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Chief Editors Message

Greetings from Team JIDAK

Yet another proud moment for JIDAK, as we are launching the very first issue of 2020, marking a new beginning in our never ending path of academic excellence !!

The new issue launch of JIDAK, which is an online journal makes its significance evident in the time of Covid 19 virus attack, where the situation promotes online platforms as much as possible..

Let's join hands in "break the chain of Covid 19" and also "not to break the chain of academics through JIDAK".

I would like to thank my entire team and the IDA KOCHI office for the continuous support in helping me take the JIDAK to greater heights of academic excellence!!

Seeking everyone's blessings and support..

Jai JIDAK

Jai IDA

Dr. Meera Gopalakrishnan
Chief Editor- JIDAK
IDA Kochi

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ORIGINAL RESEARCH ARTICLE

PREVALENCE AND ETIOLOGY OF TRAUMATIC DENTAL INJURIES IN 8-14 YEAR OLD CHILDREN IN HYDERABAD CITY - AN EPIDEMIOLOGICAL STUDY

ABSTRACT

Objectives: To assess the prevalence, type and cause of traumatic injuries to anterior teeth among 8 to 14 year old school going children in Hyderabad city.

Study Design: A total of 2350 children from various schools across Hyderabad including1245 girls and 1105 boys in the age group of 8 to 14 years were included in the study. The presence of traumatic dental injuries was assessed by clinical examination and the type of injury if present was classified according to Ellis classification. Data regarding the place and cause of injury was also noted through a questionnaire.

Results: A prevalence rate of 2.6% for traumatic dental injuries was noted in the present study. Males were more affected than females in the ratio 2.8:1. Ellis class II fractures were the most common type of fractures closely followed by Ellis class III. Maxillary central incisors were the most commonly affected teeth. Accidental falls at home accounted for most of the causes of trauma followed by falls at school and Road Traffic Accidents.

Conclusion: Community and School Dental Education programs must be conducted on a large scale basis to increase awareness among the population regarding these injuries and their management.

Keywords: Prevalence, Trauma, Dental injuries, Anterior teeth fractures, Ellis Fractures.

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INTRODUCTION

Traumatic dental injuries (TDI) affect the teeth and other hard and soft tissues in and around the oral cavity. These injuries are usually sudden, circumstantial, unanticipated, accidental, and quite often require emergency attention. They may not be pathology but the outcome of a set of unavoidable lifetime risk factors.[1]

Dental injuries can become an important public health problem not only because they are comparatively high in prevalence, but also because they have a significant effect on the quality of life of children. Most dental injuries involve anterior teeth, which may result in restraints on biting, speech difficulties, and an embarrassment to show one's teeth posing psychological effect to the child.[2]

Traumatic injuries are the third major cause of teeth mortality. Kids actively indulge in outdoor play during school age. While these actions are indicators of the child's growth and development, loss of control and impaired movements enhance the risk of injury.[3]

Therefore, traumatic anterior teeth injuries present a tremendous challenge to the dental profession, both in terms of treating and preventing the sequelae of injuries. The objective of prevention requires reaching out at the community level to those particularly susceptible to trauma. Thus, information on the incidence of traumatic injuries to the teeth and related variables such as gender, frequently affected tooth/teeth and causes of trauma need to be documented. So that they help in planning and implementing efficient trauma prevention and educational strategies.[4]

Due to limited literature regarding epidemiological data of traumatic injuries in Telanagana state, India, the present study is conducted to determine the prevalence and etiology of traumatic dental injuries among 8-14 year old school going children in Hyderabad city in Telangana state, South India.

METHODOLOGY

A cross-sectional study was carried out involving 8 to 14 year old children who were brought to the department for routine dental check-up by the volunteers of the Rashtriya Bala Swastha Kendra (RBSK) group. These children came from various government schools across Hyderabad.

The present study included only the children with completely erupted permanent anterior teeth. The children with special health care needs and also children with severe dental fluorosis, incompletely erupted anterior teeth and children who are undergoing orthodontic treatment were excluded from the study. A total of 2350 children including 1245 boys and 1105 girls in this age group were included in the study.

Dental examination was done as per WHO type IV criteria. The traumatic injuries were classified according to Ellis and Daveys classification.[5] However, type VI injury was not recorded, as dental radiographs were not taken during the examination. The examination was carried out by a single trained dental surgeon. A close ended questionnaire was prepared to collect data. Sociodemographic data included age and sex. Non clinical data collected included place of injury, cause of injury and treatment undertaken due to injury.

The sample size (nh) was determined using the formula

$nh = z2\,(p)\,(q)\,(f) / (e)2$

z- the statistic that defines the level of confidence desired (1.96)

f- the sample design effect, deff, assumed to be 2.0 (default value)

p-the proportion of the total population accounted for by the target population (0.14)

e- the margin of error to be attained (0.02)

Thus the sample size was rounded up to 2350 to be adequate for determining the prevalence rate in the children of Hyderabad city.

Statistical analysis:

The data was analysed with Statistical Package for Social Sciences (SPSS) for Windows 25.0 (SPSS, Inc.Chicago, Illinois). Descriptive statistics were used to analyse the data.

RESULTS

A total of 2350 children including 1245 boys (53%) and 1105 (47%) girls were examined and interviewed for Traumatic Dental Injuries. Sixty one children were found to be affected by Traumatic Dental Injuries showing a prevalence rate of 2.59%. Males accounted for 45(73.7%) affected children in the study, whereas females accounted for 16(26.3%). Overall males were found to be more affected than females with the ratio of 2.8:1 (45 boys:16 girls) (Table 1). While assessing the nature of trauma Ellis class II fractures accounted for 27 of the 61 cases noted (44.2%), followed by Ellis class III (32.8%) and class I (6.6%) fractures. Fractured teeth became non-vital in 3 cases (4.9%) and while 3 teeth (4.9%) showed Ellis class VIII fracture (Table 2).

When the cause of trauma was determined, accidental falls at home (47.5%) and at school (27.9%) accounted for majority of the cases followed by collisions or accidental blows (9.8%), road traffic accidents (6.6%) and incidences of violence (4.9%) (Table 3).

The teeth most commonly affected were the Maxillary Central Incisors (either one or both) 90.2%, followed by Maxillary Lateral Incisors along with one or both Maxillary Central Incisors 9.8%. Isolated maxillary lateral incisor fractures or mandibular anterior teeth fractures were not seen in the study sample (Table 4).

Table 1: Distribution of Traumatic Dental Injuries based on gender

Gender	Frequency	Percent
Male	45	73.7
Female	16	26.3
Total	61	100.0

Table 2: Frequency of Ellis Fractures

Ellis fractures	Frequency	Percent
Class I	4	6.6
Class II	27	44.2
Class III	20	32.8
Class IV	3	4.9
Multiple fractures	4	6.6
Class VIII	3	4.9
Total	61	100.0

Table 3: Causes of fracture

Cause of fracture	Frequency	Percent
Accidental Falls in school	16	27.9
Accident falls at home	28	47.5
RTA	4	6.6
Accidental blow	6	9.8
Violence	3	4.9
Others	4	6.6
Total	61	100.0

Table 4: Teeth involved in fractures

Teeth involved	Frequency	Percent
Maxillary Central incisors	55	90.2
Maxillary central and lateral incisors	6	9.8
Total	61	100.0

DISCUSSION

Trauma to the child dentition is a significant problem, since fracture of one or more teeth, especially anteriors, may result in pain, loss of function, poor esthetics and psychological trauma to both parent and the child.

The International Association of Dental Traumatology[6] reports that one out of every two children sustains a dental injury, most often between the ages of 8 and 12. That is reason in the present study this age group was chosen and also permanent incisors will be completely erupted in this age group.

Depending on the classification system used for traumatic injuries, the dentition involved, geographical and behavioural differences between study locations and countries, the prevalence of traumatic dental injuries world-wide ranges from 6% to 34%.[1] In the present study, the prevalence of Traumatic Dental Injuries was found to be 2.6%. A lower prevalence rate noted in this study may be attributed to the sample selected, type of study or classification used.

Males were found to be more affected than females in the ratio 2.8:1. This finding may be related to their tendency to be more active and involved in vigorous outdoor activities and games than girls. Many previous studies[1,2,3,7,8] are in accordance with this finding while some studies show no gender differences[9].

Ellis classification[5] is a simple classification for dental trauma recording. Since we did not assess alveolar socket injuries and jaw fractures or gingival or oral mucosa laceration, we preferred to use this basic and standard classification rather than Andreasen's classification. Ellis class II fracture (uncomplicated crown fracture involving enamel and dentin) was the most prevalent type of injury observed followed by Ellis class III (complicated crown fracture involving enamel dentin and pulp). This was in line with the research performed by Ahmad A8, Singh N et al[9], Osadolor OO[10], Bastone EB.[11] Class I fractures accounted for 6.6 percent among all fractures. Fractured teeth became non-vital in 3 cases (4.9 percent) and while 3 teeth (4.9 percent) showed Ellis class VIII fracture. It was surprising that none of these children underwent any dental treatment for these injuries except perhaps taking medication at the time of injury.

Falls are the most prevalent causes of etiology. Our research disclosed that traumatic injury etiology was predominantly due to falls (78%). Studies conducted by Gojanur S et al[3], Singh et al[9] also found that this finding is consistent with most literature research. In our present study, we have divided falls into two categories- falls at home and falls at school. Falls at home are more common than at school. The patients home for both primary and permanent dentition has been continuously recorded as the most common place for dental trauma.[1,12,13,14,15] One or both Maxillary Centrals were the most commonly affected teeth (over 90%), followed by combination of maxillary central and lateral incisors (9.8%). The findings of this study including males being more affected and maxillary central incisors being the most commonly affected teeth are in accordance with the findings of Govindrajan et al[15], Rouhani et al.[16]

Also contributing factors are the economic situation of the patient and absence of accessibility to adequate dental care. Lack of awareness has been a contributing factor for not seeking dental care immediately after injury in this study group.

CONCLUSION

The prevalence of dental trauma is 2.75%, males account for more TDI than females, and falls at home are regarded to be the most prevalent etiological fracture. Dental injury has an effect on the day-to-day lives of the child and a credible evidence base need to be established where standardized classification and adjunct data collection techniques can help. Community and school education programs need to be put in place to increase awareness and prevent dental trauma.

