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Comparison between Ferrum Phosphoricum and Sterile Gauze Pack after Dental Extraction

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ABSTRACT

Background: Exodontia is the process of removing a tooth from its socket within the alveolar bone. Pain, bleeding, and non-healing are common complications associated with exodontias.
Objectives: To compare bleeding time, pain, and healing after dental extraction using Ferrum Phosphoricum (FP) and a sterile gauze pack (SGP).
Material and Methods: This randomized controlled trial included 236 patients selected through consecutive sampling. Medically healthy individuals aged 15 to 60 were included while unwilling participants, those with medical complications, substance abuse history, fractures, or pregnancy were excluded. Patient data, including age, gender, and intervention details, were documented. Participants were randomly divided into two groups: FP tablets and pressure pack. Hemostasis achievement time, healing, and pain were recorded for both groups. Chi-square and Student t-tests were employed for comparisons.
Results: The SGP group had a longer bleeding time (6.09±1.41 min) than the FP group (2.37±0.95 min) ($p<0.001$). Abnormal bleeding was observed in 55.9% of the SGP group but not in the FP group ($p<0.001$). Regarding pain scores, on Day 3 and Day 7 post-operation, the FP group reported significantly lower pain scores than the SGP group ($p<0.001$). However, by Day 14, both groups had no reported pain (0.0±0.0). Moderate and severe pain were more prevalent in the SGP group than in the FP group on Day 3 and Day 7, with statistically significant differences ($p<0.001$). The healing score was significantly lower in the FP compared to the Gauze pack group on Day 3, 7, and 14 ($p<0.001$).
Conclusion: Ferrum Phosphoricum is superior in controlling post-extraction bleeding, pain management, and wound healing compared to a sterile gauze pack.
Keywords: Bleeding, dental extraction, hemorrhage, socket, sterile.

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INTRODUCTION

Exodontia is the process of removing a tooth from its socket within the alveolar bone. During extraction, bleeding is the most prevalent consequence. As a result, maintaining hemostasis throughout any dental operation is crucial.[1] Normal vasoconstriction or local or systemic treatments can stop bleeding. Several different medical disorders and medicines may interfere with hemostasis.[2]

Mechanical, thermal/energy-based, chemical hemostatic techniques can all be used to produce hemostasis. Hemostasis, Hemostasis Vegetal, Tachosil or Tisseel are some of the newest hemostatic agents that may be used. Gelatin sponges and polyvinyl alcohol sponges are other sponge products that can be employed.[3] A variety of local hemostatic medications can be used to reduce bleeding during oral surgical procedures in individuals with bleeding problems.[4] Ferrum phosphoricum is a Biochemic pill that promotes the formation of healthy blood cells. It is an effective bleeding treatment that provides a novel approach to establish hemostasis by operating directly on a cellular level on all cells in the body, including red blood cell hemoglobin.[5] As well as hemoglobin, Ferrum phosphoricum is found in lymphocytes as well as the muscle cells that line lymphatic and blood arteries. It is also found in hair cells. Tissue salts believe it to be one of the best on the market frequently with potential results. Vascular walls are strengthened &toughened. There are several indications for this treatment, including fever, rheumatoid arthritis, bleeding, a swollen nose and nasal bleed, headache, and sore throat. In this treatment, the Ferrum component helps to balance the iron and oxygen levels in the blood, while the phosphorous content helps to halt any bleeding that may be present.[6] We need to mix three different solutions: iron sulphate, sodium acetate, and phosphorus. Large volumes of sugar lactose are used to grind up the iron phosphate to make it non-toxic.[7] Ferrum phosphoricum tablets, when put locally in a hemorrhagic location, reveals unexpectedly quick development of gelatinous mass.[8]

