Estimation of blood loss post-dental extraction

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ABSTRACT

Introduction: Evaluation of blood loss during major surgical procedures is given utmost importance to provide supplements to compensate the same. Extraction is one of the most common procedures carried out by a dentist in their practice. During dental extractions, as the amount of blood lost is assumed to be minimal, least importance is given to quantify the same. In this study, gravimetric method of estimation of blood loss will be employed to approximate the extent of blood lost by an individual during minor surgical procedure involving extraction. **Aim:** The aim of this study is to estimate the average amount of blood lost during closed extraction procedure. **Methodology:** This clinical study was conducted using standardized size of gauze which was pre-weighed and sterilized. These pre-weighed gauze will be used score 50 closed extraction procedures which excluded the extraction of mobile teeth and patients with bleeding and clotting disorders and other systemic illness. The gauze thus used was weighed post-extraction to determine the magnitude of blood loss. **Result:** The mean blood loss in study participants was 3.06 ± 3.0036 ml. Paired sample t-test showed statistically significant blood loss before and after dental extraction ($t = 19.75$, $P < 0.001$). There was no statistical difference with respect to age and gender post-extraction ($F = 0.644$ $P = 0.595$, $F = 0.465$ $P = 0.709$). **Conclusion:** Although negligible amount of blood is lost during a closed extraction procedure, it is the duty of the dentist to grade the same so that underestimation of blood loss is neglected and necessary dietary supplements are incorporated when required.

KEY WORDS: Bleeding, Dental, Extraction, Syatemic illness

INTRODUCTION

Extraction of teeth, formally known as exodontias, is the process of removal of tooth from the alveolus. Extraction is one of the most common procedures that are carried out in the dental out patient and can be done for various reasons. Extractions are frequently carried out under local anesthesia and seldom under general anesthesia, in case of removal multiple impacted teeth. Adrenaline is nearly an inevitable agent that is used in conjunction with the local anesthetic agent to induce vasoconstriction and in turn significantly decrease the amount of blood lost during the procedure happens. Apart from the above-mentioned action, its addition is beneficial in several ways to decrease the peak plasma concentration of the local anesthetic agent in the circulation, increasing in the duration and the quality of anesthesia, and reducing the minimum concentration of anesthetic needed for nerve block.

Blood is a complex tissue that has its origin from the mesenchymal cells. It is an able agent to maintain homeostasis, regenerate soft and hard tissues, and exhibit the other entire pivotal role that is necessary for the living of a healthy human being.[1-5] Managing blood loss is one of the major concerns for a surgeon. Excessive loss of this fluid component from the body may result in a life-threatening condition known as hypovolemic or hemorrhagic shock. Symptoms of hypovolemic shock begin to occur when 10–20% of blood has been lost. The patient tends to exhibit symptoms such as tachycardia, pallor, cold clammy skin, and severe stages of shock may occur due to loss of more than forty percentage of the body weight can cause symptoms such as decrease blood pressure, extreme tachycardia, tachypnea, loss of consciousness, decrease or loss of capillary refill, and decrease or absence of urinary output. Conventionally, transfusion of fluids or blood components is strategies to manage the complication like post-operative anemia.[2-14] Taking over one of these techniques to manage both intraoperative and post-operative blood loss lowers the mortality rate of the person by

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many folds. Therefore, ways to manage the same are being effectively carried out by transfusion of blood products. In spite of the measures taken, blood loss during surgical procedures is inevitable. An array of techniques is available to evaluate the blood loss in an operating field. One of these methods was adopted to estimate that the amount of lost blood during extraction of a simple closed extraction procedure.[3]

Dental extraction is a commonly done minor surgical procedure in routine dental clinical practice. This procedure involves varying amount of blood loss depending on several factors.[15-18] However, the literature reporting quantification of blood loss during dental extraction is scarce, and hence, this study was done with the aim to estimate the average amount of blood lost during closed extraction procedure.

METHODOLOGY

The present study carried out between the academic year November 2017 and February 2018. The study consisted of 50 outpatients from Saveetha Dental College who opted to undergo extraction or were indicated for extraction of their teeth. The study included individuals who were free from any systemic ailments such as specially bleeding or clotting disorders apart from diabetes, hypertension, patients on blood thinners, or antiplatelet drugs and had to undergo closed extraction of a single and periodontal sound tooth. Periodontally compromised, multiple extractions, and extraction for which open method was indicated and impacted teeth were excluded from the study population.

To carry out the study, gauze was cut in 2.5 cm *2.5 cm square, pre-weighed to 10 g, packed, and sterilized. These packs were used for extraction. Before extraction, the height and the weight of the patients were noted to estimate the percentage of blood lost from the body during the entire course. The blood-soaked gauzes were post-weighed after use.

Gauze packed following the above-mentioned parameters was utilized for the process of extraction. The gauze pieces were weighed immediately after the procedure to avoid any errors in the result. Care was taken to not use gauze that was pre-soaked with an antiseptic liquid or the saliva of the patient as the ability of absorption may be hampered.

1gm raise in weight was equated to 1 ml of blood loss. The obtained data were tabulated to derive the amount and the percentage of blood lost during extract.

RESULTS

The mean age of the participants was 34.76 ± 11.816 years. The mean weight of the participants of the study was 59.1 ± 9.89 kg. The mean height of the participants was 159.36 ± 9.5 cm. The mean weight of the sterile gauze before extraction was 13.66 ± 3.87 mg. The weight of the sterile gauze following extraction was 16.36 ± 4.27 mg. The increase in weight denoted as blood loss 3.067 ± 3.003 mg [Table 1].

The paired sample *t*-test for blood loss estimation observed statistically difference in blood loss post-extraction with $t = 19.755$ and $P < 0.001$ [Table 2].

There was no statistical difference with respect to gender post-extraction in males and females ($F = 0.644$ $P = 0.595$, $F = 0.465$ $P = 0.709$) [Tables 3 and 4].

DISCUSSION

Blood loss during a surgical procedure is of concern both for the surgeon and for the patient. Accurate

Table 1: Demographic characteristics of the participants

Demographic parameters	n	Minimum	Maximum	Mean±SD	
Age (years)	50	19	62	34.76	11.816
Weight (kg)	50	43	78	59.1	9.898
Height (cm)	50	140	184	159.36	9.501
Weight before extraction (mg)	50	6	20	13.66	3.874
Weight after extraction (mg)	50	8	24.3	16.367	4.2748
Increase in weight (mg)	50	1.1	23	3.067	3.0036

Table 2: Paired samples *t*-test for blood loss estimation

Sample pair	Paired differences					t	df	P
	Mean	SD	SEM	95% confidence interval of the difference				
				Lower	Upper			
Pair 1 Weight after extraction - weight before extraction	2.7066	0.9688	0.1370	2.4313	2.9819	19.755	49	0.000

SD: Standard deviation, SEM: Standard error mean

Table 3: ANOVA for blood loss in males post-extraction

Age	n	Mean	SD	SEM	F	P
≤30 years	9	0.0004111	9.28E-05	3.09E-05	0.644	0.595
31–40 years	8	0.000375	0.0001488	5.26E-05		
41–50 years	6	0.0004333	0.0001211	4.94E-05		
>50 years	2	0.0005	0.0001414	0.0001		
Total	25	0.000412	0.0001201	2.40E-05		

SD: Standard deviation, SEM: Standard error mean

Table 4: ANOVA for blood loss in females post-extraction

Age	n	Mean	SD	SEM	F	P
≤30 years	11	0.0008455	0.0010662	0.0003215	0.465	0.709
31–40 years	6	0.0012583	0.0018402	0.0007513		
41–50 years	4	0.0004	0.0001414	7.07E-05		
>50 years	4	0.001475	0.0023514	0.0011757		
Total	25	0.000974	0.0014133	0.0002827		

SD: Standard deviation, SEM: Standard error mean

estimation of the blood lost plays a pivotal role as underestimation or overestimation of the same may lead to uneventful complications.[5] With regard to dentistry, the amount of blood lost is dependent on factors such as the simplicity of the procedure, accessibility of the site, the effect of local hemostatic agents, and the pressure applied by the operator to stop the bleeding.[6] Complications that may crop up during extraction can be attributed to the presence of either bleeding or clotting disorder. Therefore, it is essential to note down a proper case history of the individual.

In spite of developments in the medical province, precise estimation of intraoperative blood loss still remains bizarre. Visual estimation of blood loss is commonly used by many practitioners, especially by gynecologists, to determine the blood loss during childbirth. Al though this is one of the most frequently used method of blood estimation, but there are inaccuracies and inconsistencies with this method as well.[7] The other direct method of estimation is gravimetric method; gravimetric method has two variants, namely patient weighing and swab weighing. In patient weighing method, the preoperative and postoperative weight of the patient is estimated and the difference in the weight is equated to the amount of blood loss. 1 g loss of weight is equal to 1 ml loss of blood. In swab weighing, the swab that is the gauze or cotton is pre- and post-weighed instead of the patient and the amount of blood lost is calculated. Apart from the above-mentioned methods volumetric method and colorimetric method, the use of labeled cells, blood volume measurement, and urine strip analysis is present. In volumetric method, the magnitude of fluids that are to be introduced into the surgical field is calculated pre-operatively and the abundant fluid possessed in the aspirator after the surgery is encapsulated to be blood loss.[8] Colorimetric method involves a reagent that has the dexterity to convert hemoglobin into a much stable form methemoglobin is used.[9] Blood stained swabs, drapes, and contents from the aspirator are made to react with this agent and the hemoglobin concentration obtained is analyzed by a colorimeter to derive the result blood volume measurement technique determines the lost blood volume based on the following principle, where the difference between pre- and post-operative blood volumes are measured. This may provide additional valuable information regarding the amount of surgical hemorrhage.[10] This procedure involves injecting a known quantity of dye or radioactive tracer into a vein of the individual. After a delay of a few minutes, this permits the dye to be evenly distributed throughout the cardiovascular compartment. After providing adequate time for the diffusion of the dye into the bloodstream, a sample of blood is withdrawn. The conclusion is obtained from the dilution of the injected substance in the blood sample, post-surgery.[11]

Alternate approach for measurement of blood lost intraoperatively was directly or indirectly dependent on the specific gravity of the serum[12] carried out by determining the plasma volume that is by measuring the amount of labeled albumin. Albumin may be tagged with dyes such as vital red or Evans blue instead of radioactive active agents such as iodine, chromium, or phosphorous to decide the blood loss.[13] In contrast to the radical thought applied to sculpt them, these techniques have very little application to the measurement of the same. Similar to the above-mentioned techniques, the erythrocytes, commonly known as red blood cells, can be tagged with Fe55 or Fe59 for the estimation of blood volume. The usage of this technique is restricted as they involve a relatively high dose of radiation.[14] Excepting the above-mentioned mechanisms, relatively simple techniques like measuring the contents present in the suction bottle can also be adopted for measuring intraoperative hemorrhage, the amount of irrigating agent or antiseptic liquid, namely saline, chlorhexidine, or betadine should be adjusted to evaluate the approximate volume of blood loss.

A mathematical model of blood loss for a surgical hospitalization based on mathematical principles for blood loss and haem dilution was devised in the year 1997.[15] This model was designed so that the calculation of blood loss would be based on easily measured factors such as the patient's blood volume, the number and type of red cell units transfused the initial hematocrit, the discharge hematocrit, the transfusion trigger, the volume of intraoperatively salvaged blood transfused, and the amount of hemodilution performed.[16]

Among all the listed ways of estimating blood loss, volumetric, and calorimetric methods may be considered superior to others. This can be attributed to the reason that volumetric method is easy to perform, cost-effective, does not require any technique that has to specialize and with the prime benefit that it is more accurate than the other methods above written strategies. Calorimetric method also plays a commendable role in estimating the same. Although this technique is much more expensive than volumetric method, it is more economical than method such as labeling of cells and blood volume analysis. The most important advantages of this novel way are that it does not necessarily require the presence of specific apparatus to proceed with the evaluation of blood loss and gives a detailed account of the blood loss.[16]

Intraoperative patient monitoring forms an essential part of patient monitoring and care. Maintenance of intravascular blood volume is of utmost priority to provide adequate tissue perfusion. Fluid replacement with colloids, crystalloids, or blood components aims at replenishing the loss at the surgical field and also to nurture a steady basal metabolic rate. Use of potent anesthetic agent is a dependable factor for substantial reduction of blood loss. Proper positioning of the patient also plays a key role in increasing or decreasing the blood loss.[17] Appropriate patient positioning eliminates possible venous obstruction and engorgement of veins. Further positive pressure ventilation may alter the venous return. These factors, even though they seem basic, can cause mountain of difference in reducing blood loss. Although a wide range of fluids of replacement is available, an ideal substitute is yet to be standardized.[18] Nowadays fluid replacement therapy is selected based on the oxygen-carrying capacity rather than mere replacement of blood. Hence, it can be said that a multidisciplinary, multimodality approach should be tailor-made for every individual thereby banishing any undue complications.

In the field of dentistry, importance to estimate the blood loss is considered trivial as the blood lost during minor surgical procedures can be compensated by the body itself. Priority to estimate the transient loss during major surgeries is given, as the system may fail to compensate the same. Visual estimation in congruence with the amount of blood collected through suction devices provides a rough range for compensation.[19]

The intent of this article was to bring into limelight the fact that there are a number of studies addressing the causes for intraoperatively bleeding and their management; however, there is scarcity of literature on methods determining the quantity of intraoperative blood loss. This manuscript was pioneered to make the specialists mindful of various techniques for evaluating intraoperatively blood loss and accordingly attending to the requirement for prompt substitution of lost blood.[20] However, no procedure for estimation of blood loss is considered gold standard. Every technique has its own points of interest and drawbacks. Considering a specific method is dependent on operators' choice, feasibility, and cost-benefit ratio.

If adequate initiatives are taken, a simple yet feasible technique for precise determination of even minute quantity of blood loss can be devised. This invention may eliminate underestimation or overestimation of the same. To the least, a baseline value for comparison should be available to compare and contrast normal from abnormal. New dimensions of the study may incorporate other criteria's in variable permutations to set a minimum bar to avoid enigmas regarding fluid compensation needs.

CONCLUSION

This study concluded that there is a statistically significant amount of blood loss after extraction; however, no differences in blood loss were observed between the participants with respect to both age and gender, respectively. Although negligible amount of blood is lost during a closed extraction procedure, it is the duty of the dentist to grade the same so that underestimation of blood loss is neglected, and necessary dietary supplements are incorporated when required.

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Source of support: Nil; Conflict of interest: None Declared