



Comparative Evaluation of Hemostatic Gel vs Gelatin Sponge on Bleeding and Pain After Primary Teeth Extraction: An In-vivo Comparative Study

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Abstract

Background- In pediatric dental practice, extraction is one of the common procedures whether it's a case of over-retained deciduous teeth or carious and traumatic teeth with poor prognosis. In pre-cooperative patients or patients with special health care needs, post extraction bleeding must be managed very effectively and quickly too, as such patients are unable to follow the post-extraction pack instructions properly. Hence, aim of this study was to compare the efficacy of hemostatic gel and gelatin sponge on post-extraction bleeding and pain following extraction of primary teeth and whether the root length of the primary teeth draws any impact over the post-extraction bleeding time and flow.

Materials & Methodology- It was a prospective, randomised clinical trial of sample size 20 teeth in each group. Inclusion criteria were ASA class-I patients in the age group 6-12 years, patients with at least 1 primary tooth to be extracted under LA local infiltration. After extraction, a pressure pack of normal saline soaked gauze was given for 2 minutes and then hemostatic agent was applied as per the groups allocated either hemostatic gel or gelatin sponge to the extraction socket.

Results- Gelatin sponge performed better in controlling the bleeding from extraction socket at 5 minutes and 10 minutes interval as the mean data of bleeding code was statistically significant but it was not significant at 15 minutes interval means both the material performed equally better at the end of 15 minutes in controlling bleeding.

Conclusion- Placing Gelatin sponge pack post primary teeth extraction significantly reduces the bleeding time at 5 minutes and 10 minutes interval and hastens the blood clot in comparison with hemostatic gel.

Keywords- Post-Extraction Bleeding, Gelatin Sponge, Hemostatic Gel

INTRODUCTION

In pediatric dental practice, extraction is one of the common procedures whether it's a case of over-retained deciduous teeth or carious and traumatic teeth with poor prognosis. Post-extraction bleeding following extraction is a well identified and frequent complication which causes several difficulties like stress, pain & agony to the patients and apprehension to the care-takers as well. ¹ Hemophobia is the fear of blood which may instills a negative attitude in pediatric patients if doesn't control adequately and quickly following the extraction. Post-Extraction Bleeding (PEB) can be defined as obvious evidence of bleeding beyond the pressure pack time limit. ² This PEB may interfere in moisture sensitive procedures like restoration and cementation prolonging the chair-side and anesthesia time. This breakthrough bleeding may require hemostatic treatment, and emergency intervention in severe cases. In a study conducted by Henderson et al ³, it was concluded that total blood loss ranged from 2.5-57mL in extraction of

primary teeth. PEB depends upon the number of teeth extracted, the pathological status of the teeth, the length of the root preserved and underlying systemic diseases of the patients like bleeding or clotting disorders and liver diseases.

In pre-cooperative patients or patients with special health care needs, post extraction bleeding must be managed very effectively and quickly too, as such patients are unable to follow the post-extraction pack instructions properly.

Management of PEB includes both local as well as systemic measures. Local methods of controlling PEB are common saline pressure pack, sutures, acrylic surgical splints, and local hemostatic agents like oxidized cellulose, resorbable gelatin sponge, bone wax, calcium alginate, tannic acid, and hemocoagulase. ⁴⁻⁵

Systemic measures include oral or parenteral administration of anti-fibrinolytic agents like tranexamic acid and α -amino caproic acid.

Ideal properties of a hemostatic agents include lightness, stability, and the ability to be easily inserted into the bleeding site. It should not cause tissue irritation or destruction, must not get dissolved in the blood and can be easily removed after the arrest of the bleeding or whenever required.⁶

Gelatin sponge is one of the commonly used hemostatic agents in oral surgical procedure which has property to swell up and arrest the bleeding by compressing the blood vessels.⁷ Hemostatic gel typically contains Aluminium Chloride, glycerine and purified water are being used in dentistry for arresting bleeding during minor gingival retraction procedures and treating pulp bleeding during pulp therapy. There have been various studies conducted so far to evaluate the efficacy of gelatin sponge and resorbable packs after extraction of primary teeth in patients with bleeding disorder and anti-platelet therapy, but, there is a scarcity of literature in evaluating the efficacy of gelatin sponge and hemostatic gel in bleeding control following extraction of primary teeth. Hence, aim of this study was to compare the efficacy of hemostatic gel and gelatin sponge on post-extraction bleeding and pain following extraction of primary teeth

and whether the root length of the primary teeth draws any impact over the post-extraction bleeding time and flow.