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REVIEW ARTICLE

CHLORHEXIDINE FOR LOCAL DRUG DELIVERY IN PERIODONTITIS – A REVIEW

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ABSTRACT

Periodontitis is caused by host bacterial interactions, which leads to inflammation, pocket formation, destruction of attachment apparatus of teeth, eventually leading to tooth loss. Scaling and root planing (SRP) is considered as gold standard to attain and maintain periodontal health by elimination of bacterial plaque. Perioceutics, which includes the delivery of therapeutic agents via systemic and local means as an adjunct to mechanical therapy has revolutionized the arena of periodontal therapy. Irrigating systems, fibers, gels, strips, films, microparticles, nanoparticles and low dose antimicrobial agents are some of the local drug delivery (LDD) systems available in the field, which deliver antimicrobial agents to sub-gingival diseased sites with minimal side-effects. Over the year's chlorhexidine (CHX) has been used in the dental practice as an excellent antiplaque agent. Chlorhexidine not only exhibits special property of substantivity, it also possesses a broad antimicrobial spectrum which makes its use in wide variety of oral disorders. The aim of present review is to discuss the role of Chlorhexidine as local drug delivery in periodontitis.

Key words: Periodontitis, Scaling and root planning, Local drug delivery, Chlorhexidine

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INTRODUCTION

Periodontitis is caused by host bacterial interactions, which leads to inflammation, pocket formation, destruction of attachment apparatus of teeth, eventually leading to tooth loss. Scaling and root planing (SRP) is considered as a gold standard to attain and maintain periodontal health by elimination of bacterial plaque. As the probing depth increases, the effectiveness of SRP decreases because of limited access to deep pockets, which leads to incomplete removal of periodontopathogens.[1]

Antibacterial agents have been used along with mechanical debridement locally or systemically in the management of periodontal infections. For the effective treatment, the antibiotic must reach the depth of the pocket and produce gingival fluid concentration higher than the minimum inhibitory concentration (MIC) of the suspected pathogens.[2]

The disadvantages of systemic antibiotics like bacterial resistance, superimposed infections, uncertain patient compliance, nausea, vomiting and gastrointestinal disturbances led to the introduction of local drug delivery as a treatment option in the management of periodontitis by Dr. Max Goodson in the year 1979.[2]

Intrapocket administration, i.e., application of an antimicrobial agent at the site of infection, achieves greater concentration of the drug (sometimes 100 folds more than MIC), lessens the chance of developing drug resistance, enhances patient compliance, reduces the risk of extraoral super infections, and avoids gastrointestinal adverse reactions due to minimal systemic uptake.[3]

LOCAL DRUG DELIVERY (LDD)

An ideal LDD must be easy to administer, release the drug in a controlled fashion, sustain the drug concentration for prolonged period, should be biodegradable, biocompatible and not cause any irritation to the tissues. The placement of LDD is supported by presence of periodontal pocket, which acts as a natural reservoir in which gingival crevicular fluid (GCF) provides hydrated environment that increases distribution of the drug throughout the pocket.

Ideal requirements for local antimicrobial agents (Goodson 1985) :

- Must deliver the drug to the base of pocket
- Must have microbiologically effective concentrations in the pocket.
- Should sustain the concentration of the drug in the pocket for sufficient period of time & at a concentration to be clinically effective.
- Less undesirable side effects

Classification of Local Drug Delivery system[2] :

I. Based on the application [Rams and Slots] 1996:

1. Personally applied (self-care)

A. Non sustained subgingival drug delivery

- Home oral irrigation
- Home oral irrigation jet tips
- Traditional jet tips
- Oral irrigation (water pick)
- Soft cone rubber tips (pick pocket)

B. Sustained subgingival drug delivery

2. Professionally applied (in dental office)

A. Non sustained subgingival drug delivery

- Professional pocket irrigation

B. Sustained subgingival drug delivery

- Controlled release devices
- Hollow fibres
- Dialysis tubing
- Strips
- Films

II. Based on the duration of medicament release (Greenstein and Tonetti) 2000 :

A. Sustained release devices - Designed to provide drug delivery for less than 24 hours

B. Controlled release devices - Designed to provide drug release that at least exceeds 1 day or for at least 3 days following application (Kornman1993)

III. Depending on degradability:

1. Nondegradable devices (first generation)

2. Degradable devices (second generation)

Various drug delivery systems for treating periodontitis are fibres, films, injectable systems, gels, strips, compacts, vesicular system, microparticles and nanoparticles.

Various agents available in the market are :

AGENT	PRODUCT AVAILABLE	DOSAGE FORM
Tetracycline	Actisite (25% tetracycline Hcl) Periodontal plus AB (2mg of tetracycline in 25mg of collagen)	Non resorbable fiber Resorbable fiber
Doxycycline	Atridox (10% Doxycycline)	Biodegradable mix in syringe
Minocycline	Dentomycin gel (2% minocycline) Arestin (2% minocycline) Periocline (2.1% minocycline)	Biodegradable gel Biodegradable mix in syringe Ointment
Metronidazole	Elyzol (25% metronidazole)	Biodegradable gel
Chlorhexidine	Periochip (2.5 mg CHX) Periocol CG (2.5mg CHX) Chlosite (1.5% CHX) Cervitec (1% CHX and 1% Thymol)	Biodegradable chip Biodegradable chip Biodegradable gel Biodegradable varnish

CHLORHEXIDINE

Chlorhexidine (CHX) is a bisbiguanide antiseptic and a symmetrical molecule consisting of four chlorophenyl rings and two biguanide groups connected by a central hexamethylene bridge. It is a strong base and is di-cationic at pH levels >3.5, with two positive charges on either side of the hexamethylene bridge[5]. As an antimicrobrial agent, it is effective in vitro against both Gram-positive and Gram-negative bacteria including aerobes and anaerobes and also yeasts and fungi. It is poorly absorbed through gastrointestinal tract, metabolized in liver and kidney and excreted through faeces. It is free from systemic toxicity, microbial resistance & superinfection[5]. It is retained in the oral cavity and is progressively desorbed in bacteriostatic concentrations 8 hours after rinsing. It acts by altering integrity of cell membrane of bacteria and the mechanism of action includes plaque inhibitory effect, bacteriostatic and bactericidal effect, substantivity and pincushion effect.

When a low dose is used, the cellular transport of the bacterial cell is damaged with the creation of pores in the cellular membrane (Bacteriostatic). In higher concentration, the solution penetrates the bacterial cell and leads to microorganism destruction (Bactericidal)[5]. The ability of drugs to adsorb onto and bind to soft and hard tissues is known as Substantivity and was first described in the 1970s. It is influenced by the concentration of medication, its pH, temperature, and length of time of contact of solution with the oral structures. This property was associated with its ability to maintain effective concentrations for prolonged periods of time which made it suitable for the inhibition of plaque formation[5].One charged end of CHX molecule binds to the tooth surface and the other end interacts with bacterial membrane, as the microorganism approaches the tooth surface. This is known as the Pin cushion effect. This explains the lack of effectiveness of other antimicrobials in terms of them lacking a large, rigid molecule with two charged interactive ends[5].

The reported side effects of CXH are alteration in taste, increase in calculus formation, staining of teeth and mucous membranes and rarely, oral mucosa desquamation and parotid swelling. However, the most important side effects are the brown staining of the teeth, restorative materials and dorsum of the tongue as well as supragingival calculus formation. Non-enzymatic browning (Maillard reactions)

and formation of pigmented metal sulfides are considered the possible mechanisms of tooth discolorations[5].

The vehicles most often used to administer chlorhexidine are mouthrinses (at concentrations of 0.12% and 0.2%), aerosols (0.12% and 0.2%), gels (0.12% and 1%), CHX chip and varnishes[6].

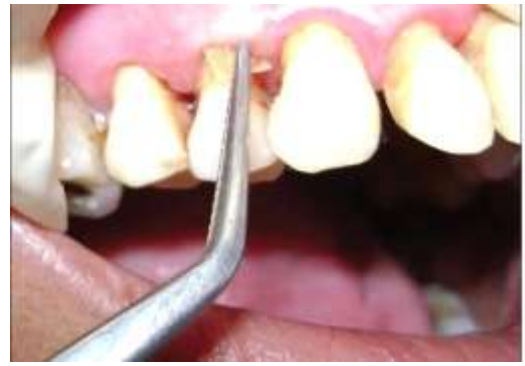
CHLORHEXIDINE AS LOCAL DRUG DELIVERY

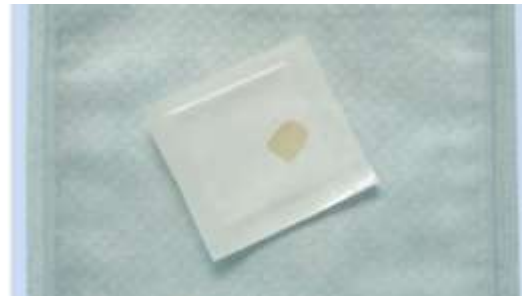
CHLORHEXIDINE GEL

Chlosite TM gel is a xanthan based 1.5% CHX gel containing 0.5% fast releasing chlorhexidine gluconate and 1% slow releasing chlorhexidine dihydrochloride. Xanthan is an optimum substrate for formation of a stable gel that is easily extruded from 0.5ml syringe needle and is delivered into periodontal pocket[7]. It degrades spontaneously in the application site in 15-30 days and is well tolerated.

CHLORHEXIDINE CHIP

Periochip is a small chip composed of biodegradable hydrolysed gelatin matrix, cross-linked with glutaraldehyde and also containing glycerine and water, into which 2.5mg of chlorhexidine gluconate has been incorporated per chip. It is a FDA approved small, orange, brown chip measuring 4.0x0.5x0.35mm in a biodegradable matrix of hydrolysed gelatin[2]. Subgingival placement of a biodegradable chip, biodegrades and releases CHX within the pocket over 7 10 days maintaining an average concentration in the GCF greater than 12 mg/ml for 8 days[1].



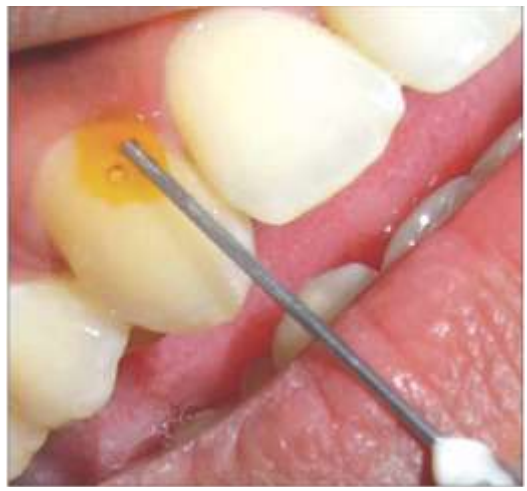


CHLORHEXIDINE VARNISH

Varnishes have been developed over the past decade. They are one of the most effective form for professional application of chlorhexidine, as they are easy to apply, do not require collaboration by the patient and although they have an unpleasant flavour, they do not cause discoloration[6]. They are a novel class of vehicles emerging for antimicrobial delivery in the management of oral infections. An ample dosage is administered and retained at the site of action, minimizing the associated adverse effects. The most salient advantage offered by this mode is prolonged direct contact of the drug with the affected tissue. It further allows multiple site intervention, thus enhancing its cost-effectiveness. Hence, they seem quite promising as vehicles for local drug delivery in periodontal milieu[3].