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Patients and surgeons are equally concerned when there is bleeding at the surgery site. According to Duke,[9] the typical bleeding time is 2-5 minutes. In this time span, the bleeding should have stopped. In complicated injuries and in situations where it is difficult to reach the bleeding site, conventional techniques are less efficient in controlling bleeding. Several newer approaches are superior to old ones and may be used more simply. Hemostatic agents of a younger generation are therefore necessary.[10] Although conventional medicines are successful in reducing post-extraction bleeding, they do not work in every scenario. The major advantages of local hemostatic agents include: a reduction in hemorrhaging induced by trauma; a reduction in factor dependence; and a reduction in patient anxiety due to uncontrolled bleeding.[11,12]

The rationale of this study is that bleeding during surgery presents a significant clinical concern that can be distressing for patients and disrupt their social life, sleep, and eating patterns. It can also lead to severe consequences such as syncope, anxiety, and tachycardia. While numerous traditional treatments exist to achieve hemostasis, the use of ferrum phosphoricum tablets has demonstrated considerable effectiveness. Dental pain after extraction, due to improper packing, can result in the dissolution of the blood clot and alveolar osteitis. Gauze packing is the normal practice after dental extraction, but there is a lack of routine practice in using ferrum phosphoricum. Additionally, there is a lack of literature on this subject in Pakistan. The aim of this study is to compare the effectiveness of ferrum phosphoricum and sterile gauze in promptly controlling post-extraction bleeding.

MATERIAL AND METHODS

This randomized controlled trial was conducted at the Oral & Maxillofacial Surgery Department, Institute of Dentistry, Liaquat University of Medical and Health Sciences (LUMHS), Jamshoro/Hyderabad, and had a duration of six months, from March 1, 2022, to August 30, 2022 on 236 patients using non-probability consecutive sampling technique. This trial was not registered previously with any database.

The sample size for this study was determined using the online Epitool sample size calculator, utilizing the parameters derived from a prior study conducted by Khurana A et al.[6] These parameters included Mean 1, which represented a post-operative serum hemoglobin measurement of 11.35 in the FM (Ferrum Phosphoricum Tablet) group, Variance (SD) 1 of 1.70, Mean 2, signifying a post-operative serum hemoglobin measurement of 10.91 in the FP (Pressure Pack by Sterile Gauze) group, Variance (SD) 2 of 1.21, a confidence interval of 0.95, a power level of 0.8, and a ratio of 1:1 between the two groups. Following the calculations, it was determined that a sample size of 118 patients was required for Group A (Ferrum Phosphoricum Tablet) and an equal number of 118 patients for Group B (Pressure Pack by Sterile Gauze), resulting in a total sample size of 236 participants for the study (Fig 01). This study was conducted at the Department of Oral and Maxillofacial Surgery after the approval from ethical review committee of the hospital (LUMHS/REC/-161). The written informed consent was obtained from all patients or their parents before starting the study.

The inclusion criteria for this study were individuals of any gender who were medically healthy with no systemic diseases or comorbidities. Additionally, participants were required to demonstrate cooperation throughout the study and during post-operative follow-ups. The study enrolled individuals within the age range of 15 to 60 years. Eligible patients presented with specific dental conditions, including grossly decayed teeth, chronic apical periodontitis, chronic destructive periodontitis, periapical abscesses, and retained root stumps.

The exclusion criteria for this study included individuals who were unwilling to participate, those with medical complications or systemic diseases, a history of substance abuse or psychiatric conditions, individuals with fractures or skeletal deformities, and pregnant women in their first or third trimesters.

The proforma documented relevant patient data, including age, gender, type and location of intervention, and post-operative condition. Each patient underwent a preoperative assessment of their general medical status and underwent laboratory and radiographic investigations, including Complete Blood Count (CBC), Random Blood Sugar (RBS), Hemoglobin A1C (HbA1c), Intraoral Periapical Radiographs (IOPAR), and Orthopantomogram (OPG) if deemed necessary. Antibiotic prophylaxis was administered to patients when indicated. All charges of laboratory investigations were paid by authors.