MATERIALS AND METHODOLOGY

It was a prospective, randomised clinical trial of sample size 20 teeth in each group. Inclusion criteria were ASA class-I patients in the age group 6-12 years, patients with at least 1 primary tooth to be extracted under LA local infiltration. Exclusion criteria were patients with any systemic or bleeding disorders or extraction requiring surgical procedures like gingival reflection or elevation and pressure packs dislodged during 15 minutes post-extraction. Informed consents were obtained from each child's legal parent or guardian. Each patient was randomly assigned to one of two study groups which after the extraction supposed to receive the Group I- Gelatin sponge (Gelatin[®] Gamma Sterile, Ready to Use) and Group II- Hemostatic Gel (Waldent). Tooth extractions were performed using forceps after local infiltration of Local Anesthesia and retraction of attached gingiva.



Figure 1: Gelatin Sponge



Figure 2: Hemostatic Gel



Figure 3: Armamentarium

Pulse rate and oxygen saturation was recorded using pulse oximeter prior to LA administration and 30 minutes after extraction to evaluate the difference in the patient's apprehension on using these two different packs.

Anxiety and pain level on the patients were recorded using Facial Image Scale prior to LA administration and 1

hour post extraction to compare if there is any difference if these two different post-extraction packs.

Root resorption stages of the tooth to be extracted was evaluated using radiographs and code was assigned using modified Fanning Scale for root resorption.

Stage	Designation for this study	Diagram
Root intact	0	
Root shows blunting or rounding at apex	1	
Root resorbed 1/4	2	

Root resorbed 1/3	3	
Root resorbed 1/2	4	
Root resorbed 2/3	5	
Root resorbed 3/4	6	
Root entirely resorbed	7	

After extraction, a pressure pack of normal saline soaked gauge was given for 2 minutes and then hemostatic agent was applied as per the groups allocated either hemostatic gel or gelatin sponge to the extraction socket.

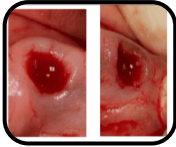


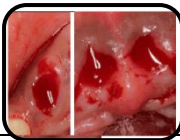
Figure 4: Placement of hemostatic gel in extraction socket



Figure 5: Placement of gelatin sponge in extraction socket

At 5 minutes, 10 minutes, and 15 minutes post-extraction, bleeding was scored according to a scale developed by Shayna Mattox et al. Existing blood, if any, was wiped using gauge and the socket was observed for 3 seconds prior to rating each socket.

Code	Description	Diagram
0	No active bleeding/ Fully clotted	
1	Active bleeding which fills the socket, but no oozing outside of the socket onto the alveolar ridge.	

2	Active bleeding which is oozing outside of the socket, but limited to immediate alveolar ridge.	
3	Active bleeding which is oozing outside of the socket, over the alveolar ridge into the working field.	

At 15 minutes, it was noted if any portion of hemostatic agent was completely removed from the socket or not and if completely removed the sample was excluded from the study. After 15 minutes, a saline soaked gauge was placed in the socket for another 15 minutes to avoid spitting or chewing anything by the child.

