Effectiveness of Newer Distraction Technique on Gagging Reflex on taking Alginate Impression in Paediatric Patients: A Randomised Control Study

Abstract-

Background- Children having anxiety due to dental treatment usually hesitate to seek timely dental treatment which may result in very poor oral health. This is the reason of complex and expensive dental treatment in the future. As a result, many behaviour guidance techniques have been used to foster positive dental attitude and provide welcoming atmosphere in dental operatory to paediatric patients.

Aim- To determine the effectiveness of distraction technique using two different types of hour glass on the severity of gagging, anxiety of patient and success of dental alginate impression taking in children between age 5-10 years.

Materials and Methods- 30 healthy children were selected for the study and were randomly divided into 3 groups with 10 children in each group. Group I was termed as the test group 1 where liquid gel based hour glass was used for distraction and in Group II- the test group 2, the sand based hour glass was used. Group 3 was the control group where no distraction was done. Child's anxiety was assessed using following parameters: Gagging-related Impression Success Scale (GISS), Gagging Severity Index (GSI), Facial Image Scale, Pulse rate and oxygen saturation.

Results- Distraction using hour glass is safe, noninvasive, successful and cost-effective method for gag reflex management in pediatric dentistry.

Conclusion- Liquid motion Hour glass diverted the child's attention by creating spellbinding visual spectacle, offering a tranquil and enchanting experience diverting their attention during stressful alginate impression, henceforth it should be considered as an alternative behavior management technique.

Keywords: - Dental anxiety, Distraction, Gagging, Gag reflex

Introduction:-

The gag reflex serves as a necessary protective mechanism which prevents foreign objects from entering the trachea, pharynx, or larynx[1]. A recent study done by Katsouda et al. in 2019 demonstrated that 28.5% children between age 4 to 12 years face gagging in dental operatory[2]. Study done by Roy et al. in 2016 demonstrated that prevalence of gagging is 18.6% reported by dentists in children between age 5 to 10 years[3].

Gagging is basically a reaction to a perceived unpleasant sensory stimulus in the form of tactile, visual, or olfactory input or a psychological trigger[4]. There is presence of intra oral trigger zones which are stimulated by any kind of tactile activity leading to gagging[4]. These are- palatoglossal and palatopharyngeal folds, uvula, posterior pharyngeal wall, base of tongue and palate[4]. Upon tactile stimulation of the intra-oral trigger zones, receptors called nociceptive receptors of these regions pass the stimulus to the medulla oblongata which send back spasmodic and uncoordinated muscle movements to cause gagging[5].

Gagging triggered by intra-oral stimulation during dental procedures may also be influenced by dental fear and negative experience of a dental visit[5]. In a study done by Katsouda (2017), significant relationship was found between gagging and dental fear in children aged 4–12 years[6]. It can be thought of an obstacle to dental treatment, which may cause distress to the patient and act as a harmful barrier to patient care[6]. Gagging during impression taking may lead to inaccurate impressions requiring repetitions and causing stress to the patient as well as the operator[6].

Different management strategies have been described and implemented practically which include behavioural modification techniques such as relaxation (Bassi et al. 2004)[7],

distraction (Krol 1963)[8], systemic desensitisation (Singer 1973)[9], pharmacological techniques such as conscious sedation (Yoshida et al. 2007)[10]; acupressure (Lu et al. 2000)[11], and hypnosis (Noble 2002)[12]. Distraction is basically the technique of diverting the peditric patient's attention from what may be perceived as an unpleasant and unappealing procedure. Distraction technique can take place as active or passive. An active technique involves a child's active participation in activities around him/her such as virtual reality, interactive toys and relaxation. Passive techniques rely on a child's passive observation of an activity and not direct participation like activities such as watching television and listening to music.

Here, we have used hour glass of two different types as these are cognitively demanding and require greater attentional capacity of the child. To our knowledge, there is no prospective study available in the literature, where the authors studied distraction using hour glass for distraction during impression taking on the severity of gag reflex and anxiety.