Varnishes containing chlorhexidine are available in the concentrations of 1% (Cervitec), 10% (chlorzoin), 40% (EC 40), and 20% (Bio C).

Varnish	Composition
EC40 ®	40% Chlorhexidine Sandarac Ethanol
Chlorzoin ®	10% Chlorhexidine Ethanol Polyurethane Methylene chloride Sumatra benzoin
Cervitec ®	1% Chlorhexidine 1% Thymol Ethanol/ethyl acetate Polyvinyl butyral



CONCLUSION

The application of chlorhexidine as an agent for LDD seems to have beneficial effects in patients with chronic gingivitis and periodontitis, improving their plaque accumulation and bleeding levels and reducing their gingival index and periodontal pocket. It is not only an excellent antiplaque agent but it also possesses very good antimicrobial properties. It's broad antimicrobial spectrum can be considered as boon for maintaining overall oral health. A wealth of research supports its use in various forms and in wide variety of oral disorders.

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REVIEW ARTICLE

CYANOACRYLATE TISSUE ADHESIVES: A PRACTICAL ALTERNATIVE TO SUTURES?

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ABSTRACT

Cyanoacrylate is a tissue adhesive, which has been widely used in the area of medicine and dentistry for wound closure and for improving healing. It is used in areas free of tension and in superficial wounds. It is widely used in gingivectomy, flap surgery and for closure of wounds in the soft tissue graft donor site in the palate. The material can be spread easily, readily wets the surface to which it is applied and produces very little heat. It will stick virtually to any biological or synthetic material. Although it has more tensile strength compared to sutures, it cannot adhere to tissues under tension. The aim of the present review is to discuss the role of cyanoacrylate as an alternative to silk sutures.

Keywords: Cyanoacrylate tissue adhesive, silk suture, flap surgeries.

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INTRODUCTION

Proper closure of the surgical wounds is necessary for attainment of healing by primary intention. Surgical sutures are the most commonly used methods of wound closure in periodontal surgery. They function primarily to approximate the flaps and to promote wound healing when wound is most vulnerable. Materials like silk, nylon, steel, catgut and polyglycolic-polylactic acid derivatives are being used for post-operative closure of the flaps. Suturing is technique sensitive, time consuming procedure and can cause tissue damage if not handled properly. Braided silk suture has a phenomenon of wicking, which make it a site for secondary infection. It also has the maximum amount of inflammatory tissue response. Hence, a need for an alternative is felt.[1]

Surgical tissue adhesives are increasingly used in place of sutures to close wounds. Tissue adhesives prevent needle stick injuries, promote healing and avoid additional appointment for suture removal.

CYANOACRYLATE TISSUE ADHESIVE

Over the entire range of surgical adhesives, cyanoacrylates have unique combination of chemical and physical properties that set them apart from others. They have been exploited for topical tissue repair and closure.

Cyanoacrylate adhesives were originally developed in the late 1940s, and their potential as a medical adhesive became evident during the Vietnam War as a hemostat for soldiers wounded in field combat. The chemical formula is CH2=C(CN)-COOR where R can be substituted for any alkyl group, making different kinds of cyanoacrylate adhesives. By changing the type of alkyl chains in the compound to one with longer molecular chain can reduce tissue toxicity.[2] Cyanoacrylate provides faster healing and the patient experience less postoperative pain.[3]

Two types of cyanoacrylates are commonly used:

1. N-butyl-2-cyanoacrylate (Histoacryl, B. Bruan, Tuttlingen, Germany; Glubran 2, GEM S.r.l., Viareggio, Italy; Trufi ll, Cordis Neurovascular, Inc., Bridgewater, NJ, USA, and others)
2. 2-Octyl-cyanoacrylate (Dermabond, Ethicon, Raleigh, NC, USA, and others)

The N-Butyl-2-cyanoacrylate has become the most popular and common adhesive. It has been widely used in endoscopic therapy for more than 10 years. Cyanoacrylate provides immediate hemostasis, rapid adhesion to soft and hard tissues, and it also has bacteriostatic proprieties, good tissue compatibility and gradual resorption without foreign-body response.

The cyanoacrylate is mostly used in areas of superficial wounds and that free of tension. It is used in gingivectomy, periodontal flap surgeries. The use of cyanoacrylate tissue adhesives can overcome the inherent limitations of silk sutures and can provide a closed environment for undisturbed healing during the early post-operative period.

For connective tissue graft procedure, graft is mostly harvested from palatal donor site. This surgery often leaves an open wound which is painful. Recently using cyanoacrylate for closure of donor sites have shown to reduce patient discomfort.[4]

Cyanoacrylate helps to stabilize collagen membrane in an extraction socket thereby delaying alveolar ridge resorption.[5]

Cyanoacrylate can be used as periodontal dressing after gingivectomy procedure to cover the exposed surgical area.

In 2014 Gümüs, reported the use of cyanoacrylate tissue adhesive to stabilize free gingival grafts and they found less graft shrinkage in sites stabilized with cyanoacrylate. This study suggests that cyanoacrylate may be considered as an alternative for stabilization of free gingival grafts.[6]

Application of cyanoacrylate

Cyanoacrylate is placed in a dropwise manner on the flap margins, which are then held in place. The application is done until a thin film

of set cyanoacrylate is formed. It sets within 5-10 seconds by polymerization in the presence of moisture and even blood, with release of heat.[7]

Advantages of cyanoacrylate

1. Cyanoacrylates are single-component, catalyst-free adhesives capable of bonding at room temperature within just a few seconds.
2. Cyanoacrylate require no external initiation, relying only on the small amount of adsorbed water and chemicals on the tissue surface for cure.

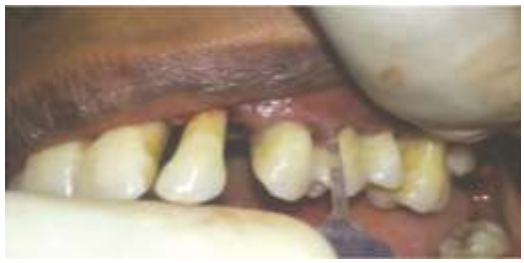

Figure 1:
Application of cyanoacrylate

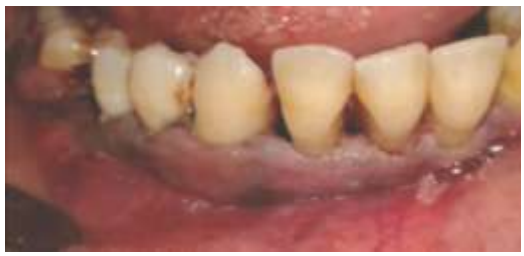

Figure 2:
Cyanoacrylate-immediate post application

3. Unlike sutures, which leave small openings in the wound, cyanoacrylates form a continuous seal which efficiently distributes the load and leads to decreased scarring.
4. These adhesives can also act as a liquid bandage to protect the wound and even act as a reservoir for antibacterial medication.

Disadvantages of cyanoacrylate

1. Significant reactivity of cyanoacrylate results in short shelf-life.
2. Due to reactivity, precautions are needed for their application and delivery.
3. Heat produced from the curing reaction can cause inflammation.
4. Toxic byproducts (e.g., formaldehyde) are formed on degradation causing inflammation (additive scavengers can reduce this risk).

CONCLUSION

Cyanoacrylate is found to be better as compared to sutures because it provides additional benefits like immediate hemostasis, easy application, patient acceptance, esthetically more pleasing, noninvasive, less time consuming, absence of postsurgical pain or infection, easy postoperative maintenance, and no food lodgment.

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REVIEW ARTICLE

INJECTABLE PLATELET RICH FIBRIN - A REVIEW

ABSTRACT

Platelet concentration [PC] has been utilized in regenerative dentistry as a supra-physiological concentrate of autologous growth factors capable of stimulating tissue regeneration. The objective of all these technologies is to extract all the elements from a blood sample that could be used to improve healing and promote tissue regeneration. Although leukocyte rich and leukocyte poor PC have their place in literature, the importance of non-platelet components in a platelet concentrate remains a mystery. PC has come a long way since its first appearance in 1970s to the T-PRF, A-PRF and i-PRF introduced recently. Platelet concentration has almost replaced platelet-rich plasma, owing to its advantages such as being 100% autogenous, ease of technique and cost-effectiveness with superior and prolonged growth factor release. These Platelet concentrates are frequently used for surgical procedures in dentistry. It has various application in periodontics, for treating gingival recession, guided bone and periodontal regeneration and in the management of peri-implant defects. It is also widely experimented for pulpal regenerative therapy. Hence the aim of this article is to review the biological properties of platelet-rich fibrin and the advancement in the PRF technologies since its inception

Key words: platelet concentrates, growth factors, platelet rich fibrin.

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INTRODUCTION

Favourable wound healing has always been a major quest in dental surgery. It is a complex biological process where many cellular events are taking place simultaneously leading to the repair or regeneration of damaged tissues. Many attempts have been made in the field of tissue regeneration to predictably repair, regenerate, or restore damaged and diseased tissues. These include strategies with foreign materials often derived from allografts, xenografts, or synthetically produced alloplasts to regenerate host tissues. While many of these materials have shown promise in various aspects of regenerative medicine, it is important to note that most of these materials may create a "foreign body reaction"[1].

Platelet concentrates collected from whole blood was first introduced over 20 years ago. The concept was developed to utilize human blood proteins as a source of growth factors capable of supporting angiogenesis and tissue ingrowth based on the notion that blood supply is a prerequisite for tissue regeneration[1].

In the past two decades, the use of autologous platelet concentrates (PCs) has gained great popularity in a variety of medical fields such as dentistry, oral surgery, orthopaedics, dermatology, ophthalmology, cosmetic and plastic surgery[2].

The rationale behind its regenerative potential is the presence of various growth factors in the alpha-granules of platelets which are released at the local site on their activation. Besides this, they also impart anti-inflammatory properties, thereby reducing postoperative pain and swelling. Also, few studies have explored its antibacterial potential although its mechanism is controversial. In the past few years, various platelet concentrates have evolved depending on the technique employed which vary in their centrifugation protocols[3].

Initially platelet concentrates were developed with anticoagulants to prevent the rapid coagulation of blood before centrifugation. Original protocols were designed utilizing a two-step centrifugation procedure, which produced what was later termed platelet-rich plasma (PRP), and many fields of medicine and dentistry have benefited from the ability of these protocols to induce a 6- to 8-fold increase in blood-derived growth factors. The main concern regarding the use of anticoagulants was its negative impact on wound healing by preventing clot formation, which is an essential step during the natural wound healing process[4].

For these reasons, in 2001 Choukroun et al. pioneered new research aimed at utilizing platelet concentrates without incorporating anti-coagulants within their preparations. This novel formulation, later termed platelet-rich fibrin (PRF), was the first strategy utilizing platelet concentrates without anti-coagulants. Two main advantages reported were the fact that the wound healing cascade was not inhibited by the anti-coagulants and that natural clot formation occurred. Furthermore, PRF contains a high concentration of host immune cells (namely leukocytes), which act to promote local wound healing and fight infection[4].

One such recently introduced platelet concentrate by Joseph Choukron in 2014 is injectable platelet-rich fibrin (PRF) more commonly referred to as i-PRF. It requires neither any anticoagulant nor any additive. It is obtained by centrifuging blood at low-speed. This results in PRF for use in the liquid (injectable) form. It coagulates within few minutes after the injection and is believed to contain not only white cells and platelets but also circulating stem cells and endothelial cells. Hence, it is considered as a "blood concentrate" and not just a platelet concentrate.[3]

BACKGROUND[5]

The evolution of the first and second generation of platelet concentrates (platelet-rich plasma and platelet-rich fibrin respectively) from their fore runner-fibrin sealants. The following tables outlines the various techniques in chronological order as Platelet concentrates evolved.

	Name	Proposed by	Technique	Drawbacks
1.	Platelet concentrates	1970's	Donor plasma which was then mixed with thrombin and calcium which led to polymerization of fibrinogen	Poor stability or risk of disease transmission in case of commercially available products
2.	Autologous fibrin glue	Tayapongsak 1994	Pre-operative (one to three weeks before the procedure) collection of blood followed by around 30 minutes (ammonium sulphate precipitation technique) to 48 hours (cryoprecipitate technique) of handling.	The technique was long and complex The amount of concentrate obtained was quite less as compared to the amount of blood collected
3.	Platelet-rich plasma	Whitman 1997	Double centrifugation of autologous blood with anticoagulant. It consisted of a soft spin followed by which the blood would separate into the red corpuscular base, buffy coat and the platelet-poor plasma. The last two components were aspirated and re centrifuged at a hard spin after which PRP was collected in the bottom of the tube.	Bovine thrombin which could give rise to life-threatening coagulopathies in rare cases
4.	Plasma rich in growth factors	Anitua & co-workers 1999	Autologous blood with anticoagulant was centrifuged at 460G for 8 mins and this resulted in the collection of plasma rich in growth factors (PRGF) at the bottom of the tube. This PRGF was then taken from the bottom of the tube and cacl2 was added (0.05ml/ ml of PRGF). This led to coagulation in around 10 minutes and a gelatinous PRGF was obtained.	Led to incomplete activation of platelets and low levels of growth factors release.
5.	Platelet-rich fibrin (PRF)	Choukroun et al. in 2001	The basic protocol of producing PRF requires around 10 ml of blood to be collected from the patient without anticoagulant in a glass tube. After collection, the blood is quickly subjected to centrifugation at 2700 rpm for 12 minutes.	

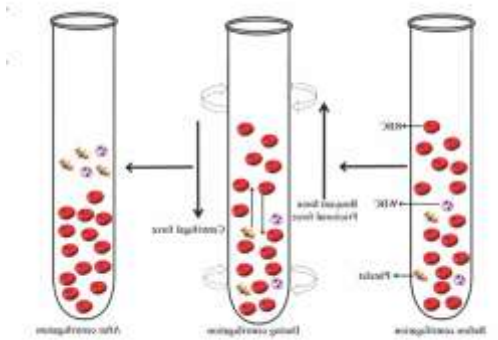
Action of centrifugal force on blood[5]

Principle - Is to allow the blood to clot as it would physiologically. Under normal circumstances, the blood would coagulate to form a blood clot.

In the centrifuge, two processes are occurring simultaneously-

1. Separation of blood elements under the centrifugation force

- The force of centrifugation exerted is directly proportional to the mass of the individual particle.



- under the centrifugation force, RBC's, which have relatively higher mass settle towards the bottom of the tube. Whereas WBC's, platelets and plasma along with its clotting factors which have comparatively lower mass are pushed towards the top of the tube.
- This occurs in the early part of the centrifugation cycle (before approximately 2-3 mins)

2. Blood coagulation

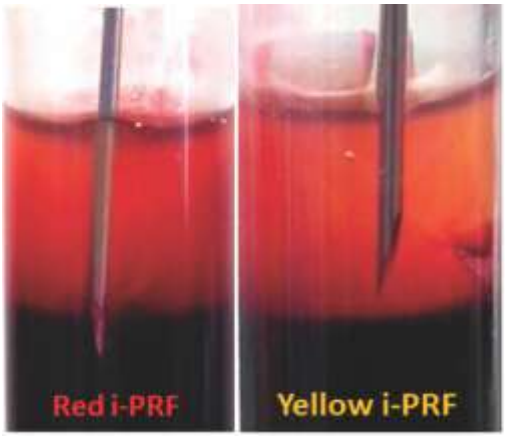
- By the time the final steps of coagulation cascade i.e. conversion of prothrombin to thrombin and fibrinogen to fibrin occurs, the factors required for coagulation are all present in the plasma, which is now located at the top of the tube near platelets under the force of centrifugation.
- Once this separation is achieved, the rest 6-8 minutes of the centrifugation cycle is to maintain the separation and let clotting proceed.
- Hence, RBC's which do not contribute significantly to the healing of a wound is effectively excluded from the blood clot under the centrifugation force, and the clot now consists mainly of platelets (1.5 to 3 lakh/ml in a blood clot to around 10 lakh/ml in PRF) and fibrin.

PRF PROTOCOLS

PRF	Described by (year)	RPM	TIME (Minutes)	TUBE
Leukocyte and Platelet-rich fibrin (L-PRF)	Chourkroun 2004	2700	12	Glass coated tube
Advanced -PRF	Ghanati 2014	1300	14	Sterile glass based vacuum tubes (A-PRF10 tubes)
A-PRF+	Fujioka-Kobayshimiron 2016	1300	8	Same as APRF
Injectable – PRF	Mourao 2015	700	3	Non coated
PRF Lysate		2700(after preparation it is incubated at 37°C in a humidified atmosphere of 5%CO2/95%air)	12	Glass coated tube
Titanium-PRF	Tunali & co-workers	2800	12	Medical grade titanium tube

Injectable PRF (IPRF)

- One of the latest developments in the PRF technology is the production of injectable PRF (i-PRF). As compared to PRP, one drawback that limits the applications of PRF is that PRF is obtained as a gel form which is not conducive to be injected.
- Thereby, according to the low-speed centrifugation concept, further reduction of the centrifugal force to 60 g and the use of plastic tubes allowed for the introduction of an injectable PRF matrix (i-PRF) without using anticoagulants.
- To avoid the need for external anticoagulants to generate an effective total autologous and fluid blood concentrate system, specific plastic tubes were developed to collect blood.
- In contrast to the glass tubes used in solid PRF matrices, the characteristics of the plastic surface do not activate the coagulation cascade during centrifugation.
- After centrifugation, the blood is separated into three main parts based on the buffy coat layer: A yellow upper part, a buffy coat middle part and a red blood cell containing the lower part[6].
- I-PRF is collected using an 18G hypodermic needle by controlled aspiration of the upper fluid part. The collected i-PRF maintains its fluid phase for up to 10 to 15 minutes after centrifugation.
- Remarkably, the reduction of the centrifugation force led to an enrichment of i-PRF with platelets and leukocytes. Consequently, flow cytometry showed that i-PRF includes the highest number of platelets, leukocytes and growth factors among all the solid PRF-based matrices.
- Also, I-PRF is devoid of the drawbacks related to bovine thrombin including the development of antibodies to the factors V, XI & thrombin and chances of life-threatening coagulopathies. Hence, an injectable variety of PRF theoretically would be a superior alternative to PRP for the abovementioned applications.



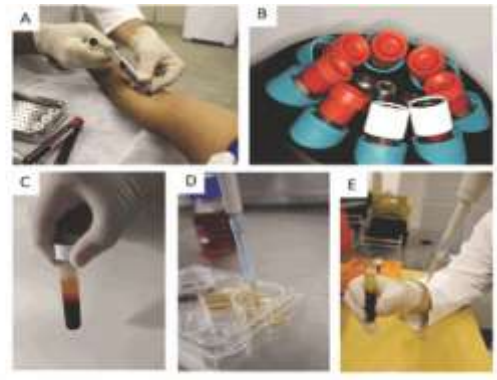


Figure 1: i-PRF preparation: (A) blood collection; (B) centrifugation machine; (C) aspect after centrifugation; (D,E) separation.

BIOLOGICAL ACTION[5]

EFFECT	MEDIATED BY	ACTION
Angiogenesis	Vascular endothelial growth factor (VEGF), angiopoietin, platelet-derived growth factor (PDGF), basic-fibroblast growth factor (FGF-b)	• Cells in the wound vicinity to migrate, divide and change phenotype • stimulates expression of **α5β3** integrin on the endothelial cells which promote the binding of endothelial cells to fibrin, fibronectin & vitronectin.
Mitogenesis	TGF-**β** Fine & flexible trimolecular/ equilateral junctions	• Mitogen for cells including fibroblasts, marrow stem cells, endothelial cells, pre-osteoblasts, mesenchymal cells • Inhibitory effect on osteoclasts • Enhanced cytokine entrapment, promotes rapid cellular migration
Immunomodulatory effects	Fibrin and its degradation Products Fibronectin Leukocytes IL-4	• Stimulate migration, phagocytosis and enzymatic degradation by neutrophils • Increases the expression of CD11C/CD18 receptor on neutrophils which mediates adhesion to endothelium and fibrinogen • Releases certain chemotactic factors which regulate wound colonization by macrophages • Increased degranulation to release several molecules including IL-1, IL-4, IL-6 and TNF-**α** • Coherent healing without inflammatory excess
Wound recolonization	Fibrinogen, fibronectin, vitronectin and tenascin Fibrin	• Undergoes degradation and allows epithelial cell migration on wound margins • Binds to several molecules including fibronectin, PDGF & TGF-b through the **αVβ3** integrin • Promotes the migration of fibroblasts
Osteogenic effect		• May upregulate the expression of alkaline phosphatase and osteoprotegerin • Enhance the expression of phosphorylated extracellular signal-regulated protein kinase, osteoprotegerin and alkaline phosphatase activity
Entrapment of stem cells		Even though the intrinsic content of stem cells is quite low, it has been hypothesized that the fibrin clot may act as a trap for circulating stem cells which may converge to a secretory phenotype allowing vascular and tissue restoration

CLINICAL CONSIDERATIONS

- Currently, I- PRF has been used along with bone grafts, which on completion of the coagulation process forms a gel-putty consistency with the graft particles incorporated in the graft.
- The graft thus formed has a good workable consistency, leading to decreased leaching of the graft as it is tightly encapsulated in the fibrin matrix.
- Mixing the bone graft with i-PRF also gives the benefit of growth factor release at the recipient site which would otherwise be missing in a normal bone graft. This has the potential to convert any osteoconductive graft to osteopromotive (due to the presence of platelets & growth factors) which would translate into faster and better efficiency of bone formation
- As an adjunct it has been used for all grafting applications to increase their volume and bio-activity, including guided tissue regeneration in intra-bony defects and Grade II furcation involvements, guided bone regeneration in cases of socket preservation/ augmentation, for combined endodontic-periodontal lesions and hard and soft tissue augmentation around implants.
- Another kind of graft that has been obtained with i-PRF is the PRF block. For its preparation, i-PRF is mixed with a combination of bone graft and shredded PRF clot. This enhances the volume of the graft.
- Platelet-rich fibrin might serve as a potentially ideal scaffold in revascularization of immature permanent teeth with necrotic pulps as it is rich in growth factors, enhances cellular proliferation and differentiation, and acts as a matrix for tissue in growth; which can be used for the treatment of immature tooth with a necrotic pulp by revascularization procedure using PRF[7] and in procedures like Pulpotomy, PRF could be used as an alternate treatment to mineral trioxide aggregate or other materials in mature permanent teeth with pulpitis[8].

CONCLUSION

PRF as a biologic surgical additive has been successfully used for varied applications in dentistry. Technological advancements in the field of PRF such as i-PRF have paved way for the versatility in the applications of the platelet concentrates. With the increase in our understanding about the biology of PRF, in future, we can expect improved additives which will further enhance the wound healing experience.

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PASSIVE IMMUNIZATION WITH IgY ANTIBODIES - A REVIEW

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ABSTRACT

Specific antibodies from hen egg yolk preparations (IgY) have attracted considerable attention in recent years, and have been studied extensively with oral and gastrointestinal pathogens in both humans and animals. Advantages of an IgY-based therapy include reduced cost, biosafety, and easy preparation in large quantities using eggs from immunized hens. This article presents an overview of role of IgY Antibodies in nutrition and diseases prevention.

Key Words: IgY, hen egg yolk antibody, immunisation

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INTRODUCTION

Recently, passive immunization has gained much attention, as compared with active immunization, because of the possible side-effects caused by vaccine antigens.[1-3] It is known that the hen transfers serum IgG to the egg yolk and that this antibody gives immunity to its offspring.[4] The antibodies present in egg yolk have been termed IgY.[5] Thus, it is possible to obtain pathogen-specific IgY antibody from eggs laid by hens immunized against antigens.[6,7] Since poultry farming is carried out on a large scale globally, eggs may be a suitable source of antibody for passive immunization, which requires large amounts of antibodies, because of the oral administration route utilized. Advantages of an IgY-based therapy include reduced cost, biosafety, and easy preparation in large quantities using eggs from immunized hens.[8] This article reviews the positive effect of including egg yolk IgY antibodies in nutrition and prevention of diseases.

HISTORY

In 1893, Klemperer first described an experiment in which he demonstrated that the immunization of a hen resulted in the transfer of specific antibodies (Abs) into the egg yolk.[9] Since the 1980s, egg yolk antibodies (IgY Abs) have found a broader application, possibly due to the availability of commercial secondary reagents such as IgY-purification kits, IgY-standards, and of labelled Abs (such as alkaline phosphatase, fluorescein isothiocyanate and peroxidase) specifically against IgY. Since 1996, IgY technology (introduced by Dr. Claus Staak in 1995) has become the internationally accepted term for describing the production and use of IgY Ab.[10] In 1996, a European Centre for the Validation of Alternative Methods (ECVAM) workshop recommended the use of IgY instead of mammalian IgG, in order to minimise pain caused by invasive Ab sampling.[11] In 1999, the IgY-technology was approved as an alternative method for supporting animal welfare by the Veterinary Office of the Swiss Government.[12]

IgY ANTIBODY

The adaptive immune system of avian and mammals is based on immunoglobulins. Birds produce three types of immunoglobulins (IgM, IgY and IgA), and the mammals five (IgM, IgD, IgG, IgE and IgA). In both cases the acquired immunity includes T-cell receptors (TCRs), polymorphic MHC class I and II molecules, primary and secondary lymphoid organs, rearrangement of the recombination-activating gene (RAG) and antibody class switch. Historically, IgY, the low molecular weight Ig class present in avian serum and egg yolk was also called IgG, due to its function and concentration in comparison with IgG mammals, including its involvement in secondary immune responses. However, it has become clear that this is inappropriate, especially because of fundamental structural differences between IgG and IgY molecules, which will be discussed below.[12,13] Furthermore, recent studies describe the evolutionary relationship between avian IgY's and human IgE.[14] In addition, IgY's are also found in reptiles, amphibian and lungfish.

Research has shown that other immunoglobulins including chicken IgA and IgM have similar molecular weight, structure and electrophoretic mobility compared to mammalian IgA and IgM.

IgY antibodies make about 75 % of all immunoglobulins. The serum concentrations of IgY, IgA, and IgM have been reported to be 5.0, 1.25, and 0.61 mg.ml-1, respectively.[15] In spite of functional homology between avian IgY and mammalian IgG, there are differences in molecular weight, structure and biochemical functions. They are composed of two identical heavy and light chains bound together with disulphide bonds. Furthermore, they own a variable antigen-binding-site and a constant highly conserved region. IgY's are distinguished from IgG's with major heavy chains and therefore a higher molecular weight. Moreover, avian IgY has a shorter and thus less flexible hinge region than IgG.[16] It has also been suggested that IgY's have more hydrophobic molecules than IgG antibodies and also have a lower isoelectric point.[17] IgY's neither activate the complement system like

IgG's nor interact with rheumatoid factors in Immunoassays.[17, 18] The structural differences between IgY's and IgG's are shown in Fig. 1. IgY's do not interfere with protein A or C. This may not simplify the purification but there are several methods for IgY extraction from the egg yolk. The antibody diversity in chicken is distinguished from mammals and is based on gene conversion and somatic hyperconversion.[19]

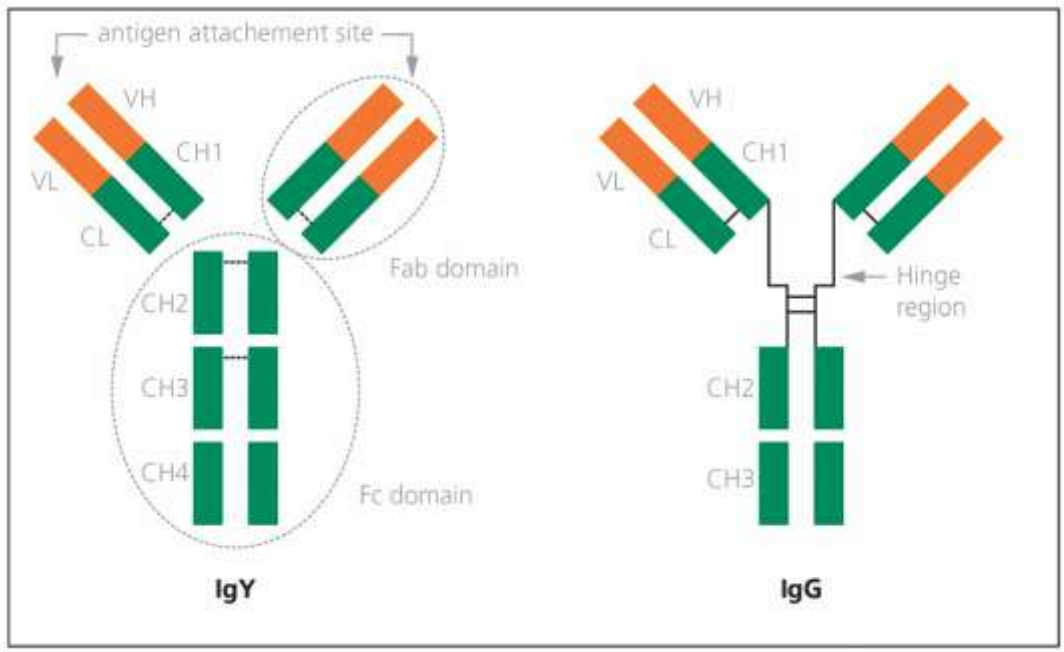
Fig 1: Structure of avian IgY versus mammalian IgG. Both molecules contain two heavy and two light chains, which consist of a variable domain (VH and VL) and four constant domains (CH1, CH2, CH3 and Ch4), respectively. IgG has a longer hinge region, which makes it more flexible than avian IgY. [19]

PRODUCTION OF IgY's

Under standard laboratory conditions, the use of a cage unit exclusively designed for keeping chickens is recommended.[20] Erhard et al. compared the mean IgY-titres and mean IgY concentrations of immunised hens kept in cages or on the ground. The results of this study clearly showed that both Ab titres and IgY concentrations were higher in hens kept in cages.[21]

Currently, there is a discussion about the advantages of using hens kept under specific pathogen free conditions (SPF hens) in comparison to conventionally kept hens.[12] Hommel & Behn showed that an identical immunisation scheme carried out in two White Leghorn hen groups, one kept under SPF conditions and the other under conventional conditions, resulted in comparable Ab titres in both groups. Significant differences were found in the total egg yolk protein concentration and the ratio of specific IgY to total IgY.[22] At present, there are not enough data to convincingly demonstrate the superiority of one keeping condition, at least as far the Ab titre or the specific IgY concentration are concerned.[23]

For immunization the hens are injected with specific antigens intramuscularly for several intervals. Antibodies are transferred from hen to the offspring via the latent stage of the egg. The transfer of IgY antibodies from maternal serum to the egg yolk is analogous to the cross-placental transmission in mammals.[24] During the last days of the embryonic development phase, IgY is transported across the yolk sac membrane into the embryonic bloodstream.[25] Recent studies show that the transfer of IgY from serum to egg yolk is a receptor-mediated process which allows a selective transfer of antibodies from the maternal serum.[26,27] Research supported that a specific sequence (His-Glu-Ala-Leu: HEAL) in the FC-region and an intact hinge region are required for



transport. Changes in this amino acid sequence inhibit IgY transport into the egg yolk. Roughly 4-6 days after inoculation, IgY's can be detected in the egg yolk.[4, 28] The antigen dose significantly influences the immune response. Through renewed immunization the concentration of antibodies can be strongly increased in the egg yolk. This process avoids bleeding of animals, stress and permits the harvest of large amounts of antibodies. Furthermore, long-lasting high titre of IgY can be detected in egg yolk.[29] Schade et al. published a review about all IgY extraction and purification methods.[12] The most frequent used processes are with help of polyethyleneglycol,[30] ammonium or sodium sulfate.[31,32] After purification IgY's show a high stability over a few months to a few years under specified conditions.[12] Gene-specific antibodies make the complicated multistep process for specific antigen synthesis redundant.[33]