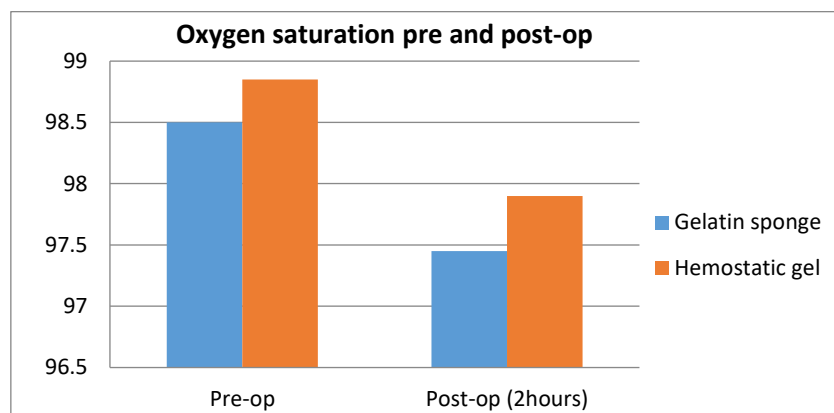
RESULTS

Data were entered in Microsoft Excel Version 2012 and SPSS software version 20.0 and following results were obtained.

1. Comparison of Oxygen Saturation pre and post extraction (After 30 min) between Gelatin Sponge and Hemostatic Gel

Time	Group	Mean oxygen saturation	Std. Deviation	Mean diff	T value	P value
Pre-op	Gelatin sponge	98.50	1.606	-.350	-.856	.39
	Hemostatic gel	98.85	.875			
Post-op (30 min)	Gelatin sponge	97.45	1.849	-.450	-.931	.35
	Hemostatic gel	97.90	1.119			

Test used- independent t test, $p > 0.05$ insignificant

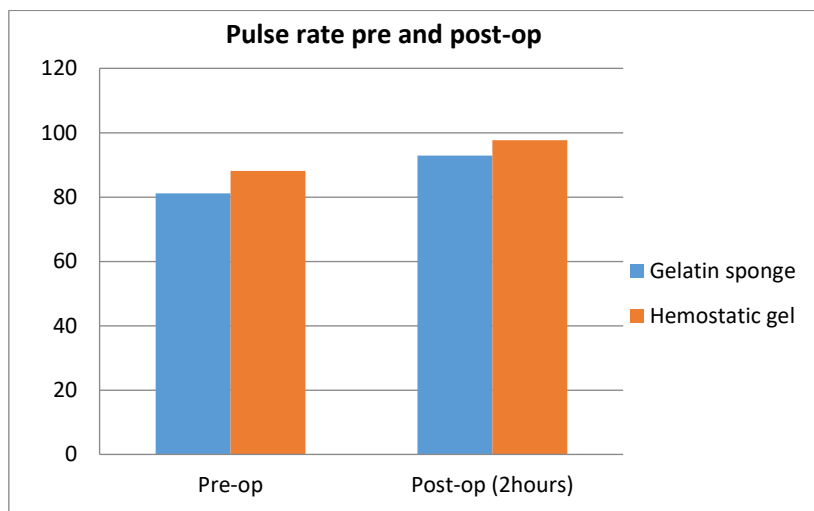


Mean $\pm$ SD of oxygen saturation at pre-op in gelatin sponge and hemostatic gel was 98.50 ± 1.606 and $98.85 \pm .875$ while at post-op it was 97.45 ± 1.849 and 97.90 ± 1.119 respectively respectively. Results were found to be statistically insignificant

2. Comparison of Mean pulse rate pre and post extraction (After 30 min) between Gelatin Sponge and Hemostatic Gel

Time	Group	Mean pulse rate	Std. Deviation	Mean diff	T value	pvalue
Pre-op	Gelatin sponge	81.15	15.500	-7.00	-1.203	.23
	Hemostatic gel	88.15	20.914			
Post-op (After 30 min)	Gelatin sponge	92.85	7.989	-4.850	-1.573	.12
	Hemostatic gel	97.70	11.239			