Pediatric dentists are always in search of something that is attractive, child-friendly for distraction to make the dental visit more pleasant and appealing for the child. Therefore, the study was designed to determine the effectiveness of distraction technique using two different types of hour glass on the severity of gagging, anxiety of patient and success of dental alginate impression taking in children between age 5-10 years.

Materials and Methodology:

Study Design- This study was designed as a single blind, randomised controlled trial with three parallel groups.Selected children were randomly allocated to one of the three groups:

(1) Test group 1- Liquid Motion hour glass for distraction, during impression taking (Figure 1)

(2) Test group 2- Sand Timer hour glass for distraction, during impression taking (Figure 2)

(3) Control group- No distraction, during impression taking (Figure 3)

Study Participants- During the study, there were total of 30 patients selected from the outpatient Department of Paediatric and Preventive Dentistry who required recording of dental alginate impression.

INCLUSION CRITERIA -

- Age between 5 to 10 years
- ASA I & II
- Frankel rating 2, 3 and 4 on first consultation visit
- Children with no relevant medical history

EXCLUSION CRITERIA

- Children with systemic disease and illness
- Children with severe Gag reflex
- Children suffering from a nasal obstruction/ upper respiratory tract infection.

Parents of the selected children were explained regarding the purpose and the scope of the study and informed consents were obtained from those who agreed to allow their children to participate in the study. A total of 30 children were included in the study with 1:1:1 allocation to each group (10 participants each).

Procedure-

On the day of the appointment, a chit was picked and the child was allocated to one of the three groups accordingly. The child was asked to score his/her anxiety using the Facial Image Scale (FIS) with help of assisting dentist. The operator was blinded to the recorded anxiety score of patients. Then the process of impression taking was started with proper seating of child on the dental chair in an upright position so that his maxillary occlusal plane comes parallel to the floor. Visual assessment of patient's arch width and length was done to select a proper stock tray and then tried in the child's mouth. The proper procedure of impression taking was explained to the patient. Then, Alginate impression was recorded using a fast-setting, unflavoured alginate (Brand Name- Tropicalgin Zhermack, Italy) using optimum loading of the tray (Figure 4).

Children assigned to both the Test groups were demonstrated about the whole procedure. Children were shown the hourglass and explained how that they had to focus on the oil bubbles and sand that descends down in the hour glass. During impression taking, position of the hourglass was kept within their line of sight. The child was encouraged to watch the bubbles and sand moving through the hourglass. The child was monitored for his/her reactions. If the child becomes anxious or starts to gag, they were gently reminded to focus on the hourglass.

For children assigned to the Control group, impression was recorded without the use of any type of distraction technique. After recording the impression, the same assisting dentist helped the child score his/her dental anxiety with FIS.

After impression taking, all the parameters were evaluated ie. Gagging-related Impression Scale, Gaging Severity, pulse rate and oxygen saturation.

Outcome Measures

- **Gagging-related Impression Success Scale (GISS)[13]**

The Success of alginate impression taking procedure was scored for each patient using a scale named Gagging-related Impression Success Scale (GISS). The following score was given:-

Score 1 was assigned when impression could not be obtained due to severe gagging.

Score 2 was assigned when impression was obtained in spite of gagging.

Score 3 was assigned when impression was obtained successfully without gagging.

- **Gagging Severity[14]**

Severity of the gag reflex during impression taking was scored for each using the Gagging Severity Index (GSI) described by Dickinson (2000), ranging from 1 to 5.

Grade 1- Normal gagging, very mild, controlled by the patient.

Grade 2- Mild gagging, control acquired by patient with reassurance from dental team

Grade 3- Moderate gagging, consistent, limits treatment options

Grade 4- Severe gagging, occurs with all forms of treatment.

Grade 5- Very severe gagging, affecting patient behaviour and making treatment impossible.

- **Patient-reported Dental Anxiety**

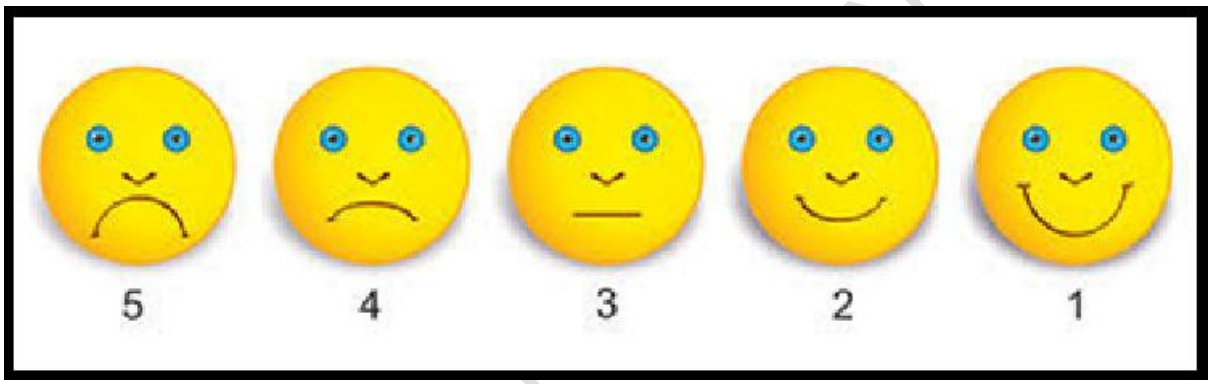
Child's anxiety level was assessed using methods which were as follows:

- **Pulse rate**
- **Oxygen saturation**

Both of these are physiological tests to measure dental anxiety. These were recorded using a pulse oximeter.

- **Facial Image Scale**- Patient's dental anxiety was recorded using FIS prior to and after obtaining the impression. FIS comprises of five faces ranging from very unhappy to very happy (Buchanan and Niven 2002)[15].

- A card was printed with 5 different faces ranging from 1 that depicted positive affect face to 5 that depicted most negative affect face. Then, all the children were shown this card and asked to point to the type of face that felt at that particular moment.



Statistical analysis-

SPSS 21 was used for analysis after the data was entered into an Excel sheet. A paired t test was employed for each of the continuous dependent variables, including the facial image scale, Gagging-related impression scale, gagging severity scores and the chi-square test was employed as a significance test for each of the independent and categorical variables. The threshold for statistical significance was set at $P<0.05$.

Results

This single blind, randomised controlled study selected 30 children between age 5 and 10 years. All of them were randomly allocated to the two groups. The mean age was 8.5 years with 17 male and 13 females.

GROUP	HEART RATE	Mean	Std. Deviation	T value	p- value
GROUP 1	BEFORE AFTER	95.20 91.20	5.903 4.614	1.337	.21
GROUP 2	BEFORE AFTER	96.30 91.00	7.394 5.538	1.874	.09
GROUP 3	BEFORE AFTER	97.20 91.00	6.795 7.102	1.572	.15

Table 1- HEART RATE

Heart rate was maximum in group 3 before impression and group 1 after the impression.

GROUP	OXYGEN SATURATION	Mean	Std. Deviation	T value	p-Value
GROUP 1	BEFORE AFTER	96.90 96.90	1.370 1.370	-	-
GROUP 2	BEFORE AFTER	96.90 97.40	1.370 2.171	-.785	.45
GROUP 3	BEFORE AFTER	97.60 98.30	1.578 1.160	-1.561	.16

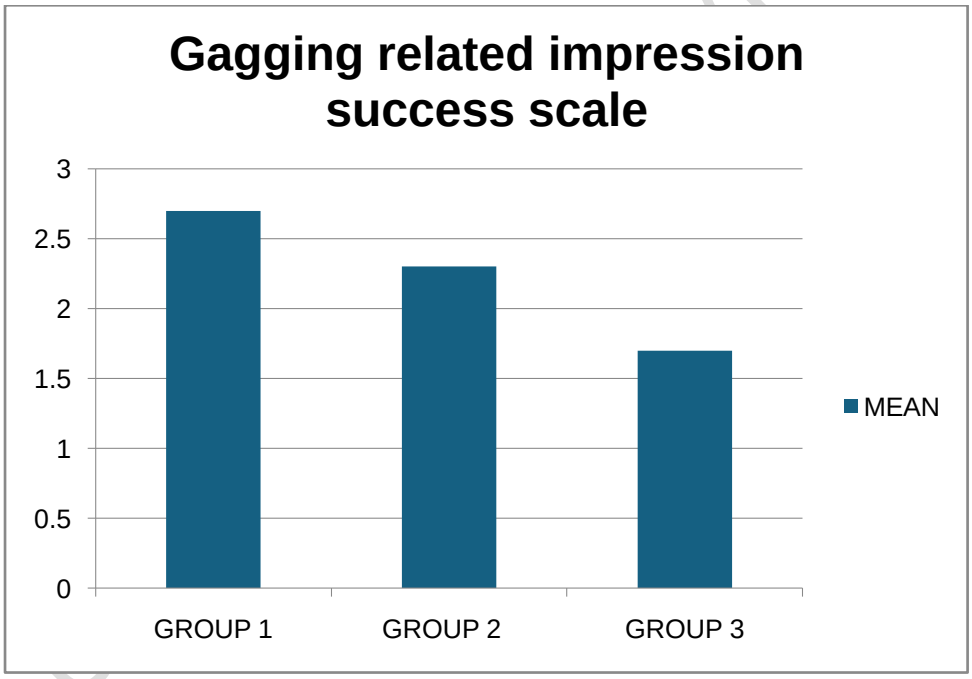
Table 2- OXYGEN SATURATION

Oxygen saturation was maximum in group 3 before and after impression.

GROUP	Mean	Std. Deviation	F value	p-value
GROUP 1	2.70	.483	6.641	.005**
GROUP 2	2.30	.675		
GROUP 3	1.70	.675		

Table 3- GAGGING RELATED IMPRESSION SUCCESS SCALE

Gagging related impression success scale was minimum in group 3.

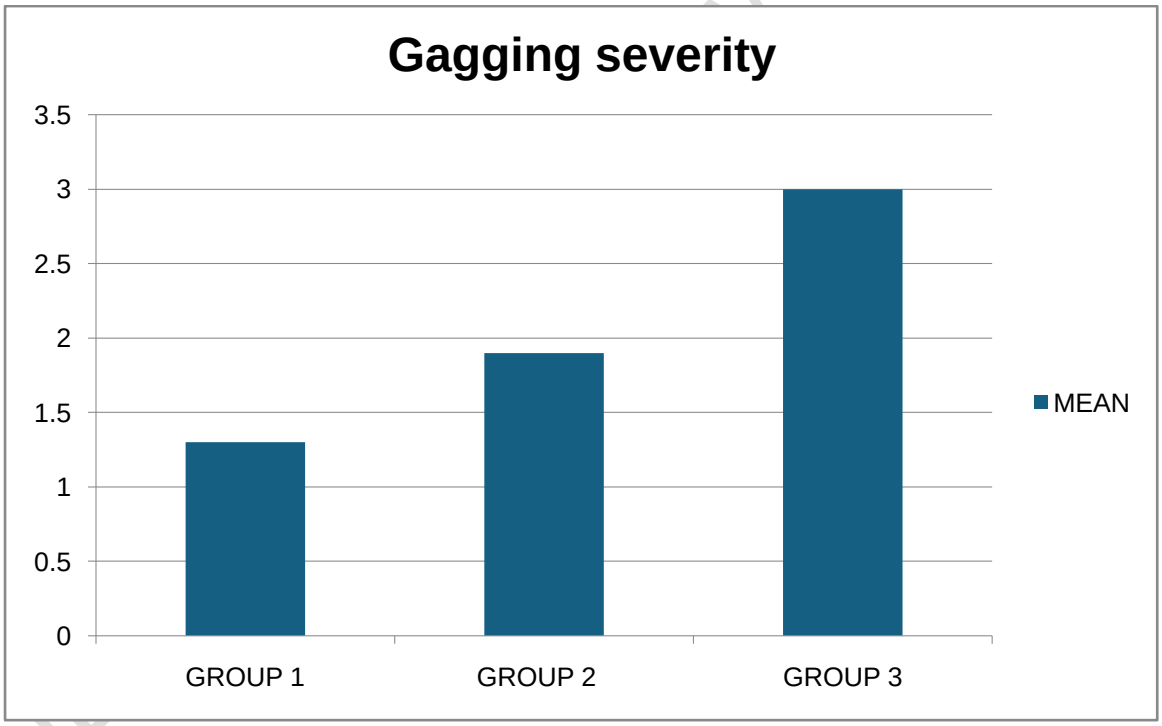


Graph 1- Mean ± SD of gagging related impression success scale in group 1, group 2 and group 3 was 2.70±.483, 2.30±.675 and 1.70±.675 respectively. Results were found to be highly significant when comparing gagging related impression success scale in between group 1, group 2 and group 3. Gagging related impression success scale was minimum in group 3.

GROUP	Mean	Std. Deviation	F value	p-value
GROUP 1	1.30	.483	15.438	<0.001***
GROUP 2	1.90	.738		
GROUP 3	3.00	.816		

Table 4- GAGGING SEVERITY

Gagging severity was maximum in group 3.

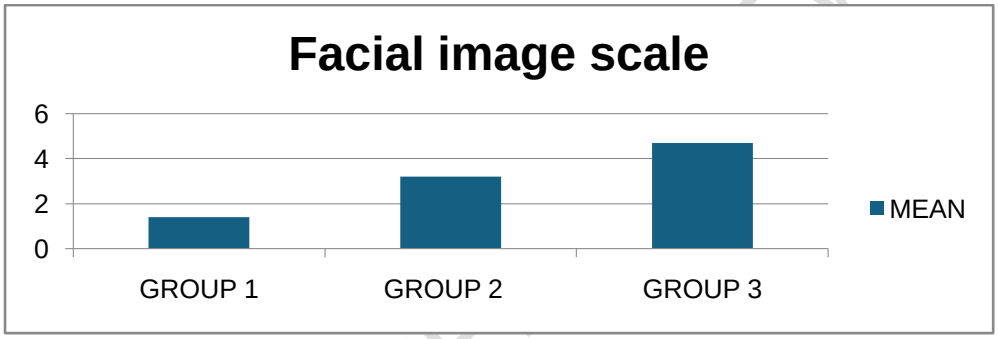


Graph 2- Mean ± SD of gagging severity in group 1, group 2 and group 3 was 1.30±.483, 1.90±.738 and 3.00±.816 respectively. Results were found to be highly significant when comparing gagging severity in between group 1, group 2 and group 3. Gagging severity was maximum in group 3.

GROUP	Mean	Std. Deviation	F value	pvalue
GROUP 1	1.40	.966	15.989	<0.001***
GROUP 2	3.20	1.033		
GROUP 3	4.70	1.767		

TABLE 5- FACIAL IMAGE SCALE

Facial image scale was maximum in group 3.



Graph 3- Mean ± SD of facial image scale in group 1, group 2 and group 3 was 1.40±.966, 3.20±1.033 and 4.70±1.767 respectively. Results were found to be highly significant when comparing facial image scale in between group 1, group 2 and group 3. Facial image scale was maximum in group 3.

DISCUSSION

Gag reflex and anxiety are the two main factors during the dental treatment that pose significant challenges in paediatric dentistry[16]. These issues often lead to avoidance behaviours and henceforth, increasing the risk of poor oral health in children[17]. Distraction techniques can help reduce the incidence of dental treatment avoidance in paediatric

patients[17]. The present study indicates that using a distraction technique effectively diminishes anxiety and gag reflex in children during alginate impression procedures.

Distraction is an effective technique which shifts the child's attention away from a potentially uncomfortable and undesirable dental procedure. Richmond et al. (2006) reported that the perception for pain is directly connected to the amount of attention a paediatric patient pays to any unpleasant stimulus around them[18].

Numerous techniques have been created so far for both visual and auditory distraction- such as background music and interactive games. According to Patel et al. (2006), children who enjoyed playing hand-held video games experienced less anxiety during anaesthesia induction compared to those who were only accompanied by their parents[19]. U.B. Dixit (2017) used intractive distraction technique and stated it as a simple, non-invasive, and cost-effective method to effectively manage gagging during dental procedures such as obtaining maxillary alginate impressions in children[20]. Likewise, Al-Khotani et al. (2016) revealed that audiovisual distraction serves as an effective means to mitigate anxiety during dental procedures[21]. Moreover, Prabhakar et al. (2007) demonstrated that engaging audio-visual presentations, coupled with multi-sensory distractions, proficiently manage anxiety in paediatric patient[22].

Current literature does not include any studies examining the impact of an hourglass as a distraction tool during impression taking in any age group on the success of impression recording and the severity of gag reflex in children. We observed that both the types of hour glass offered sufficient interest from all children in the Test group and did not obstruct with the impression taking procedure.

Results of this study showed that children who engaged in focusing their eyes on hour glass had significantly less severe gagging as compared to those who did not. These findings are

supported by an earlier study done by Debs and Aboujaoude (2017)[23]. It was particularly noteworthy that every child in our study who was distracted by the liquid bubble hourglass successfully completed the impression-taking procedure, outshining their counterparts in the comparison group. Higher success (100%) in our study may be attributed to the nature of the liquid motion hour glass used. It was attractive, easy to use and yet cognitively demanding as well as providing visual stimulation. When continuously focused on descending multicoloured bubbles, they act as a visual aid for mindfulness promoting present-moment awareness. All these qualities could have made this the liquid bubble hour glass an effective distractor. These findings align with the results of Nuvvula et al. (2015), which identify audiovisual distraction as a crucial strategy for managing gag reflex[23]. Use of an hour glass for distraction mitigates anxiety and aids in 'unlearning' the behaviours that initiate gagging. These outcomes align with the study, where the distraction technique proved effective in reducing anxiety among children.

Buchanan's Facial Image Scale (FIS) (2002) is an amazing practical tool for assessing the intensity of pain, fear, and anxiety in children[15]. It offers a straightforward and reliable method for measuring child's anxiety state within a dental setup, aiding clinicians in planning proper behavioural interventions[15]. In this study, patients distracted by liquid motion hour glass has least value on FIS.

Dickinson and Fiske introduced new gagging severity index (2013) to assess gag reflex prior to dental treatment[14]. Patients distracted by liquid bubble hour glass related to significantly lesser gagging severity.

Gagging-related impression success scale (GISS) was used to assess success of impression taking procedure. The results showed higher value for patients distracted by bubble hour glass.

Out of the two-hour glasses used, liquid motion hour glass proved to be more successful in distracting pediatric patients as these are mesmerizing to watch as colorful bubbles float and descend providing a calming and visually stimulating experience. The gentle and rhythmic movement of the bubbles can be soothing making liquid motion timer a great tool for distraction as compared to sand hour glass.

CONCLUSION

Liquid motion Hour glass diverted the child's attention by creating spellbinding visual spectacle, offering a tranquil and enchanting experience diverting their attention during stressful alginate impression. This distraction approach is of great interest to parents as it offers no pharmacological intervention. Henceforth it should be considered as an alternative behavior management technique.

CONFLICT OF INTEREST

No

REFERENCES

1. Conny DJ, Tedesco LA. The gagging problem in prosthodontic treatment. Part I: description and causes. The Journal of prosthetic dentistry. 1983 May 1;49(5):601-6.
2. Katsouda M, Tollili C, Coolidge T, Simos G, Kotsanos N, Arapostathis KN. Gagging prevalence and its association with dental fear in 4-12-year-old children in a dental setting. International Journal of Paediatric Dentistry. 2019 Mar;29(2):169-76.
3. Roy S, Bhayya DP, Gupta S, Upadhyay K, Tiwari S, Rao A. Awareness and prevention of patient gag reflex among pedodontists in India: A web-based survey. Journal of Indian Society of Pedodontics and Preventive Dentistry. 2016 Jul 1;34(3):238-43.
4. Meeker HG, Magalee R. The conservative management of the gag reflex in full denture patients. The New York state dental journal. 1986 Apr;52(4):11-4.

5. Bassi GS, Humphris GM, Longman LP. The etiology and management of gagging: a review of the literature. The Journal of prosthetic dentistry. 2004 May 1;91(5):459-67.
6. Dixit UB, Moorthy L. The use of interactive distraction technique to manage gagging during impression taking in children: a single-blind, randomised controlled trial. European Archives of Paediatric Dentistry. 2021 Apr; 22:219-25.
7. Bassi GS, Humphris GM, Longman LP. The etiology and management of gagging: a review of the literature. The Journal of prosthetic dentistry. 2004 May 1;91(5):459-67.
8. Krol AJ. A new approach to the gagging problem. J Prosthet Dent. 1963;13:611–6.
9. Singer IL. The marble technique: a method for treating the “hopeless gagger” for complete dentures. J Prosthet Dent. 1973;29(21):146–50.
10. Yoshida H, Ayuse T, Ishizaka S, Ishitobi S, Nogami T, Oi K. Management of exaggerated gag reflex using intravenous sedation in prosthodontic treatment. Tohoku J Exp Med. 2007;212(4):373–8.
11. Lu DP, Lu GP, Reed JF 3rd. Acupuncture/acupressure to treat gagging dental patients: a clinical study of anti-gagging effects. Gen Dent. 2000;48(4):446–52.
12. Noble S. The management of blood phobia and a hypersensitive gag reflex by hypnotherapy: a case report. Dent Update. 2002; 29:70–4.
13. Dixit UB, Moorthy L. The use of interactive distraction technique to manage gagging during impression taking in children: a single-blind, randomised controlled trial. European Archives of Paediatric Dentistry. 2021 Apr; 22:219-25.
14. Dickinson C. Gagging problems in dental patients: literature review for the diploma in dental sedation. GKT Dental Institute of King’s College London; 2000.
15. Buchanan H, Niven N. Validation of a facial image scale to assess child dental anxiety. Int J Paediatr Dent. 2002;12(1):47–52.
16. Kumar S, Satheesh P, Savadi RC. Gagging. N Y State Dent J 2011; 77:22-7.
17. Dickinson CM, Fiske J. A review of gagging problems in dentistry: I. Aetiology and classification. Dent Update 2005; 32:26-8, 31-2.

18. Richmond BJ, Sato T. Enhancement of inferior temporal neurons during visual discrimination. J Neurophysiol 1987;58:1292-306.Patel A, Schieble T, Davidson M, et al. Distraction with a hand-held video game reduces pediatric preoperative anxiety. Paediatr Anaesth. 2006; 16:1019–1027.
19. Dixit UB, Moorthy L. The use of interactive distraction technique to manage gagging during impression taking in children: a single-blind, randomised controlled trial. European Archives of Paediatric Dentistry. 2021 Apr; 22:219-25.
20. Al-Khotani A, Bello LA, Christidis N. Effects of audiovisual distraction on children's behaviour during dental treatment: a randomized controlled clinical trial. Acta Odontologica Scandinavica. 2016 Aug 17;74(6):494-501.
21. Prabhakar AR, Marwah N, Raju OS. A comparison between audio and audiovisual distraction techniques in managing anxious pediatric dental patients. Journal of indian society of pedodontics and preventive dentistry. 2007 Oct 1;25(4):177-82.
22. Debs NN, Aboujaoude S. Effectiveness of intellectual distraction on gagging and anxiety management in children: a prospective clinical study. Journal of International Society of Preventive and Community Dentistry. 2017 Nov 1;7(6):315-20.
23. Nuvvula S, Alahari S, Kamatham R, Challa RR. Effect of audiovisual distraction with 3D video glasses on dental anxiety of children experiencing administration of local analgesia: a randomised clinical trial. European archives of paediatric dentistry. 2015 Feb; 16:43-50.

Figure 1: Liquid Motion hour glass for distraction, during impression taking

Figure 2: Sand Timer hour glass for distraction, during impression taking

Figure 3: No distraction, during impression taking

Figure 4: Armamentarium