises to alleviate their symptoms.
- ✓ Participants might have mild to moderate symptoms.

Exclusion Criteria:

- ✓ Participants with preexisting spinal or neurological conditions.
- ✓ Participants with respiratory issues.
- ✓ Participants experiencing severe muscle pain.

Participants were informed about the study and the questionnaire was sent to them electronically. They were asked to select the responses they deemed appropriate. Those interested were provided with clinically proven exercises to perform over a 30-day period (Fig 1 & 2). Responses were recorded at both the beginning and end of this period. After 30 days, a feedback form was sent to the participants and their responses were recorded.

The Knowledge based questions included: -

- ✓ Are you experiencing musculoskeletal or joint pain during clinical hours?
- ✓ Is the pain impacting your daily activities?
- ✓ Do you think this results from an uncomfortable working position in the clinical setting?
- ✓ Do you have a previously diagnosed neurological conditions or spinal injuries?

The Attitude based question included: - Have you explored any remedies to alleviate the pain during your clinic visit?

The Practice based question included: - Are you willing to try some clinically proven exercises that can help relieve your pain for a few days?

Asanas are positions that require you to be fully present with both your body and mind. Yoga connects, unites and integrates these two aspects, harmonizing the mind and

calming its fluctuations.[5] A team of physiotherapists, orthopedician and ergonomist came together and prepared these exercises that are provided.

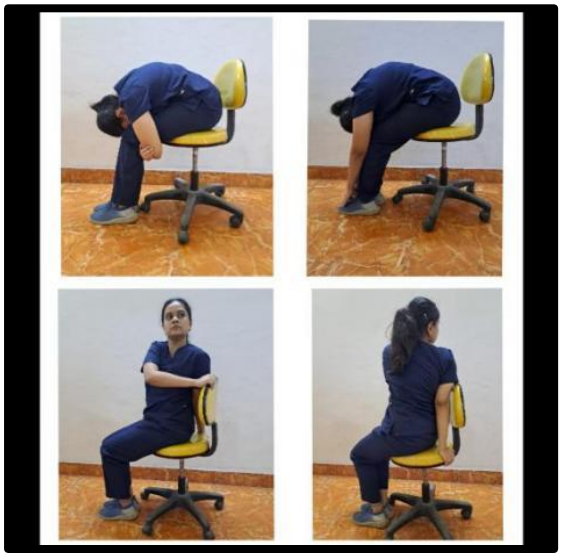

Fig 1- Upavistha Dwikonasana (Seated Double-Angle Pose or Seal Pose), Jathara Pari vartanasana (Belly Twist A or Seated Spinal Twist A)

Fig 2 -Parivrtta Pashimottan asana (Revolved Seated Forward Bend Pose), Jathara Parivartan asana (Belly Twist A or Seated Spinal Twist A).

Results

Of the 110 participants, 105 responded and expressed a willingness to engage in yogic exercises for their health. Five participants were excluded for not meeting the inclusion criteria. The scores of neck, shoulder and back pain before and after the exercises were analyzed using the chi-square test for categorical variables and the Student t-test for continuous variables. P-values below 0.05 were deemed statistically significant. Here we observed that after doing the exercises the dental professionals were working much efficiently than before. (Fig 3 &4)

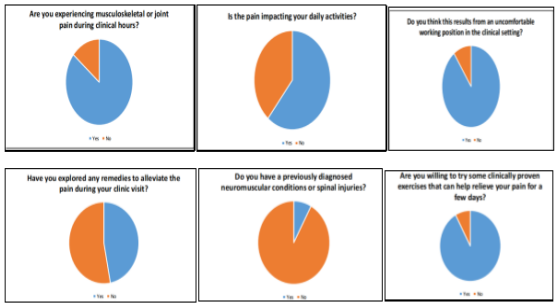

Fig 3 - Result analysis of the KAP questionnaire

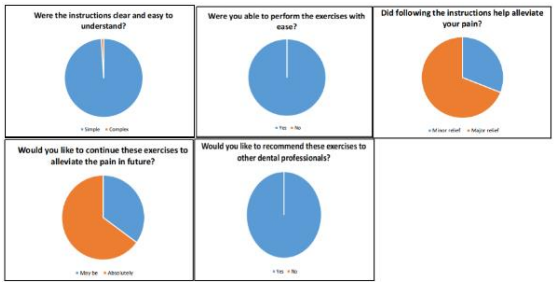

Fig 4 - Result analysis after 30 days of exercises

Discussion

Dentistry has become a vital aspect of modern self-care, offering numerous benefits while also being recognized as a physically demanding profession. The limited visual field of the oral cavity and restricted movement can lead to significant risks for low back and neck pain. Research has shown that maintaining a tense, asymmetric posture increases the likelihood of developing low back pain (LBP), while prolonged static neck positions and repetitive motions further exacerbate this risk.[4,5]

In 2015, Siddharth M. Shetty et al. examined the risk factors linked to lower back and neck pain in pediatric dentistry.

They found that pediatric dentists experience a higher incidence of neck and lower back pain compared to the general population. The authors suggested that while dentistry does not directly cause these pains, it accelerates their onset and intensifies the symptoms due to poor working posture.[1]

Alice Lai et al. reported in 2013 that self-reported musculoskeletal disorders (MSDs) among dental personnel are prevalent. They identified several work-related factors associated with musculoskeletal symptoms in different body regions.[6]

Good ergonomic practices are crucial for maintaining work capability, efficiency and high-quality patient care throughout the careers of dental practitioners. The scope of ergonomics in dentistry is broad, covering various elements such as team dynamics and environmental factors, including lighting, noise and odor.[4,10]

In 2014, Anshul Gupta et al. reviewed the importance of ergonomics in dentistry, concluding that dental professionals are vulnerable to specific muscle imbalances and require targeted exercises and ergonomic interventions to maintain optimal health throughout their careers. Understanding which interventions are effective and the sequence for their implementation is critical.[7]

Maria Giovanna Gandolfi et al. in 2024 aimed to establish a Yoga protocol for dental professionals to prevent or treat MSDs from a preventive medicine perspective. This Yoga-based guideline serves as a self-care and prevention strategy for musculoskeletal issues. Involving 60 participants, the study provided detailed guidelines for asanas aimed at relieving low back discomfort, hip joint distress, neck and shoulder pain and enhancing spinopelvic mobility. They concluded that the designed Yogasana protocol serves as an effective tool for dental professionals to alleviate tension in stiff muscles and restore balance in the musculoskeletal structures of the lower body.[9]

Conclusion

Dental professionals are susceptible to specific muscle imbalances and necessity tailored exercise and ergonomic interventions to sustain optimal health throughout their careers. It is essential to not only identify effective interventions but also to understand the appropriate sequence for their implementation. Using the clinically proven exercise protocol showed significant effectiveness in reducing musculoskeletal pain in the pediatric dental professionals. Through this study we understood the importance of relieving musculoskeletal pain. It's time we as a community should come forward and invest in self-care and protect ourselves from the professional hazards.

References

1. Shetty SM, Shetty S, Hegde A, Babu N. Prevalence of neck and back pain among Paediatric dentists, NUJHS,2015;5(1):2249-7110.
2. Boiselle PM, Levine D, Horwich PJ. Repetitive stress symptoms in radiology: prevalence and response to ergonomic interventions. J Am CollRadiol,2008;5:919-23.
3. De Sio S , Traversini V, Rinaldo F, Colasanti V, Buomprisco G, Perri R et al,. Ergonomic risk and preventive measures of musculoskeletal disorders in the dentistry environment: An umbrella review. PeerJ 2018;6:e4154.
4. Akesson I, Johnsson B, Rylander L, Moritz U, Skerfving S. Musculoskeletal disorders among female dental personnel – clinical examination and a 5-year follow-up study of symptoms. Int Arch Occup Environ Health 1999;72:395–403.

5. Ratzon NZ. Musculoskeletal symptoms among dentists in relation to work posture. Work 2000;15(3):153-8.
6. La AI, Yin K, Ballala S, Waikhin L, Ballala N, Linnaing Prevalence of musculoskeletal disorders in the dental profession in Brunei Darussalam.
7. Gupta A, Bhat M, Mohammed T, Bansal N, Gupta G. Ergonomics in Dentistry, International Journal of Clinical Pediatric Dentistry, January-April 2014;7(1):30-34.
8. Campo M, Weiser S, Koenig KL, Nordin M. Work-related musculoskeletal disorders in physical therapists:a prospective cohort study with 1-year follow-up. PhysTher 2008; 88:608-19.
9. Gandolfi MG, Fausto, Spinelli ZA, Prati C. Asana for Back, Hips and Legs to Prevent Musculoskeletal ¯ Disorders among Dental Professionals: In-Office Yóga Protocol. J. Funct. Morphol. Kinesiol. 2024;9:6.
10. Hayes M, Cockrell D, Smith DR. A systematic review of musculoskeletal disorders among dental professionals. Int. J. Dent. Hyg. 2009;7:159–165.

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Cellular Cannibalism in Oral Squamous Cell Carcinoma: An Overview

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Abstract

Cellular cannibalism" in oral squamous cell carcinoma refers to a phenomenon where cancer cells engulf and consume other cells within the tumor, often considered a marker of aggressive tumor behavior, indicating a high potential for invasion and metastasis; essentially, the cancer cells "eat" each other to survive and proliferate in harsh conditions within the tumor microenvironment. Cannibalism is a completely different entity than phagocytosis, entosis, and emeriopoliosis. It is an important morphologic feature to distinguish benign from malignant lesions. Cannibalism has been described in various cancers such as, bladder cancer, breast cancer, lung cancer, etc, and this is related with the aggressiveness of the malignancy.

Keywords: *Cannabalistic, Malignancy, Phagocytosis*

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Introduction

Cellular cannibalism, defined as the process where one cell engulfs another of the same type, has emerged as a significant hallmark of malignancy, particularly in oral squamous cell carcinoma (OSCC). This phenomenon is not merely an aberration but a complex and adaptive behaviour that may play crucial roles in cancer biology. Understanding cellular cannibalism in OSCC is vital for developing more effective treatment strategies and improving patient outcomes. This review aims to provide an in-depth overview of the biological significance, underlying mechanisms, and clinical implications of cellular cannibalism in OSCC, along with future directions for research in this area.

Biological Significance of Cellular Cannibalism

Cannibalistic cells, also referred to as cell-in-cell (CIC) structures, are frequently observed in various malignancies, including OSCC (Fig 1).[1] Studies have shown that the presence of these structures correlates with higher tumour grades, increased metastatic potential, and poorer prognosis for patients.[2,3]

The phenomenon of cellular cannibalism is particularly significant in OSCC for several reasons:

1. Survival Advantage

In the context of tumour biology, cellular cannibalism offers a substantial survival advantage to cancer cells. By engulfing and digesting neighbouring cells, particularly in

nutrient-deprived microenvironments, OSCC cells can scavenge essential nutrients and energy sources. This nutrient acquisition is crucial for their growth and proliferation (Fig 2).[4]

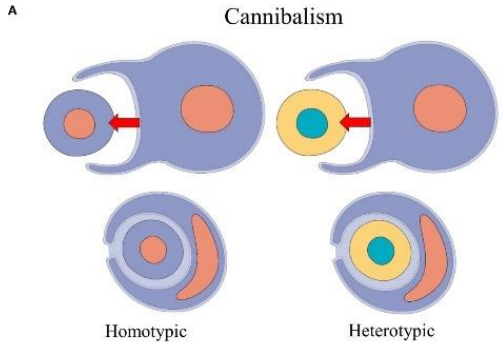

Fig 1: Cellular cannibalism in OSCC.

In solid tumours, where the availability of oxygen and nutrients can be limited due to aberrant blood vessel formation, cannibalistic behaviour allows cancer cells to survive under harsh conditions. This behaviour has been observed in various studies, highlighting that OSCC cells with higher levels of cannibalism exhibit increased resilience against nutrient scarcity.[5-7]

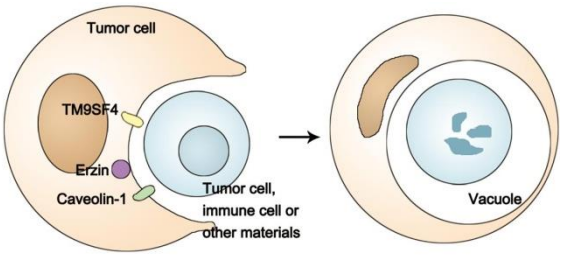

Fig 2: Nutrient acquisition through cellular cannibalism in cancer cells.

2. Immune Evasion

Another critical aspect of cellular cannibalism in OSCC is its role in immune evasion. Cancer cells can engulf immune cells, such as lymphocytes, thereby effectively eliminating a key component of the host's immune response. This ability to evade immune surveillance not only promotes tumour growth but also contributes to the overall aggressiveness of the cancer.

Studies have indicated that cannibalistic cancer cells may utilize engulfed immune cells to mask their own antigenic properties, thereby escaping detection by the immune system.[7,8] This capability poses a significant challenge in the treatment of OSCC, as traditional therapies often rely on an intact immune response to be effective.

3. Genetic Diversity

Cellular cannibalism can also contribute to genetic diversity within tumours. By incorporating genetic material from engulfed cells, OSCC cells can increase their genetic variability. This variability is advantageous for tumour adaptation, allowing cancer cells to evolve and resist therapeutic interventions.[9]

Moreover, this genetic mixing may lead to the emergence of subclonal populations within the tumour that possess distinct survival advantages, further complicating treatment strategies. Understanding the genetic implications of cannibalism is crucial for future therapeutic approaches targeting these dynamic populations.

Recent studies have specifically linked cellular cannibalism to adverse outcomes in early-stage oral tongue squamous cell carcinoma (OTSCC). This suggests that assessing the degree of cannibalism in tumours may serve as an important prognostic marker.[10,11]

Mechanisms Underlying Cellular Cannibalism

The mechanisms that drive cellular cannibalism in OSCC are still being actively investigated, but several key pathways have been identified that facilitate this intriguing process:

1. Actin Cytoskeleton Remodelling

One of the first steps in cellular cannibalism is the significant remodelling of the actin cytoskeleton. This process is essential for the physical engulfment of other cells. Actin and myosin, two key cytoskeletal proteins, are crucial for facilitating the

morphological changes that allow a cell to extend its membrane and internalize another cell.[8,12]

This dynamic remodelling of the cytoskeleton is not only a physical alteration but also involves signalling pathways that regulate actin dynamics. Disruptions in these pathways can impact the efficiency of cannibalistic behaviour, potentially providing therapeutic opportunities to inhibit this process in OSCC (Fig 3). [13]

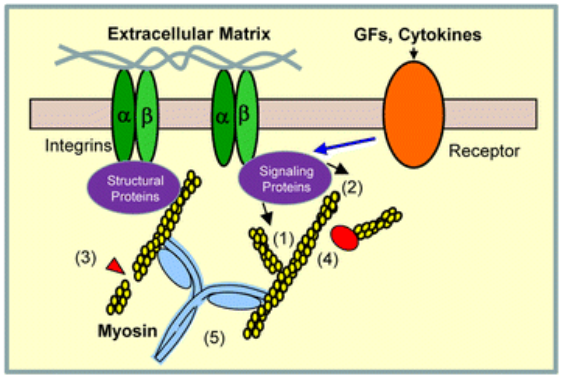

Fig 3: Role of the actin cytoskeleton

2. Adhesion Molecules

Altered expression of cell adhesion molecules is another critical factor that facilitates cellular cannibalism. Molecules such as E-cadherin and integrins play pivotal roles in mediating intercellular interactions necessary for engulfment. In OSCC, changes in the expression patterns of these adhesion molecules can promote the binding and internalization of surrounding cells.[12]

The manipulation of these adhesion pathways may serve as a therapeutic target, allowing for the development of strategies aimed at preventing cellular cannibalism and its associated advantages.

3. Autophagy Pathways

Cannibalism is closely linked to autophagy, a cellular process involved in degrading and recycling cellular components. Proteins such as LC3 and Beclin-1 are essential mediators in this process. When a cancer cell engulfs another cell, it can utilize autophagic machinery to break down the internalized material, effectively utilizing it for its own survival.[14]

Understanding the interplay between cannibalism and autophagy could reveal new therapeutic targets that disrupt this process, potentially limiting the growth of OSCC.

4. Signalling Pathways

Signalling pathways such as PI3K/AKT and mTOR are critical regulators of cellular survival and metabolism in cancer. These pathways modulate the metabolic adaptation of cancer cells, enabling them to thrive in challenging environments.[7,14]

Research indicates that these pathways may also regulate cannibalistic behaviour, further underscoring their importance in the pathology of OSCC. Targeting these pathways could represent a novel approach to inhibiting cellular cannibalism.

Recent advancements in the field have utilized in vitro 3D spheroid models to provide deeper insights into the formation of CIC structures and their contributions to tumour invasiveness. These models allow researchers to observe the complex dynamics of cannibalism in a more physiological context, enhancing our understanding of the underlying molecular mechanisms.[15]

Clinical Implications

The presence of cannibalistic cells in OSCC has several important clinical implications that could influence patient management and treatment strategies:

1. Prognostic Marker

The frequency of cellular cannibalism in OSCC has been correlated with poor prognosis. Studies have shown that higher levels of cannibalism are associated with increased metastatic potential and reduced survival rates. This association makes cellular cannibalism a potentially valuable

prognostic marker for assessing the aggressiveness of OSCC.[15]

2. Therapeutic Target

Targeting the pathways involved in cellular cannibalism presents a promising therapeutic avenue. Inhibiting actin remodelling, autophagy, or adhesion molecule pathways could diminish the survival advantage conferred by cannibalistic behaviour, leading to improved treatment outcomes.

For instance, strategies that block the signalling pathways regulating actin dynamics may prevent the structural changes necessary for engulfment, thus limiting the ability of cancer cells to scavenge nutrients from their neighbours.[12]

3. Treatment Resistance

Cannibalistic behaviour in cancer cells significantly contributes to resistance against conventional therapies, including chemotherapy and radiotherapy. This resistance may stem from the nutrient-scavenging abilities of cannibalistic cells, which can enhance their survival during treatment. Furthermore, the ability to evade immune responses complicates the effectiveness of immunotherapies.

Understanding the mechanisms behind treatment resistance associated with cellular cannibalism could lead to the development of novel combination therapies that synergistically target both the cancer cells and the immune system.

Future Directions

Several promising research directions may help elucidate the full role of cellular cannibalism in OSCC:

1. Molecular Profiling

Comprehensive profiling of molecular changes in cannibalistic cells may uncover novel biomarkers and therapeutic targets. Utilizing next-generation sequencing and advanced bioinformatics techniques could facilitate the identification of unique genetic signatures associated with cellular cannibalism in OSCC.[11,14]

2. In Vivo Studies

Employing animal models and advanced in vitro systems, such as 3D tumour spheroids, will be crucial for studying the role of cannibalism in tumour progression and metastasis. These models can provide valuable insights into the dynamics of cellular interactions within the tumour microenvironment and how these interactions influence tumour behaviour.[10,15]

3. Therapeutic Interventions

Preclinical testing of inhibitors targeting pathways involved in cellular cannibalism—such as those associated with actin remodelling and autophagy—could pave the way for new treatment strategies aimed at mitigating the impact of this phenomenon on OSCC progression and therapy resistance.[7,10] Clinical trials assessing the efficacy of these targeted therapies are essential to determine their potential benefits in OSCC treatment.

Conclusion

Cellular cannibalism represents an intriguing and clinically relevant phenomenon in oral squamous cell carcinoma. Its contributions to tumour survival, immune evasion, and genetic diversity underscore its significance in the pathology of OSCC. As research continues to unravel the complexities of cellular cannibalism, there is potential for developing novel prognostic tools and therapeutic strategies. These advances may ultimately improve patient outcomes in OSCC and pave the way for more effective treatments tailored to the unique characteristics of individual tumours.

References

1. Siquara da Rocha LO, Souza BSF, Lambert DW and Gurgel Rocha CA

(2022) Cell-in-Cell Events in Oral Squamous Cell Carcinoma. *Front. Oncol*. 12:931092.
2. Gupta, K., Gupta, S., Rajwanshi, A., et al. (2017). Cellular cannibalism in cancers: Pathophysiological significance and clinical relevance. *Indian Journal of Pathology and Microbiology*, 60(4), 505-511.
3. Sharma, A., & Khanna, S. (2014). Prognostic implications of cannibalism in oral squamous cell carcinoma. *The Journal of Oral Pathology & Medicine*, 43(7), 485-489. doi:10.1111/jop.12149
4. Wang X, Li Y, Li J, Li L, Zhu H, Chen H, Kong R, Wang G, Wang Y, Hu J and Sun B (2019) Cell-in-Cell Phenomenon and Its Relationship With Tumor Microenvironment and Tumor Progression: A Review. *Front. Cell Dev. Biol*. 7:311.
5. Dey, P. (2010). Cancer cell cannibalism and tumor progression. International *Journal of Cancer*, 126(3), 1237-1242.
6. Sen, N., & Das, B. B. (2017). Cellular cannibalism in cancer: Cellular cannibalism and its significance in cancer diagnostics and prognostics. *Histology and Histopathology*, 32(4), 317-326. doi:10.14670/HH-11-858
7. Fais, S. (2007). Cannibalism: A way to feed on metastatic tumor cells. *Cancer Letters*, 258(2), 155-164.
8. Schenker, H., Büchler, C., & Hopt, U. T. (2001). Cannibalism of living cells by human pancreatic tumor cells. *Cancer Research*, 61(9), 3606-3609. Retrieved from https://cancerres.aacrjournals.org/content/61/9/3606
9. Sarode, G. S., & Sarode, S. C. (2013). Significance of cannibalism in oral squamous cell carcinoma. *The Journal of Oral and Maxillofacial Pathology*, 17(3), 408-413. doi:10.4103/0973-029X.125222
10. Chandrashekar, C., & Sreenath, G. (2012). Cell cannibalism and the role of autophagy in cancer. *Journal of Oral and Maxillofacial Pathology*, 16(2), 202-207. doi:10.4103/0973-029X.99087
11. Trivedi, T., & Shrivastava, R. (2015). Cellular cannibalism in oral squamous cell carcinoma: A study. *Journal of Cancer Research and Therapeutics*, 11(4), 726-729. doi:10.4103/0973-1482.155127
12. Kamble, R., & Mahajan, P. (2020). Cellular cannibalism: An insight into oral squamous cell carcinoma. *Journal of Oral and Maxillofacial Surgery*, 78(9), 1461-1468.
13. Tang, D.D., Gerlach, B.D. The roles and regulation of the actin cytoskeleton, intermediate filaments and microtubules in smooth muscle cell migration. *Respir Res* 18, 54 (2017).
14. Rocha, L., Teixeira, M. L., De Andrade, N. P., et al. (2023). Clinical implications of cellular cannibalism in early-stage oral tongue squamous cell carcinoma. *Histology and Histopathology*, 38(5), 899-908. doi:10.14670/HH-38-899
15. Hamann, J. C., Surcel, A., Chen, R., Teragawa, C., Albeck, J. G., Robinson, D. N., & Overholtzer, M. (2022). Entosis is induced by glucose starvation through a cell competition mechanism. *Nature Cell Biology*, 24(2), 247-257.

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Role of dentist in Disaster Management: A review

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Abstract

Natural or manmade disaster comes with the need of both manpower as well as health care and public health systems. Effective management of a disaster requires preparedness and appropriate attitude of healthcare workers. Attitude of the healthcare workers will impact their response during any emergency situation coping. Dentists and dental auxiliaries can aggrandise the existing medical professionals, in responding to a declared medical calamity. This paper aims at discussing the role of dentists in disaster management. Articles were searched in various medical databases such as Google Scholar, PubMed Central, Science direct, Scopus, EBSCO host, Sci hub to gather all relevant information. The literature search unwraps the potential of dentistry in disaster management revealing the extended roles of a dentist.

Keywords: *Dentists, Disasters, Role, Disaster Response, Mass Casualty Situations, Disaster Preparedness*.

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Introduction

If we no longer treat the deceased with respect, what hope do the living have? One A disaster is defined as "a major disruption of the functioning of a community or a society involving widespread human, material, economic, or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources," according to the United Nations Office for Disaster Risk Reduction (UNISDR).[1, 2] A disaster is an unforeseen occurrence that can be man-made, natural, or hybrid in origin and that has the potential to severely damage the environment, property, and human life.[3] Both natural and man-made calamities impact millions of people annually. Explosions, earthquakes, floods, hurricanes, tornadoes, and flames are examples of disasters.[3] When a crisis strikes, people must the risk of physical harm or death. They might also lose their community, house, and belongings.4. They run the danger of developing mental and physical health issues because of these pressures.[4]

Following a tragedy, stress reactions resemble the typical reactions observed following any kind of trauma. A wide range of emotional and physical responses can be triggered by disasters. Along with triggers or reminders of the trauma, you could also react to issues that arise after the incident.[4]

Disaster management, according to UNISDR, is the preparation, execution, and coordination of actions in anticipation of,

responding to calamities and beginning the process of recovery.[2] Disaster response, disaster preparedness, and disaster mitigation are the three main facets of disaster management.[5]

- After a disaster strikes, response is the series of actions taken to determine needs, alleviate suffering, stop the crisis's spread and effects, and pave the road for recovery.[6]
- The actions that guarantee the systematic mobilization of people, money, supplies, and equipment in a secure setting for efficient relief are known as preparedness measures.[6]
- Mitigation is the long-term lowering of a disaster's risk. Reducing the hazard's resistance and vulnerability is known as primary mitigation. Secondary mitigation is the process of lessening the impact of the risk (preparation).[6]

During their pre-doctoral training, dentists in India and outside receive medical and surgical training that equips them to handle emergencies.[3] Additionally, they receive training on how to manage medical emergencies in hospitals and dental offices, including minor surgery, medication administration, injections, and anesthesia.[3] Furthermore, forensic odontology and the support of dental members in Disaster Mortuary Operational Response Teams have been the main roles that dentists have performed in catastrophes.[3] Due to their invaluable skills, dentists are also employed in the military.[3] Thus, the purpose of this essay was to educate readers about different types of catastrophes and the part dentists play in disaster relief.

Levels of Disasters:

Level-L1: administered within the district's resources and competencies. The state authorities are still prepared to help, though, if necessary.[2]

Level-L2: call for support, proactive state-level resource mobilization, and the establishment of state-level disaster management agencies. The main agencies keep an eye out for prompt deployment if the state calls for it.[2]

Level-L3: a situation that is almost catastrophic or a massive calamity that overwhelms the State and local authorities.[2]

Objectives of Disaster Management:

- Minimize (prevent, if at all feasible) the possible loss due to risks.
- Ensure victims receive timely and appropriate assistance when needed.
- Make a quick and long-lasting recovery.[2]

Emergency: is a situation where extraordinary steps are made to prevent a calamity and regular procedures are suspended. It is possible to characterize an emergency in terms of the social, political, and epidemiological conditions around it.[6]

Response: is the collection of actions taken following a disaster to determine needs, lessen suffering, stop the disaster's spread and effects, and pave the path for rehabilitation.

Rehabilitation: is the return of fundamental social roles.[6]

Reconstruction: The probability of a disaster is permanently decreased when mitigation is fully resumed. Reducing vulnerability and the hazard's resistance is known as primary mitigation. Secondary mitigation is the process of lessening the impact of the risk (preparation).

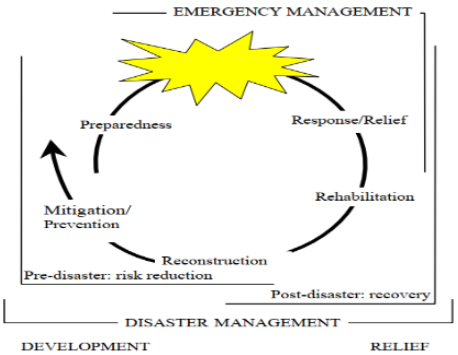

Fig 1: Disaster Management cycle

Recognizing that disasters will happen, attempting to lessen their negative impacts, and limiting their influence on human suffering, financial resources, socioeconomic activity, and preventive efforts are all part of mitigation.[6]

Preparedness: are the steps that guarantee the planned mobilization of people, money, supplies, and equipment in a secure setting for efficient relief. Building up capabilities prior to a crisis scenario occurring in order to lessen its effects is known as disaster preparedness. Food reserves, emergency funds, seed reserves, health facilities, warning systems, logistical infrastructure, relief manuals, and project shelves are only a few of its initiatives.

Major Disasters in India: The Bhopal Gas Disaster in 1984, the Gujarat earthquake in 2001, the Indian Ocean tsunami in 2004, 2008: Attacks in Mumbai Floods in Uttarakhand in 2013 Floods in Jammu and Kashmir in 2014 2016: Forest fires in Uttarakhand 2018: Dust storms in India the coronavirus pandemic of 2019–20.[6]

Disaster Management Act: A National Disaster Management Plan (NDMP) for the entirety of India is required per Section 11 of the DM Act 2005. The National Policy on Disaster Management (NPDM) of 2009 and the DM Act's requirements that the Government of India and its key ministries have sufficient DM plans are both met by the proposed NDMP.[2]

Role of Dentists: Large numbers of casualties probably will not require medical attention until after a certain kind of tragedy. Since most injuries happen during the impact, the first several hours are when emergency care is most needed. Search and rescue, first aid, victim triage and stabilization, hospital treatment, and patient transfer to another hospital if required are further subdivided under mass casualty management.

Search, rescue and first-aid: The demand for search, rescue, and first aid during a large disaster is expected to be so high that organized relief organizations will only be able to cover a small portion of it. The unharmed survivors provide the most rapid assistance.[5]

Dental Surveillance: By staying informed about uncommon clinical presentations and uncommon disorders in the community, dentists can participate in an efficient monitoring network. To aid in the early discovery of a bioterrorism attack, dentists can also alert public health authorities about the existence of patients who have cutaneous, intraoral, or both types of lesions. By using timely preventative and curative measures, early diagnosis of an infectious pathogen in a community helps reduce mass mortality.[7]

Dental Offices Acting as Medical Sites: Dental offices have the necessary supplies and equipment to act as decentralized auxiliary hospitals in an emergency. If hospitals are under attack or are dangerous due to widespread infections linked to biological weapons, dentist offices with air and suction lines, X-ray equipment, and sterilizing procedures can serve as self-contained alternative medical locations. No other medical professional has a clinic as well-equipped to serve as a backup medical location in the case of a major calamity.[2]

Distribution of Medication: Following the disease outbreak, dentists can prescribe and supply the necessary drugs under the direction of public health experts. Dentists can keep an eye out for negative responses and side effects in their patients, and if needed, they can refer them to doctors for additional care. Additionally, dentists can provide information regarding the medicine, its use, adverse effects, and the patient's need for compliance.[2]

Immunization: There might not be enough doctors and nurses on hand to implement

vaccination campaigns in a constrained amount of time. Trained dentists can take part in mass vaccination campaigns as part of urgent programs. To reduce the number of possibly infected patients, dental clinics can also be thought of as immunization locations.[7]

Definitive Treatment: In addition to providing patients with various injuries with aesthetic and surgical services, oral and maxillofacial surgeons are properly trained to provide cardiopulmonary resuscitation, endotracheal intubation, and first aid. Dentists can recognize the signs and symptoms of the infectious disease that kills large numbers of people. Dentists routinely gather nasal swabs, salivary samples, and other materials for laboratory processing, which enables accurate diagnosis, treatment progress reports, and patient infection status.[2]

Triage Services: The word triage comes from the French word "triage," which means "to sort-out." It would not be feasible to treat every casualty right away during a mass casualty event due to a lack of facilities, manpower, and medical supplies. Triage must be carried out in these circumstances to prioritize the treatment plan. Therefore, without additional training, dentists can assist with various treatment techniques. Instead of screening casualties, this gives doctors more assistance in giving definite care for patients who are most in need. If necessary, dental clinics might act as triage centres, with red denoting a high priority treatment transfer, yellow denoting a medium priority, green denoting ambulatory patients, and black denoting patients who are dead or moribund.

Forensic Assistance: One thing that sets dentists apart in catastrophic situations is this. Assessing bite marks and patterned skin injuries is part of the identification of human remains for mass disaster management. using dental materials found in the analysis of the data. In the event of a natural or man-made disaster, dental identifications are crucial for victim identification. Dental practitioners are required by law to create and keep sufficient patient records. Dental records can also be used in judicial proceedings, teaching, research, and forensic cases. An essential component of dental practice is keeping thorough and accurate records.[2]

Supporting Other Health Professionals: Informing the local emergency response planners about the services provided by the dental profession during a crisis is the duty of private practitioners and local dental associations. When local medical resources are insufficient to handle the growing number of patients, dentists can be hired to perform certain services that only doctors can perform. Until another team of doctors can arrive or the need for urgent care subsides, dentists can increase the local medical system's surge capacity.[7]

Infection Control: They may contribute their experience to mass casualty scenarios and are well-versed and trained in asepsis. Dentists can assist in preventing decontamination victims of specific bioterrorism assaults, when caregivers may become infected by touch with a patient's clothing or skin surfaces. When it comes to handling the remains of victims whose deaths were caused by contagious diseases, dentists who are already experienced with disaster mortuary procedures can be helpful.[7]

Quarantine: Strict quarantine regulations should be put in place during a pandemic or following a bioterrorism incident involving a communicable agent since primary care professionals could contract the infection directly or through contact with patients who are seeking treatment. people may not infect dentists in the same way because sick people avoid seeing dentists and, if they are sick enough, miss appointments. Dentists could be asked to offer some basic medical care to those in the quarantined area.[7]

Disaster Victim Identification: In the aftermath of a large disaster, one of the most trustworthy ways to identify specific victims is through dental evidence. The jaw bone's structure or dentures of various sizes, forms, makers, and compositions may also be used to identify people who have lost all their teeth. Additionally, dental information can be used to ascertain a person's age, gender, and race. Dental abnormalities such as missing teeth, additional teeth, or an extra cusp can also serve as a crucial foundation for identifying a person. Dental problems can also provide a rapid, accurate, and trustworthy way to estimate age during emergencies.[2]

Tagging: Every patient should have a tag that includes their name, age, origin, triage category, diagnosis, and first course of therapy.[5]

Conclusion

Disasters are sudden and inevitable for any hospital or community, hospital's response to which becomes crucial to save human lives during the critical time. Attitude of health care workers towards disaster management is very important as it impacts their response during any emergency situation. Dentists can provide a valuable service to their patients and communities by providing quality information regarding possibility of attacks, after effects of these attacks and appropriate steps to be taken in response to such attacks.

References

1. Chakraborty P, Pandey A, Natarajan S, Dahal S. Awareness and perception of an Indian dental professional in context to the process and their role in disaster victim identification as a taskmaster. J Forensic Odontostomatol. 2022;40(3):34-44. Published 2022 Dec 30.
2. Syed AA, Hamid N, Khan A, Farah Z. Role of dentist in disaster management: An Indian perspective. IOSR Journal of Dental and Medical Sciences. 2020;19(6):23-26.
3. Shaluf IM. An overview on disasters. Disaster Prevention and Management: An International Journal. 2007;16(5):687-703.
4. Makwana N. Disaster and its impact on mental health: A narrative review. J Family Med Prim Care. 2019;8(10):3090-3095. Published 2019 Oct 31. doi:10.4103/jfmpc.jfmpc_893_19
5. Park K. Park's textbook of preventive and social medicine 26th ed. Banarsidas Bhanot Publishers; 2021.
6. Sena L, Kifle W. Disaster Prevention and Preparedness. Published 10.25.2006. URL-http://hdl.handle.net/123456789/1626.
7. Dutta SR, Singh P, Passi D, Varghese D, Sharma S. The Role of Dentistry in Disaster Management and Victim Identification: An Overview of Challenges in Indo-Nepal Scenario. J Maxillofac Oral Surg. 2016;15(4):442-448. doi:10.1007/s12663-016-0896-4

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Nano Technology and its relevance to Aushadha Manakam

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Abstract

In India, Ayurveda is a medical system that dates back thousands of years. Ayurveda uses a variety of metals, non-metals, and botanicals as medicines. According to Ayurveda, a number of metallic concoctions known as *Bhasma* have been used in medicine since the eighth century AD. By repeatedly using these techniques, the *Bhasma* (incinerated metals) is produced. The metals' harmful effects are not only eliminated throughout this procedure, but they are also changed into physiologically active nanoparticles. The study of incredibly small structures, which spans a wide range of topics at sizes of roughly 1 to 100 nanometres, is known as nanotechnology. The century's greatest creation, nanoparticles have created new opportunities for use in a wide range of industries

Keywords: *Bhasma, nanomedicine, drug delivery, nanotechnology*

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Introduction

One important component of the Ayurvedic medical system is the use of metallic and mineral nanomedicines. The creation and therapeutic application of nanomedicines, especially those made from metallic and mineral nanoparticles, are the main focus of *Rasashastra*, a branch of Ayurveda. These nanomedicines are made by turning metals or minerals into ashes, which are then heated repeatedly and treated with different organic compounds in order to make organically structured nanoparticles. These organometallic or organo-mineral nanoparticles are called *Bhasma* in Ayurvedic nomenclature. According to studies, these preparations are safe for ingestion by humans and show a variety of biological actions[1].

However, traditionally, the Indian scientific community has offered little assessment of Ayurvedic ideas, which has prevented Ayurveda and contemporary science from working together in a meaningful way. Despite their promising promise, this resulted in the downfall of several Ayurvedic practices, including the use of metallic and mineral nanoparticles. However, there has been a resurgence of interest in recent years, supported by more solid scientific data. It is now evident that in order to apply Ayurvedic concepts effectively, a deeper comprehension of them is necessary. A new generation of pro-Ayurvedic activists has emerged as a result of this increased knowledge, and they are striving to dismantle semantic obstacles and advance the scientific legitimacy of Ayurveda. Consequently, a bridge has been built between Ayurveda and contemporary science, enabling improved communication between the two systems while maintaining Ayurveda's distinctive methodology. The significance and possibilities of nanomedicine have only now come to light.

Although nanomedicine has several uses,

its main ones at the moment are the development of safe and efficient drug delivery systems for targeted therapy and the diagnosis of diseases that are challenging to identify using traditional techniques. Furthermore, the application of nanomedicines to investigate molecular changes and cellular motions in synthetic cells, enzymes, and genes is growing. Another way to describe nanomedicines is as tiny carrier systems that carry various chemicals, such as drugs, imaging agents, diagnostic agents, and antibodies. Because it makes it possible to create smaller, more effective drug delivery vehicles, nanotechnology is seen by researchers as a game-changing tool that can enhance treatment plans for a number of illnesses[2].

One of the main benefits of nanotechnology is its adaptability, which enables the creation of many kinds of nanomedicines, such as liposomes, dendrimers, nanoparticles, and nanocrystals, each of which is customized to fulfil particular biological requirements. Nanomedicine is a major topic of interest for both the scientific and commercial sectors, especially in the field of human health care, because it has the potential to significantly improve illness diagnosis and treatment as it develops.

History of Nanotechnology

Although nanotechnology has been around since antiquity, the field's formal development is relatively new. The scientific field of nanotechnology deals with the manipulation and control of matter at the atomic and molecular levels, usually at sizes between 1 and 100 nanometres (1 nanometre is equivalent to one billionth of a meter). An outline of the significant turning points in the development of nanotechnology may be seen below.

The fundamental ideas of nanotechnology have been around for millennia, despite the fact that the name "nanotechnology" was created considerably later. Unbeknownst to them, ancient societies used nanomaterials in a variety of ways. In the 1990s, nanomedicine became a recognized academic discipline. Researchers started looking at the potential medical uses of nanomaterials, such nanoparticles, as a result of developments in nanotechnology. The first significant advances in the application of nanotechnology in healthcare were made during this time[3].

Nanomedicine began to receive a lot of attention in the early 2000s due to its potential uses in the detection and treatment of a number of illnesses, most notably cancer. Significant advances were made as a result of the investment made in nanomedicine research by large research institutions and pharmaceutical corporations.

Nanotechnology in Ayurveda

The *Rasaratna Samuchaya* mentioned above is an elaborate ancient culmination to the latest, impending discoveries of nanoparticles. In a captivating way, it exalts *Bhasma* (ashes) properties of being able to revitalize the body, eradicate illness, counteract poison, balance the doshas, and effectively enter all the dhatus.

मृतानि लोहानि रसीभवन्ति निघ्नन्ति युक्तानि महामयांश्च ।
अभ्यासयोगाद् दृढदेहसिद्धिं कुर्वन्ति रुग्जन्मजराविनाशम् ।।

All the metals in their *Bhasma* from readily mix with parade (and such other metals). They can eradicate deadly diseases if administered properly. If they are consumed for many days regularly, they build up the body and prevent the diseases as well as senility. (R.R.S. 5/135)

लोहानां मारणं श्रेष्ठं सर्वेषां रसभस्मना ।
मूलीभिर्मध्यमं प्राहुः कनिष्ठं गन्धकादिभिः ।।
अरिलोहेन लोहस्य मारणं दुर्गुणप्रदम् ।।

It is best to perform *Marana* of *Svarna* and other metals with the help of *Parada Bhasma*. The *Marana* of such metals carried out with the assistances of herbal drugs is supposed to be medium and with the help of *Gandhak*, it is said to be inferior. However, the *Marana* of the metals if

performed with help of *Arilohas* (*Haratala*, *Manahshila* and *Anjana*, i.e. the minerals with antagonistic characters) can lead to adverse effects. (R.R.S. 5/14)

Numerous reports indicate that gold nanoparticles are driving an impressive comeback in medicinal and diagnostic applications. Researchers at Harvard Medical School have discovered that special forms of gold, platinum and all the therapeutic metals function by releasing bacteria and virus particles from the grip of crucial immune system proteins. The typical immune response is triggered by these pathogens, which alerts other immune system cells known as lymphocytes. This immune system reaction is normally restricted to the dangerous bacteria and viruses, but, occasionally, this process can go haywire, and the body itself becomes the target of the immune system, leading to autoimmune disorders. Through series of experiments, it is reinforced that gold compounds might inactivate immune system antigen presenting cells in the culture[4].

Shodhana

Shodhana is a crucial pharmaceutical intermediate procedure used to purify minerals and metals. This detoxification procedure uses both physical and chemical methods.

When defects and harmful substances are removed, the material is ready for additional processing. Since the majority of the raw materials utilized in Rasa Shastra come from the soil, there is a constant possibility of contaminants, toxins and other heterogeneous characteristics. Humans are put through the *Shodhana* procedure when using medications in order to boost their potency and get rid of their doshas. *Shodhana*, then, is a process in which a drug's undesirable or toxic qualities are eliminated and new or altered qualities are seen in addition to modifications in the drug's physical, chemical or biological characteristics.

It involves the following steps[5]:

- *Kshalana* (washing)
- *Mardana* (pounding)
- *Bhavana* (levigation)
- *Swedana* (boiling)
- *Bharjana* (frying)
- *Nirvana* (heating and dipping in certain solutions) etc.

Main Objectives of Shodhana

1. Elimination of physical & chemical impurities
2. Neutralization of toxins
3. Induce & enhance therapeutic qualities
4. To impart organic qualities.

Marana

The *Marana* process is a key step where metals and minerals are transformed into potent medicinal forms. Metals would be too poisonous and not bioavailable for the body to absorb without this step. *Marana* assists in maximizing the metals' therapeutic potential while reducing their negative effects by chemically changing them and breaking them down into a fine, powdered form[6].

The *Marana* process, which turns minerals and metals into powerful therapeutic substances. Following Shodhana (purification) and Jarana (intermediate processing), this step aims to transform metals into a form that is safe, bioavailable, and suitable for therapeutic use.

Crucial Phases in the *Marana* Procedure

1. Heating and Calcination: Usually in a *Musha* (crucible) or *Bhatti* (furnace), the cleansed metal is heated to a high temperature. The metal's physical and chemical characteristics change as a result of this extreme heat. Particularly if plant-based powders or *Dravyas* (herbal compounds) are introduced during the procedure, the metal may oxidize or react with other substances in the environment.

2. Oxidation and Reduction: Oxidation happens when a metal is heated outside, and it frequently raises the metal's melting point. Simultaneously, the metal's structure is broken down and made more fine and absorbable by reduction reactions brought on by the interaction with plant powders.
3. Repeated Heating: The procedure often calls for several heating and cooling cycles. The metal is further refined with each cycle, becoming smaller and finer. This stage is essential because it facilitates the metal's absorption into the body, lowering toxicity and enhancing therapeutic benefits.
4. Formation of *Bhasma*: The metal becomes a fine, calcined powder known as a *Bhasma* following the last heating. The Bhasma utilized in Ayurvedic remedies is this one. Compared to the raw metal, Marana is far more effective and safe for human intake due to its tiny particle size and unique chemical structure.
5. Herbal Powder Addition: To aid in the metal's transformation and strengthen its therapeutic properties, particular herbal powders are added during the *Marana* procedure. In addition to acting as catalysts for the chemical reactions that occur, these herbs aid in neutralizing any harmful qualities, resulting in a safer and more efficient finished product.

Importance of *Marana*

- Because it renders metals and minerals safe for medicinal use, the *Marana* process is essential.
- Metals would be too poisonous and not bioavailable for the body to absorb without this step.
- *Marana* assists in maximizing the metals' therapeutic potential while reducing their negative effects by chemically changing them and breaking them down into a fine, powdered form.

Amritikaran

Amritikarana literally means 'changing in to Nectar' In most of the *Rasagranthas* the definition of *Amritikarana* is explained as "*Amritikarana*" is a special procedure followed to remove the *Shista* doshas (remained toxins) from the *Mrutha Loha* (Bhasma) even after *Shodhana* and *Maranadi* procedures. In *Rasashastra* raw metals and minerals are processed by following *Shodhana* etc procedures to convert them in to body absorbable form and to remove their toxicity. Amongst these procedures *Amritikarana* play very important role in removing toxins from the *Bhasma*, which results in reduction of toxicity of metals and minerals. *Amritikarana* procedure is followed mainly for *Abhraka*, *Swarna Makshika*, *Loha* and *Tamra*[7].

The *Amritikaran* process is an advanced Ayurvedic method that makes metals and minerals safer, more powerful, and more life-enhancing. The procedure transforms the materials into potent Rasa and Rasayana remedies by neutralizing toxins and releasing their rejuvenating qualities through the use of plant-based ingredients and specific techniques. A chemical that supports health, longevity, and vitality—all of which are highly prized in Ayurvedic treatment traditions—is the result of the *Amritikaran* procedure. It is one of the primary techniques for utilizing metals and minerals for holistic wellbeing, making sure that they are both safe and efficient in fostering vitality and well-being.

Bhasma Pariksha

Bhasma Pareeksha is one of the quality control parameter mentioned in the classics for the standardization of Bhasma. These tests are helpful in the assessment of safety and efficacy of the drugs.

Relevance of Nanotechnology to Aushadh Manakam

The manipulation of matter on an atomic or molecular scale, usually between 1 and 100

nanometres, is referred to as nanotechnology. It involves developing novel materials, tools and systems with special qualities brought about by their small size and large surface area. Applications of nanotechnology are extensive and span a wide range of industries, including materials science, electronics, medicine, and energy.

Bhasma Pariksha	**Character**
Varitara, Unama,Susukshma, Dante Kachkachaabhava, Rekhapurnata,Slakshnatvam and Anjana Sannibha Pariksha	The fitness of particle size of *Bhasma*
Nishchandratvam, Amla Pariksha, Apnarbhava[8]*, Niruttha Pariksha*[9]	Presence of any free metal
Nirodhoomatva Prariksha	Fumes indicate further incineration
Niswadu	Palability
Awami	Acceptability
Susukshma Pariksha	Absorption and assimilation

Conversely, the name *Aushadh Manakam* can refer to medicinal plants or substances utilized in healing procedures and is probably derived from old Indian medical systems, especially Ayurveda or Siddha. Translated as "the source of medicinal cures" or the "treasure of medicines," "*Aushadh Manakam*" emphasizes the use of natural ingredients or remedies in traditional medicine[10].

Nanotechnology's Significance for Aushadh Manakam

Traditional medical systems like Aushadh Manakam and nanotechnology can interact in a number of significant ways, particularly when it comes to the advancement and modernization of traditional medicine. *Aushadh Manakam* can benefit from nanotechnology in the following ways:

1. **Increased Bioavailability**: - Active compounds in traditional medical herbs and treatments are sometimes big molecules or poorly soluble, making them difficult for the body to absorb. By encapsulating these active ingredients in nanoscale carriers (such as liposomes or nanoparticles), nanotechnology might enhance their bioavailability and facilitate more efficient distribution to target tissues.
2. **Targeted Drug Delivery**: By enabling more accurate delivery of herbal or medicinal components to particular bodily areas, nanotechnology might increase therapeutic impact while lowering negative effects. For example, some herbs may be used to treat inflammation, but they can more efficiently target inflammatory tissues when supplied via nanocarriers than when utilized in conventional ways.
3. **Creating Pharmaceutical Formulations:** Traditional medicines can be made more user-friendly, stable, and possibly more effective by employing nanotechnology to create new forms like gels, lotions, or even inhalable powders. This can help close the gap between traditional methods and contemporary pharmaceutical advancements.
4. **Shelf-life and stability**: Over time, the active chemicals in certain medicinal plants may deteriorate due to their sensitivity to light, air, or moisture. By encapsulating these delicate substances in protective nanoparticles, nanotechnology can improve their stability and shelf life without sacrificing the medication's effectiveness.
5. **Synergy with Contemporary Diagnostics:** Advanced diagnostic instruments that assist in identifying particular biomarkers or medical disorders can be developed using nanotechnology. Through improved comprehension of the ailment being treated and more focused application of traditional treatments, this can support Aushadh Manakam.
6. **Safety and Standardization**: Variability in the potency and quality of natural products is a problem in

traditional medicine. By guaranteeing uniform dosages and lowering the possibility of contamination, nanotechnology can assist with standardizing the preparation of medicinal plants, improving the safety and dependability of treatments[11].

7. **Eco-friendly and sustainable solutions:** Additionally, nanotechnology can support sustainable methods in the manufacturing of plant-based medicines. When harvesting and processing medicinal plants, nanomaterials may be utilized to enhance extraction procedures, cut waste, and lessen the environmental impact.
8. **Nanocapsules for Drug Delivery**: Some plant-based medications, such as curcumin (found in turmeric), are not well absorbed by the body. This is an example of how nanotechnology is being used in herbal medicine. Curcumin's bioavailability and therapeutic potential can be greatly increased by delivering it via nanocapsules. The purpose of nanoemulsions is to increase the solubility and absorption of hydrophobic plant extracts, such as essential oils, to make them more useful in treating illnesses like digestive or skin ailments.

In conclusion, there is a lot of promise for enhancing the effectiveness, security, and accessibility of herbal medications through the incorporation of nanotechnology with conventional therapeutic approaches like Aushadh Manakam. Nanotechnology can help modernize conventional healing methods and provide more powerful, efficient treatments while conserving the knowledge of existing therapeutic systems by improving the delivery and absorption of medicinal ingredients.

Discussion

Nanotechnology has been able to lower the amount of medicine that must be loaded, it can prevent a variety of dose-related side effects. This will also aid in addressing the safety concerns and efficacy of Ayurvedic medications and formulations. Different Physical and chemical Bhasma Pariksha is also utilized to evaluate the authenticity of the specimen.

Conclusion

Ayurvedic Medicine preparations and *Bhasma's* are the best example of Nano technology & Nano medicine practiced during the ancient period. Shata puta, Sahasra puta Bhasma's are the indirect reference for the concept of conversion of drug to Nano medicine. Ancient knowledge of *Bhasmeekarana* may cover the current scientific validation of Nano Technology.

Referneces

1. Mohaptra S, Jha CB. Physicochemical characterization of Ayurvedic bhasma (Swarna makshika bhasma): An approach to standardization. Int J Ayurveda Res. 2010;1:82–6. doi: 10.4103/0974-7788.64409
2. Pal D, Sahu CK, Haldar A. Bhasma : The ancient Indian nanomedicine. J Adv Pharm Technol Res. 2014 Jan;5(1):4-12. doi: 10.4103/2231-4040.126980. PMID: 24696811; PMCID: PMC3960793.
3. Kaviratna AC, Sharma P. Vol. 5. Delhi, India: Sri Satguru Publications, A Division of Indian Books Centre; 1997. tr., The Charaka Samhita. Indian Medical Science Series. 81- 7030-471-7.
4. Sarkar, P.K., Chaudhary, A.K.: Ayurvedic Bhasma: the most ancient application of nanomedicine. J. Sci. Ind. Res. 69, 901–905 (2010) 31. Prajapati, P.K., Sarkar, P.K., Nayak.
5. Sharma sadananda, rasa Tarangini, motilal banarasi das publication, varansi{SHODHAN STEPS}
6. Wadekar MP, Rode CV, Bendale YN, Patil KR, Gaikwad AB, Prabhune AA.

Effect of calcination cycles on the preparation of tin oxide based traditional drug: Studies on its formation and characterization. J Pharm Biomed Anal. 2006;41:1473–8. doi: 10.1016/j.jpba.2006.03.032
7. Pandey, Om; Bedarkar, Prashant; Patgiri, Biswajyoti. Amrutikarana of Ayurvedic Metallic Preparations: A Systemic Review. Journal of Ayurveda 16(2):p 147-153, Apr–Jun 2022. | DOI: 10.4103/joa.joa_260_20.
8. Verma D, Tiwari SS, Srivastava S, Rawat A. Pharmacognostical evaluation and phytochemical standardization of Abrus precatorius L. seeds. Natural Product Sciences. 2011;17:51–7.
9. Sarkar PK, Chaudhary AK. Ayurvedic Bhasma: The most ancient application of nanomedicine. J Sci Ind Res. 2010;69:901–5.
10. Bhowmick TK, Suresh AK, Kane SG, Joshi AC, Bellare JR. Physicochemical characterization of an Indian traditional medicine, Jasada Bhasma: Detection of nanoparticles containing non-stoichiometric zinc oxide. J Nanopart Res. 2009;11:655–64.
11. S.V., Joshi, R.D., Ravishankar, B.: Safety and toxicity profle of some metallic preparations of Ayurveda. Anc. Sci. Life. 25(3), 57–66 (2006)

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Intraoral Scanners for Complete Dentures: A Review of Literature

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Abstract

For many years, complete dentures have stood as a cornerstone of restorative dentistry, offering a vital solution for individuals dealing with edentulism, ultimately enhancing their oral health and overall quality of life. The traditional approach to crafting complete dentures involves a series of labor-intensive steps, including impressions, and often results in time-consuming processes and potential inaccuracies. Intraoral scanners have recently emerged as a groundbreaking technology within the dental field, revolutionizing the entire process of fabricating complete dentures. In this review, we delve into the current landscape of intraoral scanners for complete dentures. The types of intraoral scanners along with the technologies used, methods of scanning the edentulous arches, examining the advantages, and addressing associated challenges are discussed. In the end, we have also shed some light on their future potential to reshape denture treatment.

Keywords: *Complete dentures, Intraoral Scanner, Oral Health, Restorative Dentistry, Quality of life*

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Introduction

Complete dentures are essential for restoring both oral function and aesthetics in individuals who have lost all their natural teeth. The precision of impressions holds paramount importance, as it directly influences the ability of denture bases to provide both secure retention and stable support within the oral cavity[1]. The conventional approach to complete denture fabrication relies on physical impressions, which can be uncomfortable for patients and prone to inaccuracies[2]. In recent years, intraoral scanners have gained momentum as a modern alternative for creating complete dentures. These digital impressions are then used for a wide range of applications, including implant planning, and complete denture fabrication.[3]

Discussion

Categories, Principles, and Operating Characteristics of Intraoral Scanners

Presently, the market offers a range of prominent intraoral digital impression systems, with notable options like CEREC, Lava C.O.S. system, iTero, E4D, and TRIOS.[3]. These systems distinguish themselves based on critical characteristics, including their underlying operational principles, light sources, requirements for

powder coat application, workflow procedures, and the format of output files.

CEREC system- Presently, the predominant CEREC system in use is its fourth-generation offering, recognized as CEREC AC Bluecam. This system utilizes visible blue light, which is radiated from a blue LED, as its illumination source for capturing images. Notably, CEREC AC Bluecam exhibits impressive efficiency, enabling the acquisition of digital impressions for a single quadrant within a mere minute and capturing antagonist impressions in a matter of seconds.

In 2012, the latest addition to the CEREC lineup, CEREC AC Omnicam, entered the market. Omnicam employs a continuous imaging technique, where successive data collection processes result in the creation of a comprehensive 3D model.[4] In contrast, Bluecam utilizes a single-image acquisition method. Omnicam stands out for its versatility, as it can scan a single tooth, a quadrant, or even an entire arch. Noteworthy features of Omnicam include its powder-free scanning capability and the ability to produce highly precise 3D images with natural color rendition. This powder-free attribute is particularly advantageous when scanning larger areas.[4]

Lava C.O.S. system- The LavaTM C.O.S. (Lava Chairside Oral Scanner), developed by 3M ESPE in Seefeld, Germany, represents an intraoral digital impression technology introduced in 2008, following its invention in 2006. This innovative system operates on the principle of active wavefront sampling, a method that involves capturing three-dimensional data using a single-lens.[5]

The core concept of active wavefront sampling revolves around the simultaneous acquisition of clinical images from various angles by three sensors. These sensors, working in harmony, utilize proprietary image-processing algorithms to create surface patches that encompass both in-focus and out-of-focus data. Impressively, the Lava C.O.S. can capture a remarkable twenty 3D datasets per second, resulting in over 10,000 data points in each scan.[6]

iTero system- Utilizing laser and optical scanning, the iTero system maps intraoral surfaces and contours based on the principle of parallel confocal imaging. This technology gathers an extensive dataset of roughly 100,000 laser points, with each point encompassing 300 focal depths through the tooth structure.[7]

In a single scan, the iTero system captures focal depth images, which are distinctly spaced at intervals of approximately 50 µ.[8] This precision enables the camera to gather accurate data regarding tooth surfaces. Notably, the parallel confocal scanning technology utilized by the iTero system allows for the comprehensive capture of all oral structures and materials, eliminating the need for applying scanning powders.[9,10]

E4D system- Developed by D4D Technologies in Richardson, Texas, the E4D system utilizes the principles of optical coherence tomography and confocal microscopy.[11] It uses a crimson laser for illumination and incorporates micro-mirrors that oscillate at an impressive rate of 20,000 rotations per second**.**

The E4D system employs a high-speed laser to produce digital impressions of prepared and adjacent teeth, creating an interactive 3D image.[12] This technology captures views from multiple angles, enabling the creation of a detailed image database that can be rapidly integrated into an accurate virtual model within seconds. Additionally, the E4D operates as a powder-free intraoral scanner.

TRIOS system- In 2010, a company based in Copenhagen, Denmark, known as 3Shape, unveiled an innovative digital intraoral impression system named TRIOS.

This system was launched in the market in 2011. The functioning of TRIOS is based on the concepts of ultrafast optical sectioning and confocal microscopy. This advanced technology involves the recognition of focus plane variations within a specific range while having a constant spatial relation between the scanner and the scanned object.[12]

The system boasts exceptional scanning speed, acquiring up to 3,000 images per second, which minimizes the impact of movement between the scanning probe and the teeth.[12] By processing this large volume of images, TRIOS rapidly produces a final 3D digital model that accurately reflects the teeth's structure and gingival color. Like the iTero and E4D systems, TRIOS is powder-free, enhancing both user convenience and efficiency

Scanning Strategy for Complete Dentures

Various scanning techniques are utilized for capturing impressions of the oral ridge, each with its distinctive approach:[13]

a. **B-O-P (Buccal-Occlusal-Palatal):** The process starts in the posterior area, continues along the buccal side of the ridge, moves to the opposite side, then returns along the occlusal surface, and finally scans the palatal or lingual side.[14]
b. **P-O-B (Palatal-Occlusal-Buccal):** This technique starts at the back, and proceeds by scanning the ridge's palatal or lingual side, moves back along the biting surface, and finishes with a scan of the buccal side.
c. **O-B-P(Occlusal-Buccal-Palatal):**[15,16] The procedure initiates at the posterior segment, scanning the occlusal facet of the ridge towards the other side, retracing along the buccal aspect, and ultimately scanning the palatal or lingual aspect.
d. **O-P-B (Occlusal-Palatal-Buccal):**[17] The scan starts in the posterior region, proceeds along the occlusal surface to the opposite side, returns via the palatal or lingual surface, and finishes with the buccal aspect
e. **ZZ-P (Zig-Zag-Palatal):**[18] Starting from the posterior on the occlusal surface, this approach alternates between occlusal and buccal scans in a zigzag path along the ridge, ending with the surface adjacent to the palate or tongue.
f. **ZZ (Zig-Zag):**[18] For the mandible, the zig-zag technique initiates posteriorly on the buccal side, alternating between buccal, occlusal, and lingual aspects while progressing along the ridge. In the maxillary arch, the process starts at the posterior buccal side, traverses the palate to the opposite side, follows a zigzag path to scan the full arch, and finishes at the anterior region

These distinct approaches offer flexibility in capturing comprehensive impressions of the oral ridge, catering to various clinical scenarios and patient needs.

Current Applications of Intraoral Scanners in Complete Dentures

Duplication of Complete dentures- The intraoral scanner can be employed to scan both the cameo and intaglio surfaces of the denture, while simultaneously superimposing the area representing the denture margin from the inter-occlusal imaging. After making slight adjustments such as connecting and smoothing the scanned data using CAD software, the process of duplicating the denture can be accomplished. This innovative technique streamlines the duplication of dentures, significantly reducing the time required compared to traditional methods and introducing a fresh approach to denture fabrication.[19]

Digital record-keeping: In conventional techniques, the impressions of any patient cannot be stored after the fabrication of complete dentures. Using the intra-oral scanners, it is possible to keep the digital impression records of the patients, so that whenever in the near term, the patients lose their dentures or have their dentures damaged, it is fairly easy to simply refabricate those dentures.[20]

Combination with conventional technique for compromised ridges- For edentulous patients with mobile tissues in the anterior maxilla, a two-step approach can be employed to create definitive complete dentures. First, an intraoral scanner can be used to capture an anatomic impression of the maxilla without applying any pressure. Then, a traditional closed-mouth impression method can be utilized to obtain a functional impression. The final complete dentures can be meticulously crafted by combining the data from both impressions, resulting in an effective solution for this specific clinical scenario.[21]

Advantages of Intraoral Scanners for Complete Dentures

a. Patient Comfort: Intraoral scanners eliminate the need for traditional impression materials, making the process more comfortable for patients, especially those with a persistent gag reflex.
b. Precision: Digital impressions are highly accurate and reduce the risk of errors, resulting in better-fitting complete dentures. As more advanced intraoral scanning devices have been introduced, the level of accuracy in direct digital data acquisition has significantly improved, with reported minor deviations as small as 125 μ.[22]
c. Time Efficiency: Intraoral scanning significantly reduces chairside time, as it eliminates the need for material setting and removal, impression tray adjustments, and shipping impressions to laboratories. The digital impression of the maxillary arch can be completed in around 2 minutes, whereas the mandibular arch can require a little longer period, around 5 minutes.[23]
d. Improved Communication: The ability to promptly share digital impressions with dental laboratories facilitates improved interaction and collaboration between dentists and technicians.
e. Enhanced Aesthetics: Intraoral scanners provide a unique opportunity for the customization of denture aesthetics, offering a digital platform for precisely tailoring the visual aspects of teeth and gums. This technology allows dental professionals to meticulously design and fine-tune the appearance of the dentures, ensuring that they align seamlessly with the patient's preferences and natural oral characteristics. This level of customization not only enhances the esthetic outcome of the dentures but also contributes to improved patient satisfaction and a more natural-looking smile.[24]

Challenges and Limitations

a. Cost: The acquisition and maintenance costs associated with intraoral scanners can be substantial, and these financial considerations may pose significant challenges for smaller dental practices. Consequently, the potential limitations in terms of financial accessibility can deter such practices from readily incorporating this technology into their operations.[25]
b. Learning Curve: The successful utilization of intraoral scanners by dentists and dental technicians necessitates comprehensive training, a factor that can potentially impede the pace of their widespread adoption in the field of dentistry.[26,27]
c. Scanning Limitations: Intraoral scanners may face challenges when scanning edentulous arches with irregular anatomy, leading to potential inaccuracies. Scanning of the

mandibular denture did face challenges, as it could not accurately replicate ideal border extensions.[28,29]

d. Data Security: Ensuring the security of patient data is crucial when using digital impressions, as they are susceptible to cyber threats. The privacy of the patient data is also in question, as the companies that store the data are susceptible to data leaks. Hence, strong privacy protection policies should be adopted by the companies so both the practitioner as well as the patient can perform scans with peace of mind.[30,31]
e. Equipment Reliability: The reliability of intraoral scanning devices, including their resistance to moisture and wear, can impact the success of complete denture fabrication.

Future Prospects

a. Democratization: With the progression of technology it is anticipated that the prices of intraoral scanners will fall, thereby making them more affordable and accessible to dental practitioners.
b. Integration with CAD/CAM: Combining intraoral scanners with computer-aided design and manufacturing (CAD/CAM) systems can greatly enhance and streamline the complete denture fabrication process. This technological integration enables a smooth digital workflow, beginning with the accurate capture of intraoral data via the scanner.[32]
   Once the digital impressions are obtained, they can be directly transferred to CAD software, where dental professionals can design the dentures with meticulous precision. This digital design phase not only enables fine-tuning of the denture's fit, aesthetics, and functionality but also allows for swift and efficient modifications if needed.[33]
c. Improved Predictability and Accuracy: AI-driven software may further improve, and computational algorithms will get even better at predicting compromised ridges, or mandibular ridges.
d. Teledentistry: Intraoral scanners have the potential to play a pivotal role in the realm of teledentistry by facilitating remote consultations and treatment planning, particularly in fabrication of complete dentures. Detailed intraoral images and impressions can be captured at their location, transmitted to dental professionals for analysis and assessment. This capability not only bridges geographical barriers but also allows for timely and informed decision-making regarding. Dental practitioners can remotely evaluate the scans, collaborate with patients, and devise comprehensive treatment plans, which contribute to more accessible and efficient complete denture care, even from a distance.[34,[35

Conclusion

The introduction of intraoral scanners represents a transformative phase in the realm of complete denture fabrication, presenting a multitude of benefits including heightened precision, enhanced patient comfort, and efficient time utilization. Despite persisting challenges and limitations, the ongoing evolution of technology and wider acceptance of this technology are poised to stimulate further breakthroughs within the domain. It is foreseeable that intraoral scanners will evolve into an indispensable instrument in the development of complete dentures, ultimately serving as a boon for dental practitioners and their patients.

References

1. Rao S, Chowdhary R, Mahoorkar S. A systematic review of impression technique for conventional complete denture. The Journal of Indian Prosthodontic Society. 2010;10(2):105-11.

2. Nedelcu R, Olsson P, Nyström I, Rydén J, Thor A. Accuracy and precision of 3 intraoral scanners and accuracy of conventional impressions: A novel in vivo analysis method. Journal of dentistry. 2018;69:110-8.
3. Ting-shu S, Jian S. Intraoral digital impression technique: a review. Journal of Prosthodontics. 2015;24(4):313-21.
4. Birnbaum NS, Aaronson HB, Stevens C, Cohen B. 3D digital scanners: a high-tech approach to more accurate dental impressions. Inside Dentistry. 2009;5(4):70-4.
5. Rohaly J, Hart DP, Brukilacchio TJ, inventors; 3M Innovative Properties Co, assignee. Three-channel camera systems with non-collinear apertures. United States patent US 7,372,642. 2008.
6. COS LC. 3M ESPE Technical Datasheet, St. Paul, MN. 2009.
7. Att W, Witkowski S, Strub JR, editors. Digital workflow in reconstructive dentistry. Quintessenz Verlag; 2021.
8. Garg AK. Cadent iTero's digital system for dental impressions: the end of trays and putty?. Dental implantology update. 2008;19(1):1-4.
9. Kachalia PR, Geissberger MJ. Dentistry a la carte: in-office CAD/CAM technology. Journal of the California Dental Association. 2010;38(5):323-30.
10. Kim SY, Kim MJ, Han JS, Yeo IS, Lim YJ, Kwon HB. Accuracy of dies captured by an intraoral digital impression system using parallel confocal imaging. International Journal of Prosthodontics. 2013;26(2).
11. Galhano GÁ, Pellizzer EP, Mazaro JV. Optical impression systems for CAD-CAM restorations. Journal of Craniofacial Surgery. 2012;23(6):e575-9.
12. Logozzo S, Franceschini G, Kilpelä A, Caponi M, Governi L, Blois L. A comparative analysis of intraoral 3D digital scanners for restorative dentistry. Internet J Med Technol. 2011;5(1):1-2.
13. Jamjoom FZ, Aldghim A, Aldibasi O, Yilmaz B. Impact of intraoral scanner, scanning strategy, and scanned arch on the scan accuracy of edentulous arches: An in vitro study. The journal of prosthetic dentistry. 2023.
14. Chang TA, Zhao YJ, Yu Chun SU, Di Heng M, Qiu Fei XI, Pan SX. Accuracy of Intraoral Scanning of Edentulous Jaws with and without Resin Markers. Chinese Journal of Dental Research. 2020;23(4).
15. Jung S, Park C, Yang HS, Lim HP, Yun KD, Ying Z, Park SW. Comparison of different impression techniques for edentulous jaws using three-dimensional analysis. The Journal of Advanced Prosthodontics. 2019;11(3):179-86.
16. Zarone F, Ruggiero G, Ferrari M, Mangano F, Joda T, Sorrentino R. Comparison of different intraoral scanning techniques on the completely edentulous maxilla: An in vitro 3-dimensional comparative analysis. The Journal of Prosthetic Dentistry. 2020;124(6):762-e1.
17. 3Shape. TRIOS® Module User Manual. TRIOS-1.18.5-S-EN. Available at: https://3shape.widen.net/view/pdf/vdaf6vgd5g/TRIOS-Module-UserManual-1.18.5-C-EN.pdf?t.download=true&u=6xmdhr. Accessed September 04, 2023.
18. Fang JH, An X, Jeong SM, Choi BH. Development of complete dentures based on digital intraoral impressions—case report. journal of prosthodontic research. 2018;62(1):116-20.
19. Oyamada Y, Yonezawa Y, Kondo H. Simple duplication technique of complete denture using an intraoral scanner. Journal of Prosthodontics. 2021;30(5):458-61.
20. Goodacre BJ, Goodacre CJ. Using Intraoral Scanning to Fabricate

Complete Dentures: First Experiences. International Journal of Prosthodontics. 2018;31(2).
21. Park SY, Yun Y, Park C, Yun K. Integration of an intraoral scan and a conventional impression for fabricating complete dentures for a patient with flabby tissues. The Journal of Prosthetic Dentistry. 2023.
22. Goodacre BJ, Goodacre CJ, Baba NZ. Using Intraoral Scanning to Capture Complete Denture Impressions, Tooth Positions, and Centric Relation Records. International Journal of Prosthodontics. 2018;31(4).
23. Patzelt SB, Vonau S, Stampf S, Att W. Assessing the feasibility and accuracy of digitizing edentulous jaws. The Journal of the American Dental Association. 2013;144(8):914-20.
24. Monaco C, Ragazzini N, Scheda L, Evangelisti E. A fully digital approach to replicate functional and aesthetic parameters in implant-supported full-arch rehabilitation. journal of prosthodontic research. 2018;62(3):383-5.
25. Resnick CM, Doyle M, Calabrese CE, Sanchez K, Padwa BL. Is it cost effective to add an intraoral scanner to an oral and maxillofacial surgery practice?. Journal of Oral and Maxillofacial Surgery. 2019;77(8):1687-94.
26. Róth I, Czigola A, Joós-Kovács GL, Dalos M, Hermann P, Borbély J. Learning curve of digital intraoral scanning–an in vivo study. BMC oral health. 2020;20(1):1-7.
27. Al Hamad KQ. Learning curve of intraoral scanning by prosthodontic residents. The Journal of prosthetic dentistry. 2020;123(2):277-83.
28. Unkovskiy A, Wahl E, Zander AT, Huettig F, Spintzyk S. Intraoral scanning to fabricate complete dentures with functional borders: a proof-of-concept case report. BMC oral health. 2019;19(1):1-7
29. Zimmermann M, Mehl A, Mörmann WH, Reich S. Intraoral scanning systems-a current overview. International journal of computerized dentistry. 2015;18(2):101-29.
30. Verizon Data Breach Investigations Report.verizon.com/business/resources/T794/reports/2023-data-breach-investigations-report-dbir.pdf. Accessed September 04, 2023
31. van Kessel R, Haig M, Mossialos E. Strengthening Cybersecurity for Patient Data Protection in Europe. Journal of Medical Internet Research. 2023;25:e48824.
32. Stanley M, Paz AG, Miguel I, Coachman C. Fully digital workflow, integrating dental scan, smile design and CAD-CAM: case report. BMC oral health. 2018;18(1):1-8.
33. Conejo J, Dayo AF, Syed AZ, Mupparapu M. The digital clone: intraoral scanning, face scans and cone beam computed tomography integration for diagnosis and treatment planning. Dental Clinics. 2021;65(3):529-53.
34. Jampani ND, Nutalapati R, Dontula BS, Boyapati R. Applications of teledentistry: A literature review and update. Journal of International Society of Preventive & Community Dentistry. 2011;1(2):37.
35. Ghai S. Teledentistry during COVID-19 pandemic. Diabetes & Metabolic Syndrome: Clinical Research & Reviews. 2020;14(5):933-5.

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Prosthodontic Rehabilitation of Atrophic Ridges: A Review

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Abstract

Prosthodontic rehabilitation of atrophic ridges is a critical aspect of modern dentistry, as a significant portion of the global population faces the challenges of the missing teeth or severe ridge resorption. Atrophic ridges present a complex clinical scenario, necessitating comprehensive treatment approaches to restore oral function, aesthetics, and the overall quality of life. This review article provides an overview of the current strategies and emerging trends in prosthodontic rehabilitation for atrophic ridges. It explores various treatment modalities, including removable prosthesis. Additionally, this article discusses future directions in research and technology that may shape the field of prosthodontic rehabilitation for atrophic ridges in the coming years.

Keywords: *Bone Resorption, Complete Dentures, Impression Techniques, Neutral zone, Residual Ridge, Removable prosthodontics*

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Introduction

The effectiveness of complete denture hinges on achieving three fundamental attributes: retention, stability, and support. Mandibular dentures often encounter greater challenges in attaining these attributes compared to maxillary dentures for several reasons.[1] Firstly, the mandibular ridge offers less residual ridge for both support and retention.[2] Secondly, the mandible experiences a faster rate of bone resorption compared to the maxilla. Research by Atwood and Tallgren suggests that mandibular bone resorption is four times more than that of maxilla.[3,4]

The reduction of resorbed ridge stands as a significant factor contributing to the loss of retention and stability, particularly in lower complete dentures.[5] Excessive resorption of both maxillary and mandibular ridges result in a sunken cheek appearance and leads to loss of stability and retention of dentures accompanied by patient discomfort. This presents that clinical hurdle in creating successful removable prosthetics.[6]

A classification system for edentulous jaws holds crucial importance, simplifying the depiction of residual ridges and thereby aiding communication among clinicians. Such a classification assists in selecting suitable surgical and prosthodontic techniques, establishes an objective baseline for comparing diverse treatment methods, and guides the decision-making process for preserving the alveolar process.[5]

A study conducted by Cawood and colleagues in 1988, they employed a randomized cross-sectional approach to investigate the morphological characteristics of edentulous jaws. Their research findings highlighted that the foundational basal bone undergoes minimal alterations, unless exposed to harmful local factors like the stress caused by ill-fitting dentures. Conversely, the alveolar ridge experiences significant changes in both its width and height, following an anticipated pattern.[1]

Based on these findings, Cawood and Hawell devised a classification system into six categories:

Class I: Dentate.
Class II: Immediately after extraction.
Class III: Well-rounded ridge with sufficient height and width.
Class IV: Knife-edge ridge with adequate height but insufficient width.
Class V: Flat ridge with inadequate height and width.
Class VI: Depressed ridge with noticeable basilar loss.

Treatment Modalities:

- Removable Prosthodontics:
  1) Conventional complete dentures
  2) Implant supported overdentures
- Fixed Prosthodontics:
  1) Implant retained fixed prosthesis

Conventional Complete Dentures

As the residual ridges undergo resorption, oral tissues lose their support and become prone to displacement. This necessitates modifications to conventional impression techniques, as using them would result in distorted impressions.[6] Several modified impression techniques have been proposed by various authors:

a. Flange technique by Lott and Levin (1966)
b. Dynamic Technique by Gerd Tried (1965)
c. Modified fluid wax technique (2009)
d. "Cocktail impression" by Praveen G et al (2011)
e. Two-step technique (using monophase and light body) (2012)
f. Wire impression technique by Tanvir H et al (2017)
g. Admixed impression technique
h. All green technique
i. The neutral zone technique

Flange technique by Lott and Levin (1966): This approach involves creating molds of the soft tissues surrounding the buccal, labial, lingual, and palatal areas of dentures. Following that, these impressions are incorporated into the denture fabrication process through the addition of extensions. These additions, commonly known as flanges or personalized flange modifications, are designed to match the unique structure and function of individual areas within the mouth.[7]

To initiate this procedure, begin by creating a wax flange that extends from the retromolar pad region to the sublingual area. The size of these extensions should be sufficient to compensate for anticipated resorption. Following that, guide the patient to engage in different activities such as swallowing and speaking with a degree of force. This will help create border extensions that cover a maximum surface area within the oral cavity.[7]

The primary objective of this modification is to augment the extent of close contact between the denture and the surrounding oral structures. By achieving this, the stability, functionality, comfort, and the overall appearance of complete dentures can be significantly enhanced when compared to alternative techniques.[7]

Dynamic Technique by Gerd Tried (1965): First, a custom-fabricated special tray is prepared. Subsequently, a self-curing resin is applied on the premolar-molar areas of this tray. While the thermoplastic material remains moldable, tray is placed in

patient's mouth, covering lower ridge. Then patient is directed to gently close their jaws. Throughout this procedure, the soft thermoplastic material molds an impression of the upper residual ridge, identifying the mandible's resting position. Following this, the tray is taken out of the mouth and left to cool.[8]

An appropriate amount of irreversible hydrocolloid is mixed with an additional 50% of water and is placed directly in the patient's mouth, covering all oral tissues. The tray is then firmly pressed onto the residual ridge using manual pressure until it securely aligns with the tray's stops. Subsequently, instruct the patient to gradually close their mouth, ensuring that the mandibular rests firmly engage with the maxillary region. In this stage, the patient is prompted to swallow 3-4 times with 10-seconds intervals, all while the final impression material is still pliable.[8]

Mandibular rests are vital for preventing mandible from reaching the vertical occlusion position and maintaining in its natural resting state. This method leads to the formation of a denture space registration, typically ensuring the accurate extension of the lingual flanges for the final denture.

When natural or artificial opposing teeth are in place, it's possible to utilize an existing denture for the impression process. Need to adjust the vertical dimension at occlusion, stops are strategically positioned to restore the correct height. Mandibular rests are then added to accommodate inter-occlusal distance. The impression material is placed into mouth, and impression is made. A meticulous examination of the edges is performed to detect any potential perforations resulting from the denture flanges.[8]

In a third method, the denture is initially processed using conventional techniques. Subsequently, a dynamic impression is taken using the dentures to refine the designs, followed by denture relining. It's crucial to highlight that during this procedure, "stops" are excluded from the denture base, as the vertical dimension of occlusion in the initial denture is assumed to be precise.[8]

Modified fluid wax technique by Tan *et al* (2009): To initiate this process, preliminary impression is made with alginate impression material with perforated metal stock tray. Subsequently, obtain a preliminary cast based on these impressions. A fabrication of custom trays on this preliminary cast.[9] This tray is then meticulously border molded in sections, with green stick compound. Once the border molding is completed, spacer wax is removed with scalpel blade.[9,10]

Following this step, the tray is trimmed, and space is generated over the mobile soft tissue on the ridge using a No. 8 round bur. In this phase, the impression wax is melted at oral temperature within a container immersed in a water bath kept at 42°C. Once the wax has liquefied, it is spread along the edges of the tray using a wax spatula.[11]

To record the remaining contours of the residual ridge, application of impression wax to the inner surface of the tray. At same time, administer adhesive along the area surrounding the window and ensure it dries completely before proceeding to the next step.[12]

“Cocktail impression” by Praveen G et al (2011): To initiate the procedure, start by creating an extended preliminary impression using alginate. If the patient has existing dentures, incorporate them to optimize basal seat support. Following this, custom tray is fabricated using auto-polymerizing acrylic resin, including a 1mm spacer wax. In the posterior mandibular region and construct cylindrical rests at an elevated vertical height. Then

soften high-fusing impression compound, placed on the mandibular rests and insert it in the patient's mouth.[13]

Subsequently, Ask the patient to close his mouth, ensuring that the mandibular rests make contact with the maxillary alveolar ridge. This crucial action stabilizes the tray and prevents both front-to-back and side-to-side movement during the final impression.[14]

To prepare the impression material, impression compound and green stick compound in a 3:7 weight ratio and place it in a water-filled bowl at 60°C. These materials thoroughly kneaded until it forms a uniform mass, providing approximately 90 seconds of working time. Following this, we remove the spacer wax, and the patient is guided to close mouth on the mandibular rests, capturing the functional state.[15]

After removing the impression from the mouth, cool it and reinsert it to assess pressure sensitivity within the denture bearing area by apply firm finger pressure to simulate functional loads. To ensure correct loading of the mucosa, the operator places their thumbs on the underside of the patient's mandible and applies pressure. If the mucosa has been adequately loaded, patient should only report discomfort where the thumbs press on the lower border of the mandible.[16]

Two-step technique (using monophase and light body) (2012): Making preliminary impressions using impression compound. After this, fabricate a mandibular custom tray with a 3 mm spacer and handles positioned in the region of the second premolars. The tray should be trimmed so that it remains 1 mm short of the vestibular reflections all around. Once the tray has been tried in the patient's mouth, create relief holes using a No. 10 round bur and coat the inner surface with tray adhesive[17].

Next, measure and mix equal proportions of base paste and accelerator paste on a glass slab until a uniform, monophase consistency is achieved. Load this mixture into the tray to record the denture-bearing area and adjacent soft tissues in a single step. Then, prepare another mix of equal parts base paste and accelerator paste in a light-body consistency. Fill the tray with this lighter material, seat it in the patient's mouth, and stabilize it using the stub handles. Repeat the border molding procedure while incorporating tongue movement to refine the extensions[17].

Once the material has set, remove the tray and carefully check that all required anatomical landmarks have been captured. Finally, clean and disinfect the completed impression[17].

Wire impression technique by Tanvir H et al (2017): To address the challenge of a highly resorbed mandibular ridge, a specialized impression technique was employed, utilizing an orthodontic wires and elastomeric impression materials to enhance retention and stability. Specifically, 19-gauge SS wire was carefully adapted over the mandibular ridge and fabrication of custom tray on primary cast.[18]

The initial impression was performed using a polyvinyl siloxane material with a putty-like consistency. Subsequently, a final impression was taken using a light-bodied addition silicone elastomeric impression material, and the master cast was produced by pouring die stone into the final impressions.

Admixed technique by Mccord and Tyson: The underlying philosophy here is to utilize a uniform thick mixture of impression compound and tracing compound to effectively eliminate any soft tissue folds and create a smoother surface over the mandibular bone. This approach aims to minimize potential discomfort

caused by what's referred to as 'atrophic sandwich'. The presence of creased mucosa trapped between the denture base and the mandibular bone.[19]

Take impression compound and green stick compound in a ratio of 3:7 parts by weight. These materials are then immersed in water at 60°C and thoroughly kneaded until they form a uniform mass, working time of approximately 90 seconds. After removing the spacer wax from the tray, load this uniform mass onto it, and then guide the patient to perform various tongue movements to record the precise borders. Finally, the definitive impression is achieved using a light-bodied polyvinyl siloxane material.[19,20]

All green technique: In this particular method, we create the secondary mandibular impression employing green stick compound. Carefully knead the green stick compound into a uniform mass and load it onto the specialized tray, incorporating border movements as necessary. Then, final impression is made using zinc oxide eugenol impression material.[19]

The Neutral zone technique: Initial impressions are created using impression compound. A maxillary wax rim is prepared along with a mandibular special tray. This special tray features upward projections, often called spurs or fins, designed to enhance the retention of the impression compound with the tray.[21]

Maxillary wax rim is modified according to the usual process for registering complete denture. Subsequently, the mandibular custom tray is placed in the patient's mouth. The fabrication of two occlusal pillars from self-cured acrylic on opposite sides of the mandibular arch. Pillars are adjusted to attain the correct occlusal height and establishing a customary 3mm freeway space.[22]

Around the remaining portion of the mandibular custom tray, particularly on the distal and mesial sides of the occlusal pillars, a thick mix is applied. The patient is instructed to swallow and then purse their lips, allowing for the correct molding lingual surface of the impression. Following a curing duration of 5-10 minutes, the impression is taken out of the mouth and meticulously inspected.[23]

Patient's musculature naturally shapes the thick material into a state of equilibrium. Afterwards indices are subsequently made using dental plaster or putty, and wax rim is fabricated in this space. Teeth arrangement is carried out accordingly. This approach enhances comfort, stability and retention of the denture, ensuring that it doesn't impede the functions of the lips, cheeks and tongue.[24]

These modified techniques offer the benefit of precisely capturing both the preliminary and secondary stress bearing areas while avoiding resorption of the residual ridge. One of the key advantages of these modified impression techniques is their effective controllability to attain comprehensive coverage.[25,26] These methods prove valuable in accurately assessing the extent of mucobuccal reflections and directing pressure toward the load-bearing regions, specifically targeting the buccal shelf and the slopes of the residual ridges in the mandible.[27,28]

In cases of atrophic ridges, selecting the appropriate denture teeth is crucial to ensure stability and comfort for the denture wearer. Various factors should be considered:

Neutrocentric Occlusion: In cases where posterior teeth need to be placed centrally without compromising tongue space, it's essential to follow specific guidelines. Mathematical formulas involving inter-canine width may be used to arrange maxillary posteriors. For aged patient,

mandibular posterior teeth can be placed over the buccal shelf area to provide more tongue space. [29]

Zero-Degree Teeth: Using zero-degree teeth with a monoplane articulation can enhance denture stability by minimizing cusp forms that might lead to interlocking and instability. [30]

Understanding Occlusal Guidance: Regardless of the chosen occlusal scheme, it's vital to consider that influence of condylar and anterior guidance to develop a stable denture occlusion.[31]

Weighted Dentures: Adding weight to mandibular dentures may not necessarily improve retention and stability. In fact, excessive weight could contribute to ridge resorption due to constant pressure on the residual alveolar ridge, especially at rest.[32]

Hollow Denture Technique: In excessive ridge resorption and adequate inter occlusal distance, a modified technique involving a hollow denture can help maintain the Vertical Dimension at Occlusion (VDO). Special orientation locks can ensure accurate seating of two parts of split denture, minimizing unwanted rotational forces and occlusal discrepancies.[33]

Soft Liners: The use of soft-liner has become popular due to numerous clinical advantages. Soft liners can facilitate healing of inflamed mucosa, effectively distribute functional loads, and enhance overall fit and retention of dentures. Cushioning effect provided minimizes the force transmitted to the underlying bone during various functions. Consequently, this leads to decrease in the rate of residual ridge resorption.[34,35]

Emerging Trends in Atrophic Ridge Rehabilitation: Atrophic ridges, characterized by bone loss and soft tissue deficiencies, pose significant challenges in dentistry. Emerging trends in their management hold the promise of improving treatment outcomes, patient satisfaction, and the overall quality of care.[36]

Digital Workflow: Digital dentistry, encompassing intraoral scanning, computer aided design (CAD) and computer aided manufacturing (CAM) has streamlined diagnosis and treatment planning process. Clinicians can visualize and simulate treatment outcomes more effectively, leading to improved decision-making and patient communication.[37]

Artificial Intelligence (AI): AI-driven software is being developed to assist clinicians in treatment planning, risk assessment, and outcome prediction. These tools analyze patient data, radiographs, and 3D scans to provide evidence-based recommendations, improving treatment accuracy and efficiency.[38]

Conclusion

Atrophic ridges pose unique challenges for traditional impression techniques due to the lack of tissue support and distortion. The modified impression techniques listed above represent various approaches to address these challenges and improve the accuracy in cases of resorbed ridges. Choice of technique depend on specific clinical situation, patient's anatomy, and preferences and expertise of dental professional. Keeping up to date with latest developments in impression techniques is crucial for providing optimal care for patients with atrophic ridges.