The patients were randomly divided into two groups using block randomization, with each block containing 20 participants. Within each block, simple randomization was carried out using a computer-generated table in an Excel sheet, employing the Rand function. Half of the participants (Group A) received Ferrum Phosphoricum tablets (Germany Incorp), while the other half (Group B) received a pressure pack with sterile gauze.

The dental extractions in this study were conducted with the use of local anesthesia, specifically 2% lidocaine with 1:80,000 adrenaline. The management of extraction sites for each patient was categorized into two distinct groups.

In Group A, a Ferrum phosphoricum tablet was inserted into the extraction socket following tooth removal. For single-rooted teeth, a single Ferrum phosphoricum tablet was carefully placed using tweezers within the socket. In cases of multi-rooted teeth, two tablets were inserted. The condition of the socket was assessed at 20-minute intervals, and this evaluation continued for up to 60 minutes.

For patients in Group B, following tooth extraction, immediate digital pressure was applied in a buccolingual direction. This pressure technique was employed to minimize the 'dead space' within the wound and facilitate hemostasis. Subsequently, sterile gauze was positioned directly over the socket area, and patients were instructed to bite down to apply the necessary pressure.

The time required to achieve hemostasis was recorded for all groups using a stopwatch. Patients were provided with routine postoperative instructions and guidance on maintaining oral hygiene. Follow-up appointments were scheduled for the 7th postoperative day to assess pain levels and monitor the progress of healing. The assessment of post-operative pain was carried out using the Visual Analogue Scale (VAS) on the 3rd day, 7th day, and 14th day after the surgical procedure. the evaluation of post-extraction healing followed the definition provided by Mozzati et al.[12] and was performed on the same time points, specifically the 3rd day, 7th day, and 14th day post-extraction.

Data analysis was done in SPSS. Continuous data were computed as mean and SD while qualitative variable as frequencies with percentages. Baseline parameters like age and gender were compared between two group using Chi-square test for categorical and student t test for numerical. Pain score, bleeding time and healing index was compare between two group with student t test. Pattern of pain was compared between two groups using Chi-square test/Fisher exact test.