FORTIFICATION OF INFANT FORMULA

Fortification of infant formula with immunoglobulins may help provide effective passive immunity in human infants. To be immunologically effective, immunoglobulins should be specifically reactive with pathogenic microbes, resistant to degradation during food processing, and resistant to acid in the stomach, as well as, to gastrointestinal digestion. The inhibition of cell growth was probably caused by intense agglutination of bacterial cells in the presence of IgY, preventing cell division and growth. The agglutination of this nature is considered to be important, particularly in the intestine, because it may inhibit the colonization of the cells in the intestine and facilitate the removal of the cells from the intestinal tract.[34] If anti-E. coli IgY contains the active fraction capable of binding the fimbriae of the cells, they may interfere with the adherence of bacteria to the intestinal mucosa.[35] The effectiveness of oral administration of Igs warrants relative stability of the ingested Ig reaching intestine almost intact in the case of infants.[36,37] IgY was found to be relatively heat-stable. According to Evans et al. (1978), 34% and 77.2% losses of human milk IgG activity were observed after heating at 62.5 and 65°C for 30 min, respectively.[38] A significant reduction in the immunological activity of human milk IgG was observed by Goldsmith et al. (1983) by HTST (72°C for 15 set) but without a loss by pasteurization (62.5"C for 30 min).[39] Larson and Rolleri (1955) reported that 89% of bovine milk immunoglobulins were denatured by heating skim milk at 70°C for 30 min.[40] Although it is difficult to compare these results directly due to the differences in the assay methods used, it is possible that IgY is as heat stable or even more so than mammalian IgG.[34] The vulnerability of IgY to acid conditions observed in this study was similar to that reported for bovine IgG.[41] IgY was more susceptible to pepsin digestion than bovine IgG. Pepsin digestion of mammalian IgG at pH 4 is reported to produce F(ab')2 which has two antigen binding sites withan activity comparable to those of the intact IgG. However, mouse IgG2b subclass is readily cleaved to Fab' by pepsin digestion at pH 4.2-4.[42] According to Tenenhouse and Deutsch (1966), the cleavage of chicken y-globulin (IgG) with pepsin was similar to that by papain, while the cleavage of the mammalian IgG is known to be definitely different. No production of a fragment corresponding to F(ab')2 was observed by pepsin digestion of IgY. Instead, a significant loss in antigen-binding activity was detected after digestion with pepsin at pH lower than 4.5.[43] The pH in the stomach of infants up to 5 months of age frequently stays between 4-5, even 2-3 hr after the intake of milk.[44] Therefore, appreciable inactivation of IgY in the infantile stomach is unlikely. However, when food products for older consumers are fortified, the protection of IgY from stomach digestion may be necessary. Contrary to the peptic digests, the damage of IgY activity during tryptic and chymotryptic digestions were moderate, despite a similarity in the SDS-PAGE patterns of the tryptic digests with the pepsin digests at pH 4.2. Therefore, IgY may retain adequate activity to prevent pathogenic infection in the intestine when it reaches that portion of the digestive tract.[34] There is evidence to suggest that the infant intestine is permeable to some molecules such as proteins.[45] Since the structure of IgY is considerably different from that of the mammalian IgG, possible allergenic

of IgY to infants should be taken into consideration. There is no close homology between human IgG and IgY, although a positive cross-reactivity of monoclonal antibodies against human IgG with IgY has been reported by May et al., 1984.[46] Further studies are required before IgY becomes a common additive for human food products.[34]

APPLICATIONS IN DENTISTRY

Many researchers have also reported the effectiveness of passive immunization against caries, in which specific antibodies against mutans streptococci are administered orally[47-50]. It has been found that antibodies are actively transported to the egg yolks from serum in large quantities during gestation in immunized hens.[51] Evidence indicated that oral administration of hen egg yolk antibodies (yAbs) prevented experimental rotavirus infection in mice.[6,52] These successful trials with yAbs raise the possibility of conferring passive protection against S. mutans-induced dental caries by using antibody prepared from the eggs of the hens hyperimmune to S. mutans antigen. In this study, we have prepared yAbs elaborated against some S. mutans antigens and examined their immunological specificity and effects on dental caries development in S. mutans-infected rats.[53]

Otake et al in 1991 have shown that IgY specific to S. mutans are actively transported in large quantities from serum to egg yolk during gestation of immunized hens and that oral administration of immune IgY resulted in statistically significant reduction in dental caries development in an experimental animal model. Another study showed that rat infected with S. mutans and provided a diet supplemented with hen egg yolk antibodies with specificity to cell-associated glucosyl transferase (GTase) of S.mutans had significant reduction in dental plaque accumulation and caries formation when compared to infected rats provided a controlled diet.[54] Hattal in 1997 proved that mouth rinse containing egg yolk antibodies (IgY) specific to S. mutans was effective for passive immunization against dental plaque formation in humans. He found that immune IgG reacts more strongly to insoluble glucans covering the surface of S. mutans than with the surface antigens of S. mutans. Hence immune IgY could be a novel ingredient for foods and mouth rinses to prevent colonization of S.mutans, especially in presence of sugar.[55]

Porphyromonas gingivalis has been implicated as one of the major pathogens in the development of periodontitis, while its coaggregation factor is known to play an important role in colonization in subgingival areas through aggregation with a number of oral Gram-positive bacteria to form dental plaque.[56,57] Molecular cloning of a 40-kDa outer membrane protein (OMP) from P. gingivalis 3813 and showed an important aggregation factor of P. gingivalis, as an affinity-purified polyclonal antibody against recombinant (r) 40-kDa OMP effectively inhibited the aggregation activity of P. gingivalis.[58] Since the 40-kDa OMP is conserved among a number of different P. gingivalis strains,[59] passive immunotherapy using a specific antibody to this pathogen may be useful to prevent P. gingivalis colonization in the subgingival area. In another study, a mouse monoclonal antibody (mAb) Pg-omp-A2, was prepared and reported to inhibit the coaggregation activity of P. gingivalis. 60IgY significantly inhibited P. gingivalis-associated haemagglutinating activity and we proposed that the IgY might also be useful for passive immunization against periodontal disease caused by P. gingivalis infection.[61]

OTHER APPLICATIONS

Life threatening enteric infections were treated with specific IgY antibodies against E. coli, Salmonella, Campylobacter and Rotavirus strains.[62-65] In 2004 Horie and colleagues demonstrated the efficiency of specific antiurease-IgY in designed drinking yogurt against H. pylori infections.[66] Oral administration of preformed specific antibodies is an attractive approach against infections of the digestive system in humans and animals.[19] H. pylori is a significant risk factor for the genesis of gastric cancer. It is conceivable that IgY's administered orally cause no allergic reaction and can be used as a preventative therapy for gastric cancer caused by H. pylori or as a general prevention against inflammation caused by this bacteria.[67]

Chronicle lung infections by the opportunistic bacteria Pseudomonas aeruginosa (PA)

are the main causes of morbidity and mortality in Cystic Fibrosis patients. In 2003, Kollberg and colleagues published that rinsing with a solution of specific anti-PA IgY in the evening may prevent the initial adhesion of the bacteria to the mucosal surface of the oropharynx in CF patients. At the end of their study, all participants in the IgY treated group were still without chronicle PA infections. It was demonstrated that IgY could be used as a possible prophylaxis treatment in CF patients and thus reduces the necessity of frequent applications of antibiotics.[68]

Okhuysenet al. observed a significant protective effect in volunteers orally treated with anti-Cryptosporidium HBC.[69] Worledge et al. (207) demonstrated significant protective effects after the oral application of specific IgY against tumour necrosis factor (TNF) in an experimental model of colitis in the rat. TNF is implicated in the pathogenesis of inflammatory bowel disease.[70] The protective effects of anti-venom IgY against rattlesnake and scorpion toxins has been shown in a mouse model.[71] Almeida et al. achieved similar results, producing IgY against venom from Brazilian snakes of the Bothropsand Crotalusgenera.[72] The use of anti-venom IgY is advantageous, since, because of the characteristics of IgY Abs discussed above, fewer immunological side-effects can be expected.[73,74]

CONCLUSION

IgY treatment promises passive immunization in newborns and immune compromised patients. There is a high potential for IgY antibodies in the treatment of a variety of diseases and an even more prospective future. In particular, because of the increasing resistance of microorganisms to antibiotics, research on all aspects related to the development of specific IgY against pathogenic microorganisms will have to be intensified. IgYs can be used both in veterinary medicine and in human medicine. In South America, for instance, there is a great interest in developing egg powders as additives for milk substitutes. Such formulations are needed to protect children

from fatal intestinal infections, particularly in financially weak countries. However, further long term clinical studies on the therapeutic or prophylactic use of IgY Abs are a critical requirement to understand the applicability of these antibodies in humans.

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BONE ANCHORED MAXILLARY PROTRACTION : A CASE REPORT

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ABSTRACT

This case report describes the treatment of skeletal class III malocclusion with retrognathic maxilla using skeletal anchorage device and intermaxillary elastics. BAMP is an alternative method to treat skeletal class III cases.

Key words: BAMP, Skeletal class III, Protraction.

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INTRODUCTION

Skeletal malocclusion occurs when the size of jaws or position of jaws are not normal. Skeletal class III malocclusion can be due to retrognathic maxilla, prognathic mandible or a combination of both. Skeletal class III malocclusions are the most difficult to treat, with most patients requiring orthognathic surgery after mandibular growth is complete. Conventional treatment for young skeletal class III patients often involves extra-oral devices designed to either increase maxillary length or restrain mandibular growth[1]. Even with patient cooperation it is difficult to maintain the correction and chances of relapse are more[2]. Facemask therapy can be given to those patients with midface deficiency and chin cup therapy is indicated in patients with mandibular prognathism. Both approaches have had limited success due to undesirable dentoalveolar movements, limited skeletal changes, poor compliance, or relapse of dental movements. Facemask therapy can result in clockwise rotation of mandible which will increases the lower facial height, which can be detrimental for Class III patients.

Bone anchored maxillary protraction(BAMP) provide an alternative treatment to skeletal class III malocclusion patients with mid face deficiency, as it demands less patient compliance and the use of Class III elastics will prevent the clockwise rotation of mandible[3]. BAMP utilises use of Class III elastics and intraoral skeletal plates to bring about an orthopaedic change, by protracting maxilla, without any dentoalveolar side effects. The treatment of Class III skeletal malocclusions in growing patients using BAMP was introduced by Hugo De Clerk In 2008[1].

Orthopaedic effects are mainly seen in Maxilla, Mandible and Glenoidfossa[4].The Phenomena occurring is the circummaxillary suture get distracted on application of traction force and aids for effective maxillary protraction[5]. In the Mandible the growth is redirected by closing the gonial angle and distalizing the posterior portion of ramus and glenoid fossa[6].

Surgical approach

In this procedure, T plate and Y plates are inserted in the infrazygomatic crest, in the maxilla and between lateral and canine in mandible. In maxilla the plate arm emerges through the attached tissue near the maxillary molars. The mandibular bone plates are inserted between the mandibular lateral incisors and canines with the intraoral attachment emerging from attached tissue. For the placement of both the maxillary and mandibular plates, a small flap is raised with a design that maintains good blood flow to the tissue. 1.5-2.0 mm of cortical plate thickness is needed to ensure both short-term and long-term stability of the plates.

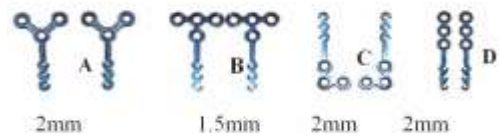

Fig 1: Y plate(A) T plate (B) L plate (C) and I plate (D)

The success of BAMP treatment primarily depends on:

- Quality of the bone at the site of plate placement.
- Cooperation with elastics and good hygiene.

SUMMARY OF CASE AND DIAGNOSIS

A 15 year old female patient was reported to the Department of Orthodontics and Dentofacial Orthopaedics with chief complaint of forwardly placed lower jaw. On extra oral examination malar prominence was deficient, maxillary deficiency with concave profile and on intra oral examination patient was having Angles Class III molar relation with anterior edge to edge bite. Pretreatment cephalometric evaluation of the case showed a skeletal Class III relationship with hypoplasia of the maxilla combined with increased effective mandibular length. The case was treated according to the BAMP protocol.

Treatment Objectives

The main treatment objective was to achieve a good profile, maximum skeletal maxillary changes, and positive over jet and over bite.

Treatment Plan

The patient was treated by bone plates and intermaxillary traction in the maxilla and in the mandible .

Treatment Progress

Four orthodontic miniplates (T plate and Y plates: SK surgicals) were inserted into the infrazygomatic crests in maxilla and between the canine and lateral incisor in mandible on both the right and left sides (Fig 3). Surgery was performed with patients under local anaesthesia. The miniplates were fixed to the bone with 3 titanium screws (2mm in diameter and 5 mm in length) after predrilling with a1.6-mm-diameter bur. Three weeks after surgery, maxillo mandibular elastics were attached between the upper and lower miniplates oneach side, applying a force of 100 g (1/4" 3.5oz)per side (Fig 5) . Then force is increased to 150 gm (1/4" 6oz) per side for 6 weeks later to 250 gm (2 x ¼" 4oz)for again 6 weeks. The patient was asked to replace the elastics once a day and to wear them 24 hours per day[1].

DISCUSSION

Class III malocclusion is characterized by a variety of skeletal and dental components including a protrusive mandible, retrusive maxilla and combination of these components. A normal occlusion and improved facial esthetics of skeletal class III malocclusion can be achieved with growth modification, Orthodontic camouflage or orthognathic surgery. Three treatment alternatives were considered for maxillary advancement. The first option was to delay treatment and perform orthognathic surgery. The second was to apply a protraction face mask. The third was to use skeletal anchorage with intermaxillary elastics for maxillary protraction. Each technique has its own merits and demerits and age is also a factor. In this case maxilla was protracted using bone plates and inter maxillary elastics. After

CASE 1

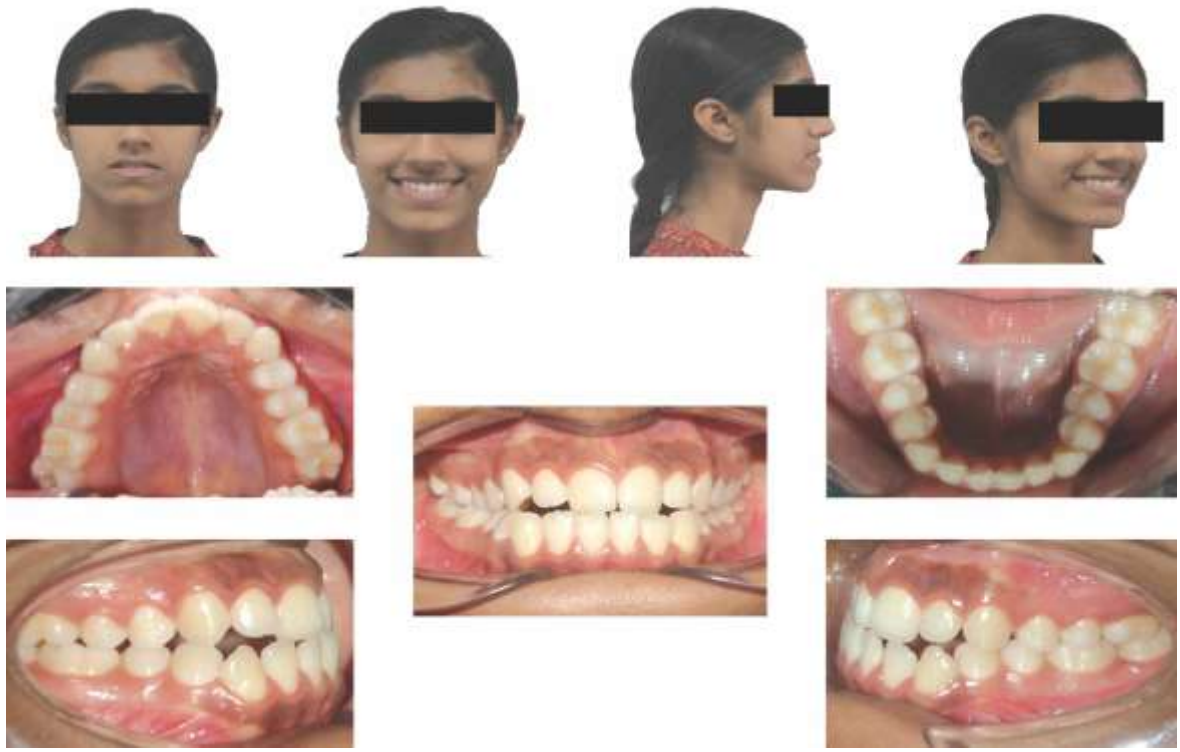

Fig 2: Pre treatment extra oral (A) and intra oral (B) photographs of the patient.

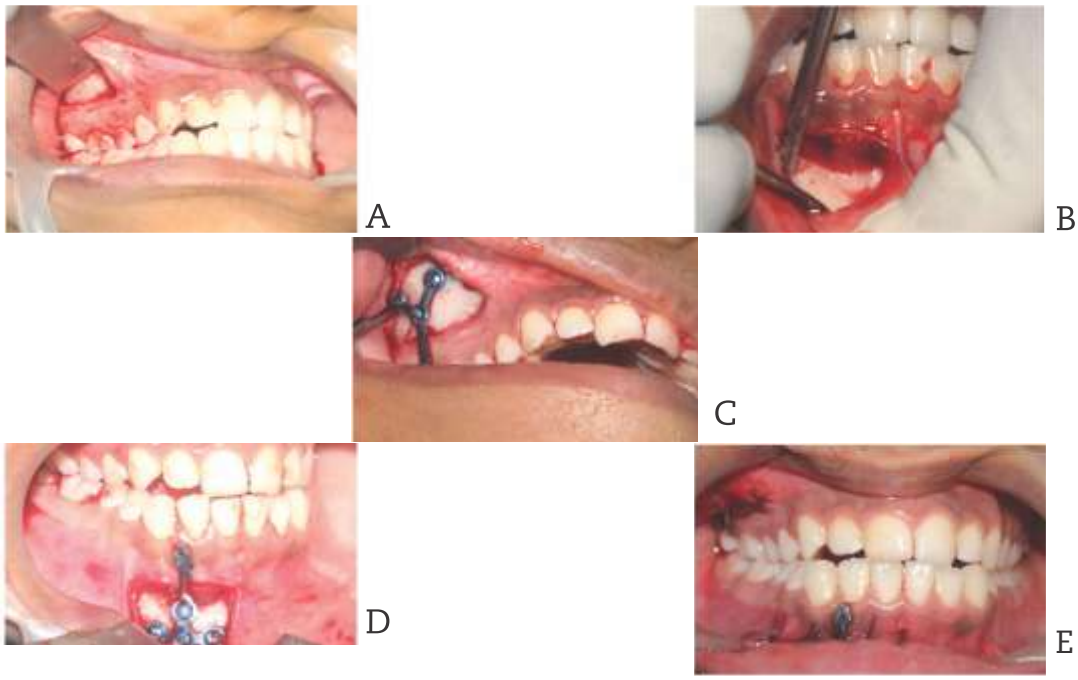

Fig 3: Incision is made and flap elevation is done in infrazygomatic crest in maxilla (A) and between lateral incisor and canine in mandible(B), Y plate is inserted in maxilla C and T plate in mandible (D) and Suturing done in maxilla and mandible(E).

Fig 4: Pre treatment lateral ceph film (A) and pre treatment panoramic film (B)

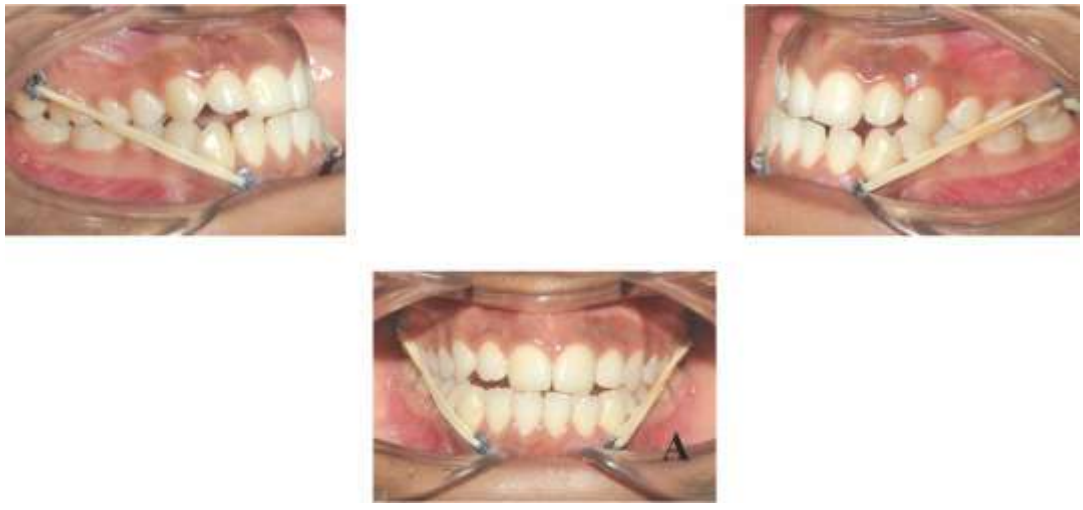

Fig 5: Traction force applied from the miniplates after 3 weeks of placement (A)

obtaining positive overjet, intermaxillary elastics were to be continued for 6 months for the purpose of retention. The protraction phase was followed by fixed orthodontic treatment. This method can be considered promising for use in Class III patients with increased vertical plane angle or vertical facial height. In most of the earlier studies dental compensations using face mask therapy constituted half of the total corrections and these dental effects continued to increase depending up on the patient's age.[11] The undesirable effects with facemask treatment, such as anchorage problems in mixed dentition, unaesthetic appearance, discomfort, patient compliance, increased vertical dimensions, excessive maxillary incisor protrusion, and mandibular incisor retrusion were eliminated with this method. Studies[13] reported that patients treated with the mini-implants and mini-plates exhibited skeletal improvements with little effect on mandibular position. Limited patient compliance with the use of elastics and maintenance of oral hygiene, and it may reduce the frequency of surgery.

BAMP protocol resulted distraction of many of these circummaxillary sutures. A constant force from the elastics, when applied before sutural maturation can effectively produce distraction of these sutures resulting in the forward displace of the entire midface. Studies have shown that continuous force application is more effective at expanding the sutures when compared to intermittent forces.[5] It is also interesting to note that the BAMP protocol did not restrain growth of the mandible - but instead, it altered the direction of mandibular growth by closing the gonial angle and distalizing the posterior ramus and condyles.[6]

A disadvantage of tooth-borne devices is the loss of anchorage due to the inability to apply the orthopedic force directly to the maxilla, especially when preservation of arch length is necessary.[12]

With Bone Anchored Maxillary Protraction, patient compliance was improved due to the use of intraoral elastics instead of extra-oral headgear. Studies[3] showed that BAMP was significantly more effective for early treatment of Class III malocclusion and can also be implemented at a later age.

CONCLUSION

BAMP is effective for protracting the maxilla and restraining the growth of mandible in growth period with minimum side effects.

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TECHNIQUE TO IMPROVE COMPLETE DENTURE AESTHETICS USING CHEEK PLUMPER APPLIANCE: A CASE REPORT

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ABSTRACT

Aesthetics plays an important role in complete denture treatment. Prosthetic rehabilitation of a completely edentulous patient no longer confines to only the replacement of missing teeth. Nowadays patients are too demanding for improvement in esthetics at the completion of treatment. The loss of support of the facial musculature is of great concern in treating completely edentulous patients. Sunken cheeks are one of the major consequences of flaccid facial musculature. Natural teeth should be preserved but at the same time, clinician must be aware of the edentulous ridge that could be destroyed by forces exerted on the denture during function. Further, it has a greater impact on the aesthetics as well as the psychology of the patient. Cheek plumper appliances can restore such facial delinquencies. The underlying principle for providing this appliance is that some patients have depressed cheeks and require extra support for improved facial aesthetics. Literature has well evidenced the extensive usage of magnets as attachments, but it has been shown that magnets lose their magnetic property over a period leading to failure of treatment. However, push buttons that were used in the cheek plumpers seems to increase the durability of the check plumper appliances. This clinical report describes a simple technique to improve support for sunken cheeks using detachable acrylic cheek plumper.

Keywords: Cheek Plumpers, Facial Esthetics, Sunken Cheeks, Pre fabricated attachment.

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INTRODUCTION

As the world becomes more image conscious, people are increasingly on the lookout for ways and means of enhancing their natural beauty. It is important for a dentist to consider the whole face in totality when trying to work on dental aesthetics. External facial features like eyes, nose, cheeks, lips and facial musculature due to their extreme visibility are an important factor in determining facial aesthetics[1].

Ageing leads to the high impact on external facial aesthetics due to early tooth loss, alveolar resorption and reduced tonicity of musculature. The key to aesthetic replacement to all these losses is to support and harmonize the collapsed lower third of the face with the upper part with the help of various treatment modalities[2].

At times denture flange do provide support to the peri-oral muscles but fails to mimic the fullness of the cheeks. Cheek plumper or cheek lifting appliance is essentially a prosthesis that support and lift the cheek to provide necessary support and esthetic[3]. A conventional cheek plumper prosthesis is a single unit prosthesis with extension near premolar–molar region which support the cheek. Cheek plumpers or cheek lifting appliances have been used previously for the purpose of improving psychological profile in patients. Cheek plumper can be of two types :

1. Undetachable / Conventional Cheek Plumper

2. Detachable cheek plumper

Undetachable cheek plumper has some limitations like increased weight which could hamper retention of the maxillary complete denture and makes it difficult to insert. Moreover, long-term use can lead to muscle fatigue, and also it cannot be used in patients with limited mouth opening[4].

Slumping or sagging of cheeks can increase person's age in appearance and hence have a negative effect on the self confidence of the patient. This clinical report focuses on to improve facial aesthetics of completely edentulous patients with sunken cheeks with the help of detachable cheek plumper.

CASE REPORT

A 40 year old patient reported to the department of prosthodontics with the complain of missing teeth and poor aesthetics. It was noticed that patient was socially demoralized due to loss of teeth and poor aesthetics because of sunken cheeks. History revealed that patient was edentulous since last 1 year and has not worn denture since then.

Extra-oral examination revealed that patient had poor aesthetics, unsupported oral musculature leading to sunken cheeks. Intra-oral examination revealed that ridges were low well rounded in both maxillary and mandibular arch. Maxillary and mandibular diagnostic impressions were made with impression compound. Maxillary and mandibular arch final impression was made using selective pressure impression procedure using green stick compound for peripheral molding and impression with zinc oxide eugenol. Vertical jaw relation was established and tentative jaw relation was recorded ,tentative centric was verified using extra oral tracers. Balanced occlusal scheme was developed using a balancing ramps (figure1). For the try in appointment waxed denture were first tried for occlusion and esthetics. After that cheek plumper made in wax and were attached to the maxillary denture and were evaluated to give patient a more fuller appearance. The waxed plumper was separated from the waxed denture. Prefabricated attachments were waxed in the complete denture in place of the plumper prosthesis.

Acrylisation was done in conventional way. Upper denture was acrylised with the attachments placed on the buccal surface of denture. The finished and polished dentures were tried in the mouth. The waxed plumper prosthesis was repositioned over the attachment and required corrections were done(figure2). Wax pattern of plumper was invested and acrylised. Patient was instructed on the use of plumpers and dentures were delivered after evaluating them for fit and esthetics (figure 3a, 3b). Recall appointment were scheduled after 1 day, 1 month and every 6 months.

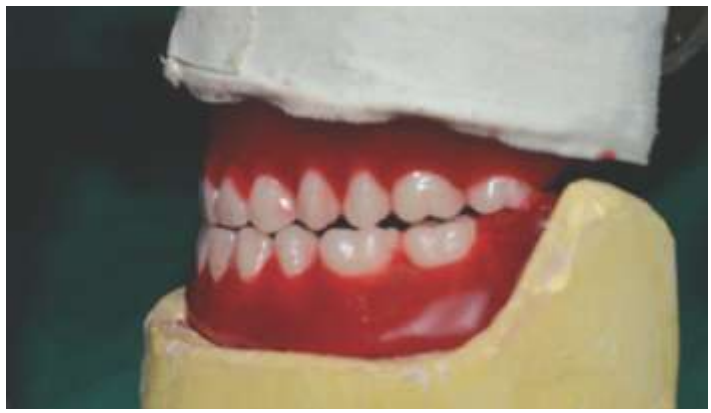

Figure 1:
Bilateral balanced occlusion obtained using balancing ramps

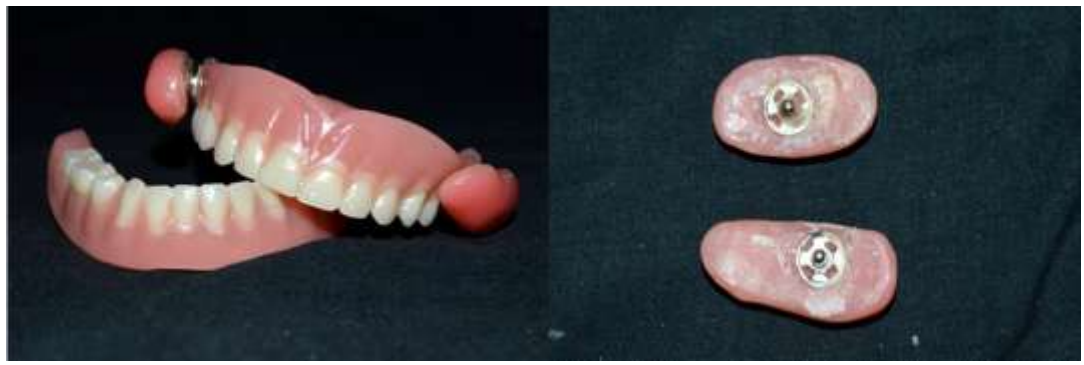

Figure 2:
Maxillary Complete denture fabricated with detachable cheek plumpers attached using prefabricated attachment

Figure 3a: Pre treatment (frontal view)

Figure 3b: Post treatment (frontal view)

DISCUSSION

The area available for the cheek plumper is not static and therefore requires knowledge of anatomy and physiology of the area for fabrication of a successful and functional prosthesis. The cheeks are supported from three aspects, the zygoma above, the mandible below, and the parotid gland overlying the masseter muscle posteriorly[5]. Additional support is provided by the subcutaneous fat and the buccal fat pad. This support is responsible for the soft, rounded contours of the cheeks in the lower third of the face[5]. The anterior part of the cheek is supported by the muscular framework converging into the modioli, and posterior support is provided by the posterior teeth and their supporting structures[5].

In order to mimic the fullness of the cheeks, a cheek plumper is often used and known as the cheek lifting appliance. It is variously cited in literature for providing support to the cheek wherever and whenever deficient[6,7]. This prosthesis is basically for supporting and plumping the cheek to provide a youthful appearance. It is especially useful in young patients who have lost all their teeth and part of the maxillary bone as a result of a traumatic injury. Its use in Maxillofacial Prosthodontics is well documented[6,7]. However it can also be used in patients who have an unusually excessive slumping of the cheeks as a result of teeth loss.

A Conventional cheek plumper would be a part of the complete maxillary denture prosthesis forming single unit prosthesis with extensions on either side in the region of the polished buccal surfaces of the denture and are continuous with the rest of the denture[6,7,8]. The retentive mechanism used for the cheek plumper was a friction lock attachment. It does not contain any metal components, can be fabricated easily in the laboratory, does not require any extra or specialized equipment, and is cost effective. Further research is needed to establish its serviceable lifespan[9].

CONCLUSION

The ability of the dentist to understand and recognize the problems of edentulous patients, to select the proper course of treatment required and reassure them is of great clinical importance. This case report describes a simple and economic prosthetic aid that not only offers esthetics but also improves the psychological profile of the patient.

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