References

1. Cawood JI, Howell RA. A classification of the edentulous jaws. Int J Oral Maxillofac. Implants. 1988;3(2):69-75.
2. Yadav B, Jayna M, Yada H, Suri S, Phogat S, Madan R. Comparison of Different Final Impression Techniques for Management of Resorbed

Mandibular Ridge: *Case Reports* in Dentistry, 2014;214: 6: 25373.
3. ATWOOD DA. The problem of reduction of residual ridges. Essential of complete denture prothodontics. 1979.
4. Atwood DA (1963) Post extraction changes in the adult mandible as illustrated by microradiographs of midsagittal sections and serial cephalometric roentgenograms. J Prosthet Dent 13:810–824
5. Tallgren A. The Continuing Reduction of the Residual Alveolar Ridges in Complete Denture Wearers: A Mixed-Longitudinal Study Covering 25 years. J Prosthet Dent. 1972; 27: 120-32.
6. Krishna P, Mehra D, Prasad A. Prosthodontic Management of Compromised Ridges and Situations. INDIA, NUJHS, 2014; 4: 2249-7110
7. Lott F, Levin B. Flange technique: an anatomic and physiologic approach to increased retention, function, comfort, and appearance of dentures. The Journal of prosthetic dentistry. 1966 May 1;16(3): 394-413.
8. Tryde G, Olsson K, Jensen SA, Cantor R, Tarsetano JJ, Brill N. Dynamic impression methods. The Journal of prosthetic dentistry. 1965 Nov 1;15(6):1023-34.
9. Cso A, Michman J. Initial retention of complete mandibular dentures. The Journal of Prosthetic Dentistry. 1970 May 1;23(5):503-11.
10. Tan KM, Singer MT, Masri R, Driscoll CF. Modified fluid wax impression for a severely resorbed edentulous mandibular ridge. The Journal of prosthetic dentistry. 2009 Apr 1;101(4):279-82.
11. Klein, Ira E., and Alan S. Broner. "Complete denture secondary impression technique to minimize distortion of ridge and border tissues." The Journal of prosthetic dentistry 54.5 (1985): 660-664.
12. Klein IE, Goldstein BM. Physiologic determinants of primary impressions for complete dentures. The Journal of Prosthetic Dentistry. 1984 May 1;51(5):611-6.
13. Sharry JJ. Complete Denture Prosthodontics, ed. 2, New York, 1968.
14. Rahn AO, Heartwell CM. Syllabus of complete dentures. Lea and Febiger; 1974.
15. Praveen G, Gupta S, Agarwal S, Agarwal SK. Cocktail impression technique: a new approach to atwood's order vi mandibular ridge deformity. The Journal of Indian Prosthodontic Society. 2011 Mar; 11: 32-5.
16. Fernandes V, Singh RK, Chitre V, Aras M. Functional and esthetic rehabilitation of a patient with highly resorbed, asymmetrical residual ridge. JIPS. 2011 1:22-4.
17. Gandage Dhananjay, S., et al. "Two - step impression for atrophic mandibular ridge." Gerodontology 29.2 (2012): e1195-e1197.
18. Tanvir H, Kumar N, Singh K, Kapoor V. An Innovative Wire Impression Technique of Highly Resorbed Mandibular Ridge. Periodontics and Prosthodontics. 2017;03(01).
19. Yadav B, Jayna M, Yadav H, Suri S, Phogat S, Madan R. Comparison of different final impression techniques for management of resorbed mandibular ridge: a case report. Case reports in dentistry. 2014 Aug 10;2014.
20. Jain V, Prakash P, Udayshankar V. Impressing for excellence: special impression techniques for compromised ridges: case report.
21. Ohkubo C, Hanatani S, Hosoi T, Mizuno Y. Neutral zone approach for denture fabrication for a partial glossectomy patient: A clinical report. J Prosthet Dent 2000; 84: 390– 393.
22. Fahmy FM, Kharat DU. A study of the importance of the neutral zone in complete dentures. Journal of Prosthetic Dentistry. 1990 Oct 1;64(4):459-62.
23. Alfano SG, Leupold RJ. Using the neutral zone to obtain

maxillomandibular relationship records for complete denture patients. The Journal of prosthetic dentistry. 2001 Jun 1;85(6):621-3.
24. Daniel S, Daniel AY, Kurian N. A Modified Physiologic Impression Technique for Atrophic Mandibular Ridges. Chrismed: Journal of Health & Research. 2017 Jul 1;4(3).
25. Prithviraj DR, Singh V, Kumar S, Shruti DP. Conservative prosthodontic procedures to improve mandibular denture stability in an atrophic mandibular ridge. The journal of Indian prosthodontic society. 2008 Oct 1;8(4):178-84.
26. Petropoulos VC, Rashedi B. Current concepts and techniques in complete denture final impression procedures. Journal of Prosthodontics. 2003 Dec; 12(4):280-7.
27. Lytle RB. The management of abused oral tissues in complete denture construction. J Prosthet Dent 1957; 7:27-42.
28. Tyson KW, McCord JF. Chairside options for the treatment of complete denture problems associated with the atrophic (flat) mandibular ridge. British Dental Journal. 2000 Jan;188(1):10-4.
29. DeVan MM. The concept of neutrocentric occlusion as related to denture stability. J Am Dent Assoc. 1954 Feb 1;48(2):165-9.
30. Rangarajan V, Gajapathi B, Yogesh B, Ibrahim MM, Kumar RG, Karthik P. Concepts of occlusion in prosthodontics: A literature review, part I. The Journal of the Indian Prosthodontic Society. 2015 Jul;15(3):200.
31. Rangarajan V, Yogesh PB, Gajapathi B, Ibrahim MM, Kumar RG, Karthik M. Concepts of occlusion in prosthodontics: A literature review, part II. The Journal of the Indian Prosthodontic Society. 2016 Jan;16(1):8.
32. Azpiazu-Flores FX, Lee DJ, Lang LA. Weighted mandibular complete denture fabricated by using selective laser melting: A clinical report. The Journal of Prosthetic Dentistry. 2021 Aug 1;126(2):144-9.
33. O'Sullivan M, Hansen N, Cronin RJ, Cagna DR. The hollow maxillary complete denture: A modified technique. The Journal of prosthetic dentistry. 2004 Jun 1;91(6):591-4.
34. Whitmyer C, Esposito S, Alperin S. Longitudinal Treatment of a Severely Atrophic Mandible: A Clinical Report. J Prosthetic Dent. 2003; 90: 116–20
35. Carlsson GE. Clinical Morbidity and Sequelae of Treatment with Complete Dentures. J Prosthet Dent. 1998; 79: 17-23.
36. Campbell RL. A comparative Study of The Resorption of the Alveolar Ridges in Denture-Wearers and non-Denture-Wearers. J Am Dent Assoc. 1960; 60:143-5
37. Wyatt CC. The effect of prosthodontic treatment on alveolar bone loss: a review of the literature. The Journal of prosthetic dentistry. 1998 Sep 1;80(3):362-6.
38. McCord JF, Tyson KW. A conservative prosthodontic option for the treatment of edentulous patients with atrophic (flat) mandibular ridges. British dental journal. 1997 Jun;182(12):469-72.

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Aesthetic Revival: Direct Composite Rehabilitation of Anterior Teeth

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Abstract

Restoring anterior teeth affected by Class III, IV, and V carious lesions requires precise knowledge of aesthetic and periodontal factors to ensure functional and visually appealing outcomes. Composite resins are widely utilized due to their superior adhesion, conservative approach to tooth structure preservation, and excellent aesthetic potential. This case report discusses the clinical management of anterior composite restorations, focusing on material selection, bonding techniques, and aesthetic outcomes. Proper adhesion, shade matching, and finishing techniques were employed to achieve natural-looking, durable restorations. The results highlight the significance of composite resins in modern restorative dentistry, demonstrating their ability to enhance both function and aesthetics in anterior teeth.

Key words: *Aesthetic restoration, Direct composite resin, Restorative dentistry*

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Introduction

The aesthetic aspect has always been important for individuals, as modern society places significant emphasis on facial aesthetics, which is essential for social integration.[1] Dental aesthetics plays a crucial role in this, as symmetry, visibility, proportion, and color contribute to a harmonious smile.[2] Tooth substance loss in the anterior region, caused by caries or trauma, impacts both function and appearance, while lateral dental destructions affect overall health.[3] Due to the rising demand for aesthetic dental treatments, new materials have emerged, promoting minimally invasive approaches for anterior aesthetic restorations in a single visit.[4]

Case report

A 28-year-old male patient presented with a chief complaint of sensitivity in both upper and lower anterior regions In the Department of Conservative Dentistry and Endodontics at Narsinhbhai Patel Dental College and Hospital, Visnagar. Upon intraoral examination, extensive dental caries was observed: Class 3 caries involving teeth 11, 12, 13, 21, 22, 23, 31, 32, 33, 41, and 42, Class 4 caries affecting teeth 11 and 21, and Class 5 caries on teeth 13, 22, 23, 32, 33, 43, and 45. Patient was made aware about yellowish discoloration and suitable treatment options for the same were given. However, he opted not to proceed with treatment for the discoloration. The patient had no

significant medical history, facilitating a focused approach to dental management.

Fig 1: Preoperative photograph

Following patient consent, a minimally invasive and cost-effective treatment plan was devised, opting for direct composite restorations to be completed in a single visit. The button technique was employed for color determination, ensuring aesthetic harmony with the patient's dentition. The chosen restorative material, 3M ESPE Filtek Z250 XT nanohybrid composite, was selected for its proven durability and aesthetic properties.

Treatment commenced with meticulous caries excavation and enamel beveling to enhance adhesive bonding. For teeth exhibiting proximity to the pulp, an indirect pulp capping procedure was performed using a calcium hydroxide liner (Cal LC - PrevestDenPro), followed by application of a glass ionomer cement (Shofu FX Ultra Bulk Fill) as a protective base.

Subsequent to etching the enamel with 37% orthophosphoric acid and thorough rinsing and drying, a self-etch adhesive (3M ESPE Single Bond Universal) was applied as per manufacturer instructions. The nanohybrid composite was then incrementally layered and polymerized using a LED curing light (Woodpecker LED D curing light), ensuring adequate conversion of the resin and bond strength.

To prevent the formation of an oxygen inhibition layer, glycerine gel was applied prior to final polymerization. The restorations were meticulously contoured and finished using polishing discs (3M ESPE Sof-LexTM, USA), achieving a smooth and natural surface texture.

Fig 2: Postoperative photograph

This comprehensive approach not only addressed the patient's immediate concern of sensitivity but also restored function and aesthetics effectively. Post-operative care instructions were provided to ensure long-term success of the restorations, highlighting oral hygiene maintenance and regular follow-up appointments.

Composite restoration provides an effective and economical solution for restoring esthetic regions of the dentition. Advancements in bonding technology, along with the development of nano-composite materials, have significantly enhanced the longevity and overall performance of composite restorations, particularly in challenging clinical scenarios.[5] The continuous improvements in optical properties, including color stability, as well as physical attributes of direct composite materials, have made single-visit direct composite restorations a preferred treatment modality in this study. One of the key advantages of direct composite restorations is their efficiency, allowing the entire restorative procedure to be completed within a short duration.[6]

Traditionally, one-shaded restorative materials have been claimed to exhibit different optical behaviors compared to conventional group-shaded composites. To

ensure better color matching, the button try-in method was utilized in this case, as it has been observed to provide superior results compared to the VITA shade guide. The VITA shade guide, although commonly used, is primarily designed for ceramic restorations rather than composite materials, as ceramics undergo a different polymerization process. Additionally, the use of the VITA shade guide can pose a risk of cross-infection, which further necessitates alternative methods for shade selection.[7] In cases where accurate shade matching is critical, taking images in black and white format proves to be beneficial. The black and white image aids in assessing the value of the shade more effectively. While an untrained observer may perceive tooth color as simply white or yellow, the human eye is more adept at detecting value differences in a dental restoration rather than variations in hue or chroma. Among the three dimensions of color—hue, chroma, and value—value is the only one that exists independently. For instance, in a black and white photograph, only the value of a color can be distinguished, while hue and chroma remain indistinguishable.[8]

A two-step beveled approach was adopted for the composite restorations in this case report to enhance bonding effectiveness and aesthetic blending. The first bevel was relatively steep and measured approximately 2mm in width, which facilitated adequate exposure of enamel rods, thereby ensuring a more durable bond. The second bevel was more superficial, allowing for a seamless transition and improved shade integration with the adjacent tooth structure.[9] The selection of appropriate composite shades played a crucial role in achieving a natural appearance. High-value shades were strategically used to replicate enamel, while more chromatic shades were employed to restore the middle and cervical thirds of the crown, where increased chromaticity was necessary.[9]

To achieve optimal anatomical form and contour, a three-increment layering technique was implemented. The first and second increments were carefully shaped to recreate the mesial and distal line angles, providing a natural emergence profile. The third increment, being flatter, was utilized to fill the remaining space between the line angles, where grooves and other anatomical structures were meticulously sculpted to enhance the final aesthetic outcome.[5] This layering approach not only improved the visual appeal of the restoration but also contributed to its mechanical integrity and long-term durability.

The selection of composite material is a critical factor in achieving predictable aesthetic and functional results. In this case report, a nanofill-based composite material was chosen due to its superior aesthetic properties and excellent mechanical performance. Nanofill composites have been shown to provide enhanced polishability, improved color stability, and greater translucency compared to traditional microhybrid composites. Additionally, microhybrid composites are more prone to color degradation and opacity loss over time, making them less ideal for anterior restorations where aesthetics is a primary concern. Nanofill composites have also demonstrated superior bond strength in multiple studies, further reinforcing their suitability for long-lasting restorations. Given these advantages, the decision to use a nanofill-based composite material was justified to ensure a high-quality and aesthetically pleasing outcome in the presented case.[5]

In summary, advancements in composite materials and bonding techniques have significantly improved the outcomes of direct anterior restorations. The selection of an appropriate shade-matching method, the implementation of a strategic beveling approach, and the use of an effective layering technique are all crucial in achieving natural and long-lasting

restorations. The case highlights the importance of meticulous treatment planning and material selection to optimize both esthetic and functional results in composite restorations of Class III, IV, and V carious lesions.

Conclusion

Resin composites have become the preferred choice in modern dentistry, allowing for the resolution of esthetic and functional concerns that once required indirect restorations. With advancements in material science, these composites now exhibit superior bonding strength, enhanced mechanical properties, and exceptional esthetic qualities. Their ability to accurately replicate natural tooth characteristics, such as color, shade, and saturation, makes them invaluable for restorative procedures.

Additionally, resin composites can effectively mimic the opacity and translucency of teeth, particularly in crucial areas like the incisal edges. This ensures seamless integration with natural dentition, resulting in an aesthetically pleasing smile. The continued evolution of composite materials has greatly expanded their clinical applications, making them an essential component in modern restorative and cosmetic dentistry.

References

1. Policy on medically-necessary care. Gheorghiu IM, Mitran L, Mitran M, Iliescu AA, Perlea P, Scărlătescu S, Bucur F. Esthetic function direct restoration in the anterior area-case repo. ORL. ro. 2023 Oct 1(61).
2. Blatz MB, Chiche G, Bahat O, et al. Evolution of Aesthetic Dentistry. J Dent Res. 2019;98(12):1294–1304.
3. Eltahlah D, Lynch CD, Chadwick BL, Blum IR, Wilson NHF. An update on the reasons for placement and replacement of direct restorations. J Dent. 2018;72:1- 7.
4. Araujo E, Perdigão J. Anterior veneer restorations-an evidence-based minimal-intervention perspective. J Adhes Dent. 2021;23(2):91–110.
5. Mittal, Rishu & Goyal, Radhika & Goyal, Nikita & Gupta, Saurabh &Bogra, Poonam. (2021). Restorative technique for class IV direct composite restoration. IP Annals of Prosthodontics and Restorative Dentistry. 7. 59-63. 10.18231/j.aprd.2021.012.
6. Batgerel OE, Üçüncü MK, Yazıcıoğlu O. Aesthetic rehabilitation of the anterior region in the presence of class III lesions and diastema. Eurasian Dental Research. 2023;1(1):16-9.
7. Lee YK, Yu B, Lee SH, Cho MS, Lee CY, Lim HN, et al. Shadecompatibility of esthetic restorative materials–A review. Dent Mater.2010;26(12):1119–26.
8. Villavicencio-Espinoza CA, Narimatsu MH, Furuse AY. Using cross-polarised photography as a guide for selecting resin composite shade.Int Dent - Afr Edition. 2018;9(1):24–33.
9. Hasan A, Shahid O. Esthetic restorations, the putty matrix technique. JDow Uni Health Sci. 2013;7(3):122–5.

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Fungal osteomyelitis involving the maxilla with concurrent mycotic infections: A Case Report

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Abstract

Fungal osteomyelitis is a rare but potentially fatal opportunistic infection. Filamentous fungi such as *Aspergillus* and members of the *Mucorales* group primarily affect individuals with compromised immune systems. Both types of infections are marked by aggressive spread into nearby tissues. A co-infection involving both *Aspergillus* and *Mucorales* in the rhinocerebral region is extremely uncommon and typically occurs in immunocompromised patients, often resulting in high mortality. This case report discusses a rare instance of concurrent aspergillosis and mucormycosis in a patient with type 2 diabetes mellitus and also had a history of tooth extraction at site 27 with necrosis of the left palatal mucosa. Comprehensive diagnostic and interventional approaches led to a final diagnosis of mixed fungal osteomyelitis. The main objective of presenting this case is to emphasize its rarity, clinical features, and the importance of timely management for a favourable prognosis.

Keywords: *Aspergillus, concurrent, fungal, Mucormycosis, osteomyelitis*.

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Introduction

Fungal osteomyelitis is a rare condition that typically exhibits a slow clinical course. Nevertheless, once these infections become invasive, they can cause significant tissue destruction and morbidity.[1] *Aspergillosis* and *mucormycosis* are the second and third most common opportunistic fungal infections following *candidiasis*.[2] Although involvement of the orofacial region by *Aspergillus* and *Mucorales* species is rare, such infections are notably aggressive and may lead to life-threatening complications. Individuals with compromised immune systems are particularly susceptible to these opportunistic pathogens.[3]

The mortality rate of mucormycosis varies widely, ranging from 10% to 100%, depending on the infection site and the patient's underlying risk factors. Maxillary sinus involvement in mucormycosis is associated with a poor prognosis and a high mortality rate of approximately 46%. *Aspergillosis* carries an overall mortality rate of around 30%. Prompt diagnosis and immediate management are critical for improving patient outcomes. Effective treatment involves addressing predisposing conditions, administering appropriate antifungal medications, surgical debridement, and supportive care. Additionally, surgical or prosthetic

reconstruction plays a vital role in restoring the patient's quality of life to its pre-illness state.[2]

We present a case of a 52-year-old male with medical history of Diabetes Mellitus and a recent tooth extraction but no prior COVID-19 infection, who developed severe maxillary necrosis resulting from a co-infection with *Mucorales* and *Aspergillus* species.

Case Report

A 52-year-old man presented with intermitted, sharp shooting pain in upper left back tooth region since 2 months, for which he visited private dental clinic where extraction of 27 was done. Approximately one month later, he began to notice nasal regurgitation and blackening of the palatal mucosa. His medical history includes diabetes mellitus for the past five years, with a fasting blood sugar level of 281 mg/dl prior to surgery. He also has a long-standing habit of chewing pan masala (3–4 packets daily) for 10–15 years but no prior COVID-19 infection. On examination, his mouth opening was restricted to 30 mm (interincisal distance). Clinical evaluation revealed necrosis of the left palatal mucosa, nasal regurgitation, and exposed bone extending from tooth 21 to the maxillary tuberosity, crossing the midline in the anterior region. A mesiodens was noted between teeth 11 and 21. The lesion surface was rough, covered with necrotic slough, surrounded by erythematous tissue, and tender to palpation (Fig. 1). A provisional diagnosis of chronic osteomyelitis was made.

Fig 1: Necrosed left palatal mucosa

CT imaging revealed thickening of the bilateral nasal cavity walls and nasal septum. Surgical management included sequestrectomy and saucerization of the affected region under general anaesthesia (Fig. 2). A 7 x 3 cm, greyish-black, hard tissue sample was received for histopathological examination (Fig. 3).

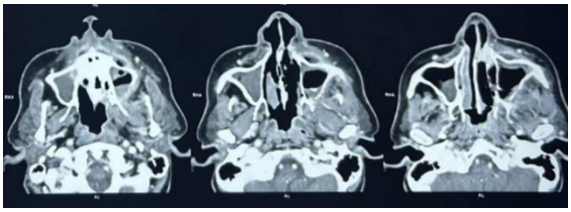

Fig 2: CT image showing thickening of the bilateral nasal cavity walls and nasal septum

Fig 3: Gross specimen

The tissue was decalcified with 5% HNO3 and stained with Haematoxylin and eosin (H&E). Sections showed multiple tissue fragments with inflamed stromal tissue and necrotic debris. The stroma contained thick collagen bundles, a few spindle-shaped fibroblasts, and a chronic inflammatory infiltrate composed of lymphocytes, plasma cells, and macrophages. Eosinophilic hyaline fungal structures were identified, with septate hyphae branching at acute angles indicative of *Aspergillus* (red arrow in Fig. 4 a, b) and non-septate hyphae branching at obtuse angles suggestive of *Mucormycosis* (yellow arrow in Fig. 4 a, b). Fungal spores were also scattered throughout the stroma. Periodic acid–Schiff (PAS) staining confirmed the presence of

fungal elements. Most of the bony trabeculae lacked osteoblastic rimming and osteocytes. The marrow spaces were filled with necrotic debris. The final diagnosis of mixed fungal osteomyelitis involving both *Aspergillus* and *Mucor* species was made.

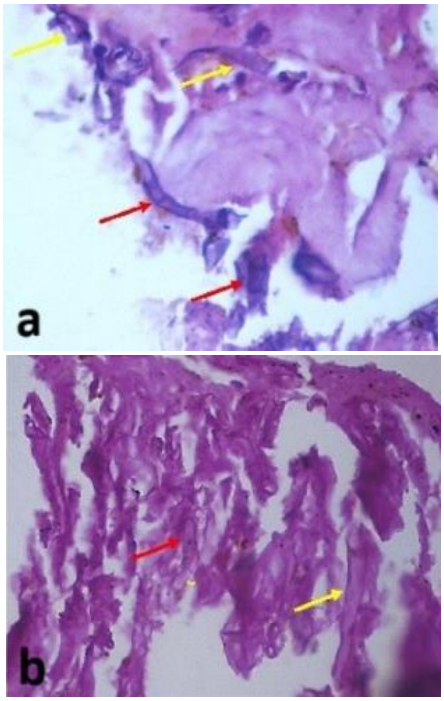

Fig 4: Photmicrograph (X100 magnification) showing eosinophilic hyaline fungal structures with Aspergillus septate hyphae branching at acute angles (Red arrow) and Mucormycosis non-septate hyphae branching at obtuse angles (yellow arrow), a. Hematoxylin & Eosin staining, b. Periodic Acid Schiff staining.

Discussion

Osteomyelitis is an inflammatory condition of bone and bone marrow content that typically arises from chronic infection. Etiopathogenesis includes surgical procedures like dental extractions, as in the current case, the patient has a history of tooth extraction in the same area as the lesion, which may have served as a potential entry point for fungal invasion, bloodstream infections, fungal infection or a contiguous infectious sites and systemic diseases. One contributing factor is reduced blood flow or stasis, which creates a favourable environment for infection. While fungal osteomyelitis is rare and typically progresses slowly, in this case, the lesion developed unusually quickly—within just two months following the extraction. However, when fungal infections become invasive, they can be highly destructive to affected individuals as in present case.[1]

Aspergillosis and mucormycosis affecting the orofacial region are uncommon but they are highly aggressive opportunistic infections that can have life-threatening consequences. Immunocompromised individuals are more vulnerable to such opportunistic infections. Key predisposing factors are uncontrolled diabetes and, in this case, the patient also had a medical history of poorly managed diabetes, lymphomas, leukemia, renal failure, immunosuppressive or long-term steroid therapy, organ transplant, renal failure, protein-energy malnutrition, and AIDS.[3]

Aspergillus and Mucorales are filamentous fungi capable of rapidly invading tissues and disseminating both locally and systemically in affected individuals.[4] These organisms are widespread in nature, commonly present in decaying organic matter, including plant debris and animal waste. Multiple species exist within each genus, with *Aspergillus fumigatus* and *Rhizopus* spp. being the most frequently encountered. Infection typically occurs through inhalation of spores, though cutaneous or percutaneous transmission can also arise following skin barrier disruptions such as trauma, burns, direct inoculation, or catheter insertion and tooth extraction site.[2, 4] Infections caused by *Aspergillus* species result primarily from direct tissue invasion and the inflammatory response they provoke. In contrast, *Mucorales* infections are characterized by angioinvasion, leading to tissue necrosis as a hallmark pathological feature.[4]

In a study conducted by Niranjan et al., the highest occurrence of fungal osteomyelitis

was observed in individuals over the age of 40, which aligns with the present case involving a 52-year-old patient.[3] Fungal osteomyelitis was found to occur more frequently in the maxilla than in the mandible, as in present case. [1,3]

Typically, necrosis in the maxilla is rare due to its rich blood supply. However, in fungal osteomyelitis, the fungus infiltrates blood vessels and spreads through them. The fungal hyphae create clots (thrombi) within these vessels, reducing blood flow to the tissues and ultimately leading to necrosis. Additionally, diabetic patients with peripheral vascular disease—caused by microangiopathy and atherosclerosis—experience local tissue ischemia, which further increases their vulnerability.[3] Hence, diabetes is a major factor in exacerbating symptoms, and in this case, both the patient's diabetic condition and the recent tooth extraction likely contributed to the swift and abrupt development of the lesion within a two-month period.

In the orofacial region typically present with symptoms such as nasal discharge, facial swelling (cellulitis), runny nose, and necrosis of the nasal turbinates, often accompanied by fatigue, fever, and headache. In more advanced stages, the infection may spread to the eyes, leading to symptoms like eye pain, blurred vision, redness of the conjunctiva, drooping eyelids (ptosis), bulging of the eye (proptosis), and swelling (chemosis). In some cases, vision loss may occur due to retinal artery blockage.[4] However, none of these features were observed in present case with the exception of nasal regurgitation.

Direct histological examination continues to be the definitive method for diagnosis. Mucor species are identified by their broad approximately 6-20 µm in size, ribbon-like, non-septate hyphae with right-angle branching, while *Aspergillus* species display narrower, septate hyphae that typically dichotomous and measure approximately 3-6 µm in diameter, branching at 45 and 90-degree angles, concomitant with the present case.[1,2,5]

Mucormycosis and aspergillosis are typically severe infections, with mortality rates between 20% and 40% in immunocompromised individuals, and as high as 80% to 90% when the infection spreads or involves the brain. Management involves surgical removal of infected bone (sequestrectomy) along with thorough wound debridement. Antifungal treatment commonly includes medications such as amphotericin B, voriconazole, and posaconazole. In cases where surgical removal results in tissue defects, reconstruction using soft or hard tissue, or the use of a prosthetic obturator, may be necessary for rehabilitation.[6] In the current case, sequestrectomy was also carried out, an antifungal regimen was subsequently prescribed, and a maxillary obturator was advised for rehabilitation.

Conclusion

Immunocompromised patients especially those with diabetes—are more prone to fungal infections, as diabetes poses a concealed risk that heightens susceptibility to conditions affecting the jawbones and soft tissues of the oral cavity. Early identification of these aggressive lesions is essential to improving patient outcomes. Prompt and accurate diagnosis, followed by appropriate treatment, is crucial to prevent serious complications. Nevertheless, the uncommon nature and limited reporting of these infections often make diagnosis challenging for healthcare providers. As such, fungal osteomyelitis should be included in the differential diagnosis when encountering comparable clinical symptoms.

References

1. Urs AB, Singh H, Mohanty S, Sharma P. Fungal osteomyelitis of

maxillofacial bones: rare presentation. Journal of oral and maxillofacial pathology. 2016 Sep 1;20(3):546.
2. Deepa AG, Nair BJ, Sivakumar TT, Joseph AP. Uncommon opportunistic fungal infections of oral cavity: A review. Journal of Oral and maxillofacial Pathology. 2014 May 1;18(2):235-43.
3. Niranjan KC, Sarathy N, Alrani D, Hallekeri K. Prevalence of fungal osteomyelitis of the jaws associated with diabetes mellitus in North Indian population: A retrospective study. Int J Cur Res. 2016;8:27705-10.
4. Srivastava A, Mohpatra M, Mahapatra A. Maxillary fungal osteomyelitis: a review of literature and report of a rare case. Annals of maxillofacial surgery. 2019 Jan 1;9(1):168-73.
5. Zayet S, Zaghdoudi A, Ammari L, Kilani B, Benaissa HT. Cerebro-rhino-orbital mucormycosis and aspergillosis coinfection in a patient with diabetes mellitus: A case report. IDCases. 2021 Jan 1;23: e01022.
6. Ramírez-Hinojosa JP, Medrano-Ahumada S, Arenas R, Bravo-Escobar A, Paraguirre-Martínez S, Xicohtencatl-Cortes J, Martínez-Herrera E, Hernández-Castro R. Fungal invasive co-infection due to Aspergillus fumigatus and Rhizopus arrhizus: A rhino-orbital presentation. Journal of Fungi. 2021 Dec 20;7(12):1096.

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Peripheral Giant Cell Granuloma: A Diagnostic Dilemma- A Case Report

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Abstract

The unusual condition known as peripheral giant cell granuloma (PGCG) affects the gingiva or alveolar mucosa. Although the cause is unknown, this lesion has been described as a response to long-term local traumas like as trauma, ill-fitting dentures and restorations, sub- or supra-gingival dental biofilm, etc. This article presents a case of 37 years old female patient complaining of swelling in posterior mandible.

Keywords: *Peripheral Giant Cell Granuloma, Irritation, Giant Cell Epulis*

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Introduction

Giant cell granuloma lesions, which can be either peripheral or central, are mildly uncommon, benign, and non-odontogenic tumours of the oral cavity. They either develop centrally (in the bone) or peripherally (inside the gingiva). The peripheral giant cell granuloma (PGCG), also known as a giant cell epulis, a giant cell reparative granuloma osteoclastoma, or a giant cell hyperplasia, is a rare reactive exophytic lesion that develops on the gingiva and alveolar ridge. Although the exact cause is unknown, it is believed that an aggravating or aggressive factor such as trauma, tooth extraction, poorly done fillings, insecure dental prostheses, plaque, calculus, persistent infections, or impacted food may be to blame.[1]

Clinically, PGCGs can manifest as polyploidy or nodular lesions, which are typically bluish red, have a smooth, glossy, surface, a stalky, sessile base, and are tiny and well defined. Pain is infrequent, and continual trauma is typically what causes lesions to form. The muco-periosteum or periodontal ligament are the two typical sources of PGCGs. The PGCG is typically seen in the lower jaw, near the gingiva or edentulous alveolar borders.[2]

Case Report:

A 37-year-old female patient reported to the department with a chief complaint of swelling in her lower right back tooth region since last 3 months. The patient mentioned that the swelling was small pea sized initially which gradually increases and has attained the present size. There was no associated pain except for occasional interference of the swelling with occlusion and mastication. Past dental and medical history were non- contributory. Extraorally, no gross asymmetry was noted.

Intraorally, on inspection a large solitary swelling was present on right posterior

mandibular region extending from 45 to 47 region antero-posteriorly and from buccal vestibule of 36,37 to its lingual vestibule medio- laterally. The size of the swelling was approximately 4x7cm. The mucosal covering of the lesion exhibited surface tan, red, and bluish areas with a focal area of ulceration. On palpation, the swelling was firm in consistency, mildly tender, sessile and lobulated. Grossly decayed 47 was also present without any mobility of the teeth present (Fig 1).

Fig 1. Growth extending from 45 to 47 region

On the basis of history and clinical examination, provisional diagnosis of Peripheral Ossifying Fibroma irt 47 was given with a differential diagnosis of Peripheral Giant Cell Granuloma.

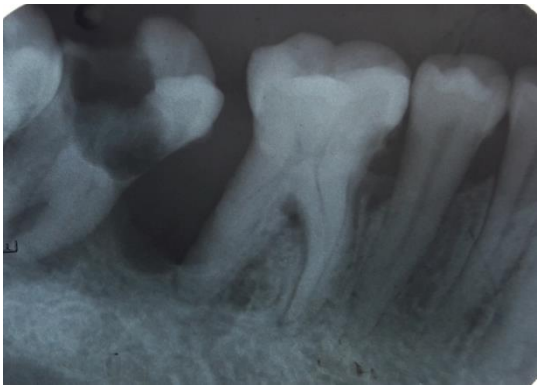

Fig 2. IOPAR with Cupping resorption from distal of 46 to mesial of 47

Radiographic investigations such as IOPAR and Mandibular Lateral Topographic Occlusal Radiograph were advised. IOPAR revealed resorption of bone irt distal to 46 till mesial aspect of 47 in “Cupping” fashion. Grossly decayed 47 was noted (Fig 2). Mandibular occlusal radiography revealed slight lingual cortical expansion irt 47,48 region (Fig 3).

Fig 3: Occlusal view showing slight lingual cortical expansion irt 47,48 region

The patient was then referred for histopathological examination which revealed a lesion covered by a parakeratinized stratified squamous epithelium, with areas of atrophy and ulceration in its thickness. A dense proliferation of multinucleated giant cells was dispersed on a stroma of the tissue, which was highly vascularized, with areas of hemorrhage, deposits of hemosiderin, and infiltrate due to accumulation of lympho- plasmacytic inflammatory cells (Fig 4). Final diagnosis of Peripheral Giant Cell Granuloma was given based on histopathological report.

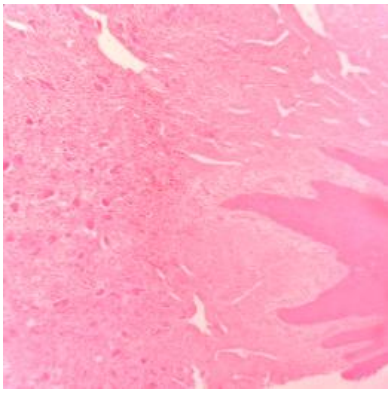

Fig 4: Photomicrograph showing Giant cells in the stroma. (X40 Magnification)

Discussion:

The most frequent oral giant cell lesion is a peripheral giant cell granuloma, often known as a "giant cell epulis". It typically manifests as a soft tissue purplish-red nodule with a backdrop of mononuclear stromal cells and extravasated red blood cells, and it contains multinucleated giant cells. This lesion is most likely not a real tumour; rather, it may be reactive in nature and thought to be triggered by local irritation or trauma, however the exact aetiology is unknown.[3,4]

The PGCG is present throughout life, with incidence maxima in the mixed dentition years and in the 30- to 40-year-old age range. 60% more women than men have it. Affected teeth are slightly more frequently the mandible than the maxilla.[5]

Lesions can grow enormous, with some reaching a diameter of 2 cm. Although the PGCG frequently has a more bluish-purple hue as opposed to the brilliant red hue of a typical pyogenic granuloma, the clinical presentation is comparable to that of the more prevalent pyogenic granuloma. The PGCG linked to dental implants has also just been identified.

It is still unclear what causes PGCG (giant cell epulides) and what its nature is. Previous explanations for the nature of multinucleated giant cells included the idea that they were osteoclasts left over from the normal resorption of teeth or a response to periosteum injury. The ability of these cells to excavate bone in vitro and the discovery that they express calcitonin receptors support the hypothesis that they are osteoclasts.[6,7,8]

Even though the PGCG grows within soft tissue, there may occasionally be "cupping" or superficial resorption of the alveolar bone crest beneath is present as seen in our case. Sometimes it may be challenging to distinguish between a core giant cell granuloma eroding through the cortical plate into the gingival soft tissues and a periphery lesion. The gingiva-related extra-osseous lesions of cherubism resemble giant cell epulides in appearance. The additional distinguishing clinical and radiological cherubism traits, however, will help to make the right diagnosis.[9]

Histologically, PGCG is made up of nodules of multinucleated large cells against a background of hefty mesenchymal cells in the ovoid and spindle shapes as well as extravasated RBCs. The number of nuclei within the big cells might range from a few to several hundred. Some of them have big, vesicular nuclei, while others show little, pyknotic nuclei. Unknown is the huge cell's place of origin. Studies on immunology and ultrastructure have demonstrated that the large cells are descended from osteoclasts (Fig 4).[10]

The surgical removal of the complete lesion's base as well as the elimination of the irritating factors' underlying cause make up the treatment for PGCG. The growth can come back if the bone was only partially removed. After treatment, the source of irritation must be eliminated in addition to complete simple excision and extensive clearing of the lesion's base to prevent recurrence. Recurrence of PGCG is uncommon; reports of it range from 5 to 11%. Early diagnosis based on clinical, radiographic, and pathological symptoms and validated by these methods enables conservative care with a lower chance of tissue and tooth destruction.[11,12]

Conclusion

Proper and prompt diagnosis of this lesion is necessary to provide suitable treatment. Excisional biopsy and subsequent histopathology should be the main management strategy for soft tissue disorders.

References

1. Chaparro-Avendaño AV, Berini-Aytés L, Gay-Escoda C. Peripheral giant cell granuloma. A report of five cases and review of the literature.Med Oral Patol Oral Cir Bucal 2005; 10(1): 53-57, 48-52.
2. Lester SR, Cordell KG, Rosebush MS, Palaiologou AA, Maney P. Peripheral giant cell granulomas: A series of 279 cases. Oral Surg Oral Med Oral Pathol Oral Radiol 2014; 118(4): 475-82.
3. Eversole LR**,** Rovin S**.** Reactive lesions of the gingiva. J Oral Pathol 1972;1:30-8.
4. Motamedi MH**,** Eshghyar N**,** Jafari SM**,** Lassemi E**,** Navi F**,** Abbas FM, *et al*. Peripheral and central giant cell granulomas of the jaws: A demographic study. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2007;103:e39-43.
5. Shafer WG, Hine MK, Levy BM. Textbook of Oral Pathology. 4th ed. Philadelphia, PA: WB Saunders; 1983. p. 144-6.
6. Carvalho YR**,** Loyola AM**,** Gomez RS**,** Araújo VC**.** Peripheral giant cell granuloma. An immunohistochemical and ultrastructural study. Oral Dis 1995;1:20-5.
7. Mannem S, Chava VK. Management of an unusual peripheral giant cell granuloma: A diagnostic dilemma. Contemp Clin Dent 2012; 3(1):93-6.
8. Grand E, Burgener E, Samson J, Lombardi T. Post-traumatic development of a peripheral giant cell granuloma in a child. Dent Traumatol 2008; 24(1): 124-6.
9. Patil KP, Kalele KP, Kanakdande VD. Peripheral giant cell granuloma: A comprehensive review of an ambiguous lesion. J Int Clin Dent Res Org 2014; 6: 118.
10. Adlakha VK, Chandna P, Rehani U, Rana V, Malik P. Peripheral giant cell granuloma. J Indian Soc Pedod Prev Dent 2010; 28(4): 293-6.
11. Volpato LE, Leite CA, Anhesini BH, Aguilera JM, Borges ÁH. Peripheral giant cell Granuloma in a child associated with eruption and traumatic habit with control of four years. Case Rep Dent 2016; 2016: 6725913.

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The Multidisciplinary Management of Fused Maxillary Central Incisor with Talon Cusp: A Case Report

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Abstract

Background: Tooth fusion involving supernumerary teeth is an uncommon developmental dental anomaly, particularly in the permanent dentition. It may present as an esthetic and functional concern, often requiring interdisciplinary management. Early diagnosis and a tailored treatment plan are essential to preserve oral health and achieve satisfactory cosmetic outcomes.

Case Presentation: A 9-year-old male presented with an esthetic complaint due to an abnormally shaped maxillary right central incisor. Clinical and radiographic evaluation revealed fusion of a supernumerary tooth with the permanent central incisor, accompanied by palatal displacement of the right lateral incisor. A multidisciplinary treatment plan was executed, including endodontic therapy, surgical hemisection, auto-transplantation of the lateral incisor, and reimplantation of the hemisectioned central incisor. Regenerative aids including platelet-rich fibrin (PRF) and platelet-rich plasma (PRP) were used. Esthetic rehabilitation was completed with a three-unit anterior fixed prosthesis.

Conclusion: Fusion involving supernumerary teeth presents a diagnostic and therapeutic challenge in pediatric patients. A multidisciplinary approach combining endodontics, surgery, regenerative therapy, and prosthetic rehabilitation can lead to successful functional and esthetic outcomes.

Keywords: *Tooth fusion, supernumerary tooth, hemisection, auto-transplantation, platelet-rich fibrin, esthetic rehabilitation*

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Introduction

Tooth fusion is a developmental dental anomaly resulting from the union of two adjacent tooth germs[1]. When this occurs between a normal and a supernumerary tooth, it may result in abnormal crown morphology, altered eruption paths, or esthetic concerns.[2,3] Although fusion is more common in the primary dentition, its occurrence in the permanent dentition is rare and poses significant diagnostic and therapeutic challenges.[1]. Early diagnosis, often radiographically aided, is critical for selecting the optimal treatment approach.[4] When associated with esthetic or functional impairment, a multidisciplinary intervention including endodontics,

surgery, and prosthodontics is frequently warranted.[2,5]

Case History

A 9-year-old male presented to the pediatric dentistry department with a complaint of esthetic dissatisfaction concerning his upper front teeth. The child had no significant medical history, trauma, or previous dental treatment. Physical and mental development was within normal limits.

Clinical examination revealed a conical supernumerary tooth fused lingually to the maxillary right central incisor (tooth 11), giving an enlarged appearance to the crown. Both teeth were vital and showed no tenderness, mobility, or periodontal concerns. The right lateral incisor (tooth 12) was observed to be palatally displaced, likely due to spatial hindrance by the fused tooth.

Radiographic analysis (IOPA and OPG) confirmed a fusion between tooth 11 and a supernumerary structure, with incomplete root formation. The supernumerary portion showed complete pulp canal calcification, while the central incisor retained a partially open canal. No periapical pathology was evident. Tooth 12 showed an otherwise normal morphology and root development. A treatment plan involving hemisection of the fused tooth, auto-transplantation of the displaced lateral incisor, and subsequent esthetic rehabilitation was formulated. (Fig 1,2)

Clinical Management

1. Endodontic Treatment: The canal of tooth 11 was prepared and obturated using MTA to achieve an effective apical seal.
2. Hemisection and Extraction: The fused structure was extracted, followed by surgical hemisection to remove the supernumerary component.

Fig 1: Preoperative and intraoperative images showing fusion of supernumerary tooth with central incisor

Fig 2: Postoperative view showing three-unit anterior fixed prosthesis

3. Auto-transplantation: A socket was surgically prepared to accommodate the displaced lateral incisor (tooth 12), which was then auto-transplanted into the prepared alveolus.
4. Reimplantation and Regenerative Support: The right central incisor (tooth 11) was reimplanted, and PRF was placed to promote periodontal healing. A splint from the right to the left premolars stabilized the teeth for 14 days.
5. Post-surgical Follow-up: Two weeks later, splints were removed and mobility assessed. Healing was satisfactory. Root canal treatment of the auto-transplanted lateral incisor was completed with MTA, and PRP was injected into the socket to stimulate bone regeneration.

Esthetic Rehabilitation: Due to disproportionate crown morphology, intentional root canal therapy was performed on the contralateral left central incisor (tooth 21). Crown preparation was done on teeth 11, 12, and 21. A three-unit fixed prosthesis was fabricated and

delivered. The esthetic outcome was highly satisfactory, with proper alignment and symmetry.

Discussion

Fusion anomalies involving supernumerary teeth are rarely encountered in the permanent dentition. These cases require individualized treatment depending on the vitality, root morphology, esthetics, and occlusion of the affected teeth.[3,6] In this case, pulp canal obliteration in the supernumerary portion made endodontic access impractical, necessitating hemisection of the fused unit and retention of the functional segment.[8]

Auto-transplantation of the displaced lateral incisor was planned to restore the arch continuity, a method supported in the literature for young patients with incomplete root development and good periodontal status.[7] The success of this technique depends on atraumatic extraction, appropriate socket preparation, and minimal extraoral time.[5,9]

Biologic adjuncts like platelet-rich fibrin (PRF) and platelet-rich plasma (PRP) were used to enhance healing, given their documented efficacy in stimulating soft tissue repair and osteogenesis.[2,6] Their use has shown improved periodontal outcomes and accelerated recovery in complex surgical cases involving pediatric patients.
Final esthetic rehabilitation was achieved with a fixed prosthesis to address crown size discrepancies and maintain facial harmony. Literature supports early prosthetic intervention in pediatric cases to restore psychosocial confidence and functional integrity.[4,10]

Conclusion

Successful management of fused teeth involving supernumerary elements necessitates a multidisciplinary approach. This case demonstrated the value of combining endodontics, auto-transplantation, regenerative materials, and prosthetic rehabilitation in restoring both esthetics and function in pediatric patients.

References

1. Steinbock N, Wigler R, Kaufman AY, Lin S, Abu-El Naaj I, Aizenbud D. Fusion of central incisors with supernumerary teeth: a 10-year follow-up of multidisciplinary treatment. *J Endod*. 2014 Jul;40(7):1020-4. doi: 10.1016/j.joen.2013.12.004. PMID: 24935556.
2. Demircioglu Guler D, Sen Tunc E, Arici N, Ozkan N. Multidisciplinary management of a fused tooth: a case report. *Case Rep Dent*. 2013;2013:634052. doi: 10.1155/2013/634052. PMID: 24396611; PMCID: PMC3874312.
3. Ozden B, Gunduz K, Ozer S, Oz A, Otan Ozden F. The multidisciplinary management of a fused maxillary central incisor with a talon cusp. *Aust Dent J*. 2012 Mar;57(1):98-102. doi: 10.1111/j.1834-7819.2011.01637.x. PMID: 22369566.
4. Gautam G, Kumari VS, Jayashankar CM, Hadge P, Garg G. Interdisciplinary management of dental anomalies: fusion and supernumerary teeth. *Orthodontics (Chic.)*. 2011 Summer;12(2):140-7. PMID: 21935508.
5. Kulkarni VK, Reddy S, Duddu M, Reddy D. Multidisciplinary management of multiple maxillary anterior supernumerary teeth: a case report. *Quintessence Int*. 2010 Mar;41(3):191-5. PMID: 20213018.
6. Ammari AB, Young RG, Welbury RR, Fung DE. A report of treatment of a fused permanent central incisor and supplemental lateral incisor. *Dent Update*. 2008 Nov;35(9):636-8, 640-1. doi: 10.12968/denu.2008.35.9.636. PMID: 19065881.

7. Ozalp SO, Tuncer BB, Tulunoglu O, Akkaya S. Endodontic and orthodontic treatment of fused maxillary central incisors: a case report. *Dent Traumatol*. 2008 Oct;24(5):e34-7. doi: 10.1111/j.1600-9657.2008.00635.x. PMID: 18557749.
8. Cetinbas T, Halil S, Akcam MO, Sari S, Cetiner S. Hemisection of a fused tooth. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2007 Oct;104(4):e120-4. doi: 10.1016/j.tripleo.2007.03.029. PMID: 17656128.
9. Karacay S, Guven G, Koymen R. Management of a fused central incisor in association with a macrodont lateral incisor: a case report. *Pediatr Dent*. 2006 Jul-Aug;28(4):336-40. PMID: 16903442.
10. Ballal NV, Kundabala M, Acharya S. Esthetic management of fused carious teeth: a case report. *J Esthet Restor Dent*. 2006;18(1):13-7; discussion 18. doi: 10.2310/6130.2006.00002. PMID: 16426503.

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Endodontic Management of an Uncommon Three-Rooted Maxillary First Premolar: A Clinical Case Report

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Abstract

Variations in root canal morphology can create challenges in endodontic practice. Among these, the appearance of three distinct roots in a maxillary first premolar is highly unusual, occurring in only a small fraction of the population (0.5%–6%). This report documents the clinical journey of a 28-year-old male patient diagnosed with this rare anatomy. By combining detailed preoperative imaging with careful step-by-step treatment execution, the case was managed successfully, resulting in the thorough cleaning, shaping, and sealing of all root canals.

Keywords: *Three-rooted premolar, Maxillary first premolar anatomy, Root canal therapy, Rare dental morphology, Endodontic case study.*

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Introduction

In endodontics, a precise understanding of root canal morphology is fundamental to achieving predictable treatment outcomes[12]. The maxillary first premolar most often contains one or two roots; however, rare cases may exhibit three completely separated roots, closely mimicking the anatomy of a maxillary molar. This additional root can significantly complicate both diagnosis and clinical management. Missed canals remain a well-documented cause of failure in root canal therapy[1], making careful radiographic assessment and preoperative planning critical. This report presents the diagnosis and management of a three-rooted maxillary first premolar in a young adult patient, highlighting the importance of thorough examination and tailored treatment strategies.

Case Report

A 28-year-old male came to the Department of Conservative Dentistry and Endodontics with pain in the upper left back tooth region. Examination revealed tooth 24 (maxillary left first premolar) with deep caries extending into the pulp chamber. Vertical percussion produced a painful response, and cold testing elicited an exaggerated, lingering reaction. Radiographic evaluation demonstrated an unusual three-root configuration. Diagnosis of symptomatic irreversible pulpitis with associated apical periodontitis in tooth #24 was considered (Fig 1).

Treatment Protocol

- After local anaesthesia, the tooth was isolated with the help of a rubber dam.

- Access preparation revealed three distinct canal orifices.
- Working lengths were measured using an apex locator and confirmed radiographically. Cleaning and shaping were performed with rotary nickel titanium instruments, using 2.5% sodium hypochlorite alternated with saline as irrigants.
- Obturation was completed with gutta-percha and AH Plus sealer via cold lateral condensation.
- A postoperative radiograph confirmed complete obturation.
- The access was temporarily restored, with a definitive full-coverage crown planned.
- Follow-Up: At one-week and one-month reviews, the patient reported no discomfort. The tooth was stable in function, maintained normal occlusion, and exhibited no clinical signs of pathology.

Fig 1: IOPAR showing 3 rooted 24

Discussion

Although most maxillary first premolars exhibit either one or two roots, the occurrence of three distinct roots is rare[2]. Detecting such variations early is vital because untreated canals are a leading cause of persistent infection and treatment failure. Radiographic evaluation from multiple horizontal angulations, and when accessible, cone-beam computed tomography[3], are valuable in identifying these anatomical differences. Additionally, magnification devices such as dental operating microscopes or high-quality loupes, combined with optimal lighting, can significantly improve canal detection. In this case, meticulous review of the preoperative radiograph led to early recognition of the extra root, facilitating comprehensive instrumentation and obturation, and ultimately producing a favorable outcome[13].

Conclusion

The success of endodontic treatment is heavily dependent on locating and treating all existing canals. Awareness of rare root configurations, such as a three-rooted maxillary first premolar, together with careful diagnostic imaging and precise operative technique, is essential in preventing missed anatomy and ensuring long term treatment success.

References

1. Vertucci FJ. Root canal anatomy of the human permanent teeth. Oral Surg Oral Med Oral Pathol. 1984;58(5):589–599.
2. Pecora JD, Saquy PC, Sousa Neto MD, Woelfel JB. Root form and canal anatomy of maxillary first premolars. Braz Dent J. 1992;2(2):87–94.
3. Cleghorn BM, Christie WH, Dong CC. Root and root canal morphology of the human permanent maxillary first molar: a literature review. J Endod. 2006;32(9):813–821. doi:10.1016/j.joen.2006.04.014

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