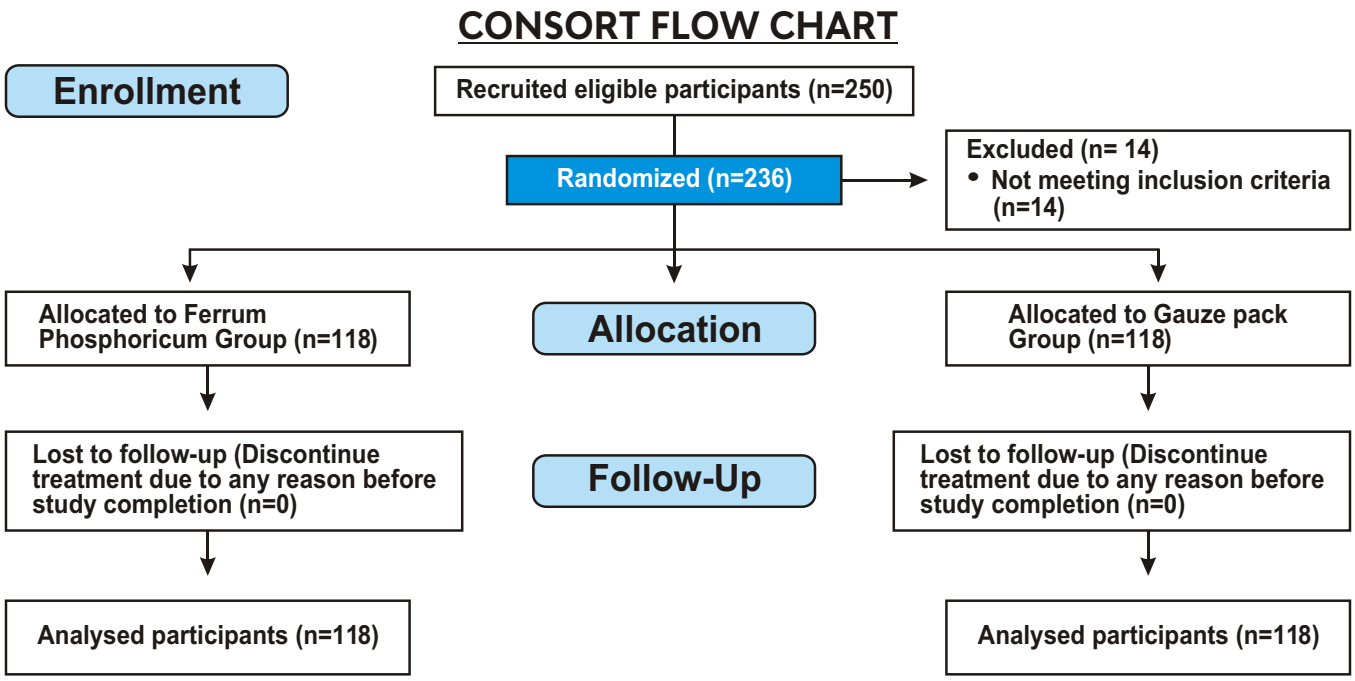


Fig 01. A CONSORT diagram showing the flow of participants through each stage of the trial

RESULTS

Baseline parameters between two study groups were compared, table 01: Ferrum Phosphoricum and Gauze Pack. In the Ferrum Phosphoricum group, there were 65 males (55.1%) and 53 females (44.9%). Meanwhile, in the Gauze Pack group, there were 63 males (53.4%) and 55 females (46.6%). Our analysis found no statistically significant difference in gender distribution between the two groups (p = 0.79). Within the Ferrum Phosphoricum group, 65 individuals (55.1%) belonged to the 16-30 age group, 40 individuals (33.9%) to the 31-45 age group, and 13 individuals (11.0%) to the 46-60 age group. Similarly, in the Gauze Pack group, 60 individuals (52.54%) were in the 16-30 age group, 39 individuals (33.05%) in the 31-45 age group, and 19 individuals (16.1%) in the 46-60 age group. These differences in age group distribution were also found to be non-significant (p = 0.22). In terms of mean age, the Ferrum Phosphoricum group had a mean age of 32.2 ± 9.78 years, while the Gauze Pack group had a mean age of 34.92 ± 10.51 years. The difference in mean age between the two groups was not statistically significant (p = 0.11).

The mean bleeding time was longer in the Gauze pack group (6.09±1.41 minutes) than in the Ferrum Phosphoricum group (2.37±0.95 minutes), and this difference was statistically significant (p<0.001). Abnormal bleeding was not observed in the Ferrum Phosphoricum group, whereas it was present in 66 (55.9%) patients in the Gauze pack group. These results were also highly statistically significant (p<0.001). (Table 2)

Table 03 shows comparison of post-operative pain scores at various time points between two groups, specifically the Ferrum Phosphoricum group (n=118) and the Gauze pack group (n=118). Pain scores were assessed on Day 3, Day 7, and Day 14 post-operation. On Day 3, the Ferrum Phosphoricum group exhibited significantly lower pain scores (0.88±1.30) compared to the Gauze pack group (2.73±1.51), with a p-value of <0.001, as determined by the Student t-test. On Day 7, a similar trend was observed, with the Ferrum Phosphoricum group reporting substantially lower pain scores (0.14±0.50) in contrast to the Gauze pack group (0.80±1.17), again showing a highly significant difference (p<0.001) based on the Student t-test. However, on Day 14, pain scores for both groups were recorded as 0.0±0.0, indicating that no pain was reported by either group at this time point.

Moderate and severe pain was more in Gauze pack group than Ferrum Phosphoricum at day 3 and day 7 and the differences were statistically significant (p< 0.001). The details are given in table 04.