Test used- independent t test, $p > 0.05$ insignificant

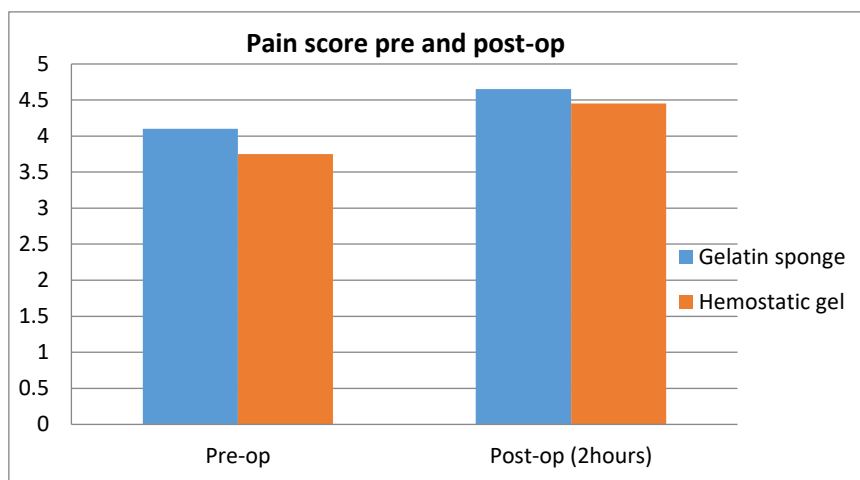


Mean $\pm$ SD of pulse rate at pre-op in gelatin sponge and hemostatic gel was 81.15 ± 15.500 and 88.15 ± 20.914 respectively and post-op was 92.85 ± 7.989 and 97.70 ± 11.239 respectively. Results were found to be statistically insignificant.

3. Comparison of Pain perception pre and post extraction (After 2 hours) between Gelatin Sponge and Hemostatic Gel

Time	Group	Mean pain score	Std. Deviation	Mean diff	T value	P value
Pre-op	Gelatin sponge	4.10	.718	.350	1.406	.16
	Hemostatic gel	3.75	.851			
Post-op (After 1 Hour)	Gelatin sponge	4.65	.489	.200	1.265	.21
	Hemostatic gel	4.45	.510			

Test used- independent t test, $p > 0.05$ insignificant

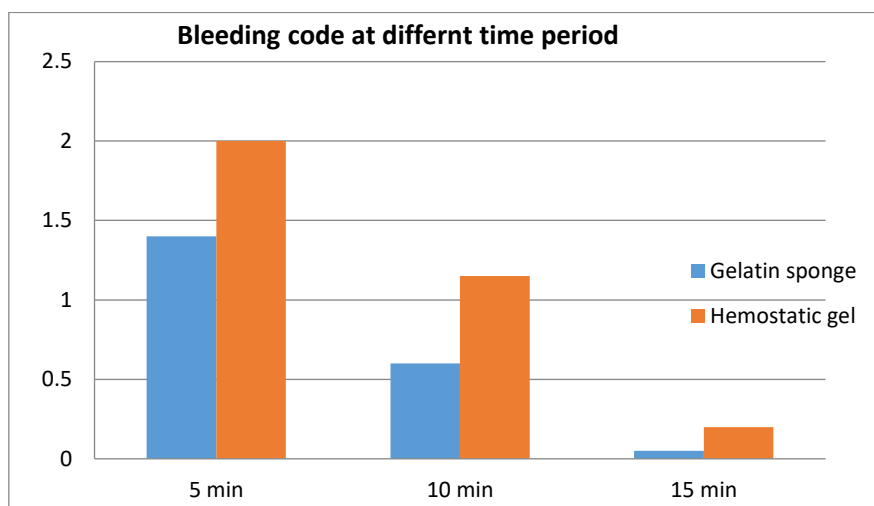


Mean $\pm$ SD of pain score at pre-op in gelatin sponge and hemostatic gel was $4.10 \pm .718$ and $3.75 \pm .851$ respectively and post-op was $4.10 \pm .718$ and $3.75 \pm .851$ respectively. Results were found to be statistically insignificant

4. Comparison of Bleeding at 5 min, 10 min and 15 min post extraction between Gelatin Sponge and Hemostatic Gel

Time	Group	Mean bleeding code	Std. Deviation	Mean diff	T value	P value
5 min	Gelatin sponge	1.40	.598	-.600	-2.854	.007**
	Hemostatic gel	2.00	.725			
10 min	Gelatin sponge	.60	.598	-.550	-2.437	.020*
	Hemostatic gel	1.15	.813			
15 min	Gelatin sponge	.05	.224	-.150	-1.435	.16
	Hemostatic gel	.20	.410			

Test used- independent t test, $p < 0.05$ significant and $p > 0.05$ insignificant

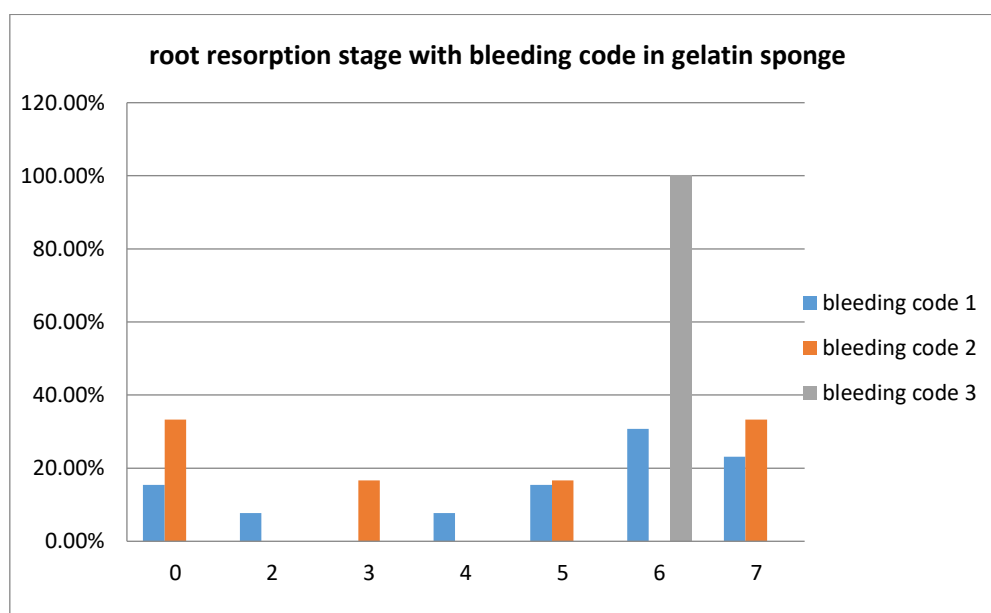


Mean $\pm$ SD of bleeding code at 5 min, 10 min and 15min in gelatin sponge and hemostatic gel was $1.40 \pm .598$ and $2.00 \pm .725$, $0.60 \pm .598$ and $1.15 \pm .813$ and $0.05 \pm .224$ and $0.20 \pm .410$ respectively. Results were found to be statistically significant when comparing gelatin sponge and hemostatic gel of bleeding code at 5 min and 10min but insignificant at 15min.

5. Comparison of bleeding code at 5 min with root resorption stage in gelatin sponge

Root resorption stage of gelatin sponge	Bleeding code			Total	Chi value	P value
	code 1	code 2	code 3			
0	15.4%	33.3%	0	20%	8.803	.72
2	7.7%	0.0%	0.0%	5.0%		
3	0.0%	16.7%	0.0%	5.0%		
4	7.7%	0.0%	0.0%	5.0%		
5	15.4%	16.7%	0.0%	15.0%		
6	30.8%	0.0%	100.0%	25.0%		
7	23.1%	33.3%	0.0%	25.0%		
Total	100.0%	100.0%	100.0%	100.0%		

Test used- chi square, $p > 0.05$ insignificant

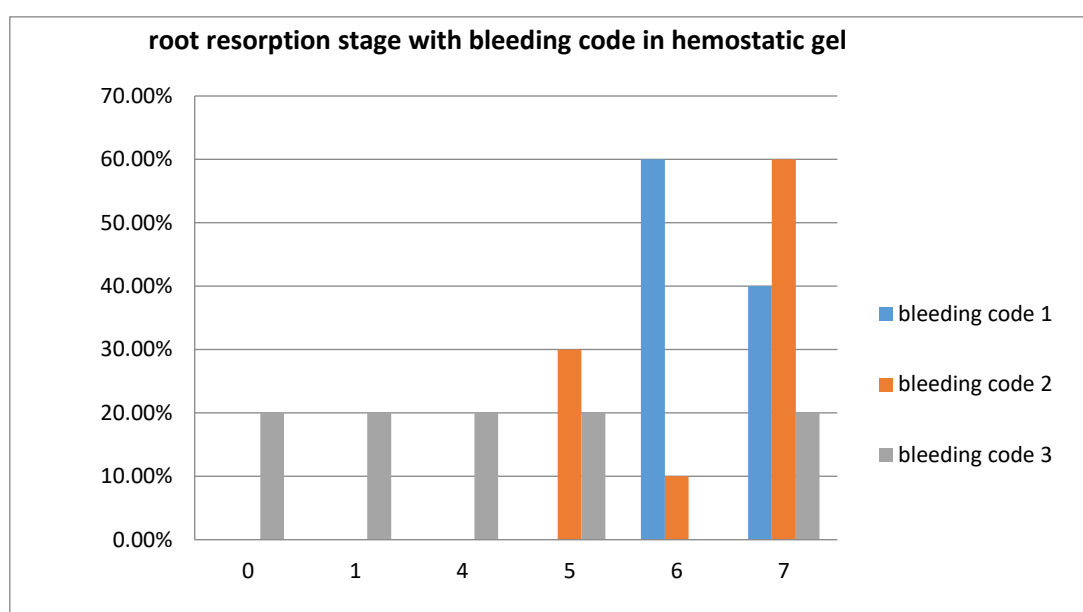


Results were found to be statistically insignificant when comparing bleeding with root resorption stage in gelatin sponge.

6. Comparison of bleeding code with root resorption stage in hemostatic gel

Root resorption stage of hemostatic gel	Bleeding code			Total	Chi value	P value
	code 1	Code 2	code 3			
0	0.0%	0.0%	20.0%	5.0%	17.222	.07
1	0.0%	0.0%	20.0%	5.0%		
4	0.0%	0.0%	20.0%	5.0%		
5	0.0%	30.0%	20.0%	20.0%		
6	60.0%	10.0%	0.0%	20.0%		
7	40.0%	60.0%	20.0%	45.0%		
Total	100.0%	100.0%	100.0%	100.0%		

Test used- chi square, $p > 0.05$ insignificant



Results were found to be statistically insignificant when comparing bleeding with root resorption stage in gelatin sponge.

DISCUSSION

Extraction of primary teeth is a common procedure encountered in routine pediatric dental practice. Reason for primary teeth extraction include trauma, serial extraction for interceptive orthodontics, over-retained teeth, grossly decayed teeth which can't be restored or treated endodontically.⁸ After primary tooth extraction, a gauze pack is placed over the socket and patient is directed to bite on the pack for half an hour, exerting firm even pressure.⁹ Pre-cooperative children and those with intellectual disabilities don't comply with the pressure packs advice and they tend to remove the pack, before the time of pressure pack retention lasts. Due to lack of cognitive development in such patients, there is search of a proper hemostatic agent since long times that too in primary extraction socket, to hasten the clotting time and reduction in pressure packs timing as well. Many hemostatic agents like gelatin sponge, gelfoam (Gelatin sponge with glutaraldehyde), hemostatic gel and snake venom (batroxobin)¹⁰ have been used as post-extraction hemostatic agent but mostly in cases with bleeding and

clotting disorders, such patients require additional care to avoid excessive bleeding.

Gelatin sponge is a water insoluble, resorbable material which is flexible in nature and made from animal skin.^[7] It is hemostatic in nature and can be used to control bleeding after exodontia.¹¹ It can be used dry or in combination with saline solution. The mechanism behind using the sponge is water absorption and formation of clots, protecting the wound, reducing complications and hastening recovery.¹² Mahmaudi A et al (2023) advocated the use of gelatin based dental sponge in primary molar extraction in order to reduce bleeding pain and post-operative infection.¹³ Similarly, in a study conducted by Pattabhi A et al (2024),¹⁴ they showed that using gelatin sponge in the extraction sockets of impacted third molars, when excessive bleeding is not present, reduces postoperative pain.

Hemostatic gel basically contains Aluminum Chloride and Ferric Sulfate which acts by constricting blood vessels and helping in formation of clot.¹⁵ In a systemic review

by Gupta G et al (2018)⁴, clinical outcomes of topical hemocoagulase was compared with placebo in extraction socket sites of adults and found that topical hemocoagulase led to a significant differences in bleeding stoppage time, pain, swelling, wound healing, and other postoperative complications. In adult patients, particularly after 3rd molar extractions, such hemostatic agents are used to avoid excessive bleeding as well as dry socket. There is paucity of literature regarding use of gelatin sponge and hemostatic gel in primary extraction socket. Thus, this study was carried out to compare the efficacy of bleeding control between gelatin sponge and hemostatic agent after primary teeth extraction.

In this study, Gelatin sponge performed better in controlling the bleeding from extraction socket at 5 minutes and 10 minutes interval as the mean data of bleeding code was statistically significant but it was not significant at 15 minutes interval means both the material performed equally better at the end of 15 minutes in controlling bleeding. Gelatin sponge performed better due to its characteristic to effectively absorb blood at a rate that is 45 times its own weight. The hemostatic action is associated with the consistent porosity of the gelatin sponge, which facilitates platelet adhesion and subsequent degradation, resulting in the release of thrombokinase. It's neutral pH, rendering it compatible for moistening with thrombin or antibiotic solutions without compromising its integrity.¹⁶ The result was in accordance with the conducted by Shayna Mattox et al (2020)¹⁷, in which they concluded that use of hemostatic pack in maxillary primary extraction socket reduces the bleeding time at 5 minutes and 10 minutes post extraction compared to the controls.

In this study, we also tried to co-relate the difference in Oxygen saturation, pulse rate and pain perception of the children after use of these two haemostatic packs but result revealed that the difference in data were statistically insignificant. The data was not in accordance with the study by Shayna Mattox et al (2020) in which they claimed that there is an odd of increasing bleeding by 9% for increase in heart rate per beat every minutes.

In another parameter, the study also tried to rule out whether there is any impact of root resorption stages of primary teeth on post extraction bleeding in which results revealed the data as insignificant too which was in accordance with the Shayna Mattox et al's study. In this study, root resorption stage was evaluated using vertical resorption and lateral root resorption was not taken into account. Again, periodontal status and mobility of the primary tooth plays a significant role in the post-extraction bleeding which was not measured in the study and these might be the reason behind the data to be statistically insignificant.

This study had certain limitations like smaller sample size, location and status of root resorption stage of the tooth to be extracted and lack of blood profile tests for International Normalized Ratio (INR) prior to extraction. But, as this study is a pioneer in its own terms as one of the first study to be conducted in India as role of two different haemostatic packs after extraction of primary teeth, it will provide a backbone for further research and

studies specially in terms of providing a quick performing haemostatic pack after primary teeth extraction specially in un-cooperative patients and paediatric patients with intellectual disabilities.

Importance of the study

In uncooperative and intellectual disability patients, who don't comply with the post-extraction pack instructions, Gelatin sponge can be used on chair side to arrest the bleeding from primary teeth extraction site.

Use of gelatin sponge can be used in pediatric patients with bleeding disorders in order to hasten the clotting of primary teeth extraction bleeding site and to avoid post-operative complications.

CONCLUSION

Placing Gelatin sponge pack post primary teeth extraction significantly reduces the bleeding time at 5 minutes and 10 minutes interval and hastens the blood clotting in comparison with hemostatic gel.

There is no any difference in impact on oxygen saturation, pulse rate and pain perception by pediatric patients between these two hemostatic agents used.

Root resorption stage doesn't play a major role in post-extraction bleeding in primary teeth.

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