The mean healing index score was lower in Ferrum Phosphoricum than Guaze pack at day 3, 7 and 14. All these differences were statistically significant (p<0.001). (Table 05)

Table 01. Comparison of baseline parameter in both groups

Variable	Characteristics	Ferrum Phosphoricum (n=118)	Guaze pack (n=118)	P-Value
Gender	Male	65 (55.1%)	63 (53.4%)	0.79*
	Female	53 (44.9%)	55 (46.6%)	
Age groups (years)	16-30	65 (55.1%)	60 (52.54%)	0.22*
	31-45	40 (33.9%)	39 (33.05%)	
	46-60	13 (11.0%)	19 (16.1%)	
Age (years	Mean±SD	32.2±9.78	34.92±10.51	0.11**

* Chi-square test, **Student t test

Table 02. Comparison of post operative bleeding time between two groups (n=236)

Variable	Characteristics	Ferrum Phosphoricum (n=118)	Guaze pack (n=118)	P-Value
Bleeding Time (minutes)	Mean ± SD	2.37±0.95	6.09±1.41	<0.001*
Bleeding pattern	Normal	118 (100.0%)	52 (44.1%)	< 0.001**
	Abnormal	0 (0.0%)	66 (55.9%)	

* Chi-square test, **Student t test

Table 03. Comparison of post operative pain score various time point between the two groups (n=236)

Pain Score	Ferrum Phosphoricum (n=118)	Guaze pack (n=118)	P-Value*
Day 3	0.88±1.30	2.73±1.51	<0.001
Day 7	0.14±0.50	0.80±1.17	<0.001
Day 14	0.0±0.0	0.0±0.0	--

**Student t test

Table 04. Comparison of post operative pain type at various time point between the two groups (n=236)

Follow up	Pain Type	Ferrum Phosphoricum (n=118)	Guaze pack (n=118)	P-Value*
Day 3	No Pain	66 (55.9%)	8 (6.8%)	< 0.001
	Mild Pain	44 (37.3%)	70 (59.3%)	
	Moderate Pain	8 (6.8%)	38 (32.2%)	
	Severe Pain	0 (0.0%)	2 (1.7%)	
Day 7	No Pain	110 (93.2%)	76 (64.4%)	< 0.001
	Mild Pain	8 (6.8%)	36 (30.5%)	
	Moderate Pain	0 (0.0%)	6 (5.1%)	

* Chi-square test

Table 05. Comparison of post operative healing index score various time point between the two groups (n=236)

Healing Index Score	Ferrum Phosphoricum (n=118)	Guaze pack (n=118)	P-Value*
Day 3	6.46±0.89	7.35±0.48	<0.001
Day 7	5.53±0.62	6.28±0.45	<0.001
Day 14	4.37±0.61	5.12±0.37	<0.001

**Student t test

DISCUSSION

This study's findings indicate that Ferrum Phosphoricum is superior in managing post-extraction bleeding, pain control, and promoting the healing of extraction wounds when compared to the Pressure Pack with Sterile Gauze method.

To the best of our knowledge, very few studies have been conducted worldwide to compare the efficacy of Ferrum Phosphoricum Tablets and the Pressure Pack with Sterile Gauze. Therefore, this study was conducted at the Oral & Maxillofacial Surgery Department, Institute of Dentistry, Liaquat University of Medical and Health Sciences (LUMHS) in Jamshoro/Hyderabad. The study aimed to compare the efficacy of Ferrum Phosphoricum Tablets and the Pressure Pack with Sterile Gauze method in terms of controlling post-extraction bleeding, pain, and promoting the healing of extraction wounds.

In this study, out of 236 patients who underwent tooth extraction, 55.1% were male and 44.9% were female in group A (Ferrum Phosphoricum Tablet), while in group B (Pressure Pack with Sterile Gauze), 53.4% were male and 46.6% were female. Kavin et al.[8] reports the 60.0% male and 40.0% female patients. Haseeb et al.[13] reports the 59.6% male and 39.4% female patients. Shakeel et al.[14] reports the 56.2% male and 43.8% female patients. Similar studies are reporting that males were in higher proportion for extraction as compared to females.

In this study, a post-operative assessment of bleeding time revealed a significant difference (P<0.001) between both groups. Specifically, bleeding time remained within normal limits for all patients Ferrum Phosphoricum, whereas in Pressure Pack with Sterile Gauze, bleeding time was normal for none and abnormal for 66 (55.9%) patients. Kavin T, et al.[8] reports the lower time of bleeding 3.92 minutes in Ferrum Phosphoricum Tablet group and 9.05 minutes in Pressure Pack with Sterile Gauze group. Bleeding from an extraction socket is the most common post operative haemorrhage encountered by the dental surgeon. Hence, in the group where Ferrum phosphoricum tablets were used, hemostasis was achieved earlier than the other group where Pressure Pack with Sterile Gauze was used.[8,15,16]

In this study, post operative assessment of VAS pain score shows significant difference in both groups i.e., 0.88 ± 1.30 and 2.73 ± 1.51at 3rd day(P-value < 0.001) and 0.14 ± 0.50 and 0.80 ± 1.17 at 7th day (P-value < 0.001) in group A (Ferrum Phosphoricum Tablet) and group B (Pressure Pack with Sterile Gauze) patients respectively, whereas post operative assessment of VAS pain score at 14th day shows that no any patient was suffering from pain ingroup A (Ferrum Phosphoricum Tablet) and group B (Pressure Pack with Sterile Gauze). Kavin T, et al.[7] reports the lower pain in Ferrum Phosphoricum Tablet group and worst pain in Pressure Pack with Sterile Gauze group.[8,15,16]

In this study, post operative assessment of healing index score shows significant difference in both groups i.e., 6.46 ± 0.89 and 7.35 ± 0.48at 3rd day (P-value < 0.001), 5.53 ± 0.62 and 6.28 ± 0.45at 7th day(P-value < 0.001) and 4.37 ± 0.61 and 5.12 ± 0.37at 14th day (P-value < 0.001) in group A (Ferrum Phosphoricum Tablet) and group B (Pressure Pack with Sterile Gauze) patients respectively. Kavin T, et al.[7] also reports the significantly better wound healing in Ferrum Phosphoricum group compared with the other Pressure Pack with Sterile Gauze group in terms of better epithelialization, tissue color and response to palpation, assessed using soft tissue healing index.[8, 15, 16]

In general, the post operative bleeding time, pain score and healing index score was significantly low in group A (Ferrum Phosphoricum Tablet) patients as compared to group B (Pressure Pack with Sterile Gauze) patients that shows the better efficacy of Ferrum phosphoricum in controlling post extraction bleeding, pain and healing of extraction wound as compared to Pressure Pack with Sterile Gauze method.

CONCLUSION

It was concluded from the study that Ferrum phosphoricum is better in controlling post extraction bleeding, controlling pain and healing of extraction wound as compared with Pressure Pack with Sterile Gauze method.

Ethical Consideration

This study was approved by the ethical board of Liaquat University of Medical and Health Sciences (LUMHS) in Jamshoro/Hyderabad, Pakistan.

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Conflicts of interest

Authors declare no conflicts of interest.

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DATA SHARING STATEMENT: The data that support the findings of this study are available on request from the corresponding author. The data is not publicly available due to privacy or ethical restrictions.

AUTHOR'S CONTRIBUTION

The following authors full fill authorship criteria as per ICMJE guidelines;

Rahoojo MA, Shahzad M: Substantial contribution to conception and design, drafting the manuscript, final approval, agreed to be accountable for all the work.

Baloch MA, Hasan F: Substantial contribution to conception and design, data acquisition, drafting the manuscript, final approval, agreed to be accountable for all the work.

Siyal ZH, Salman P: Analysis and interpretation of data, drafting the manuscript, final approval, agreed to be accountable for all the work.

Shams S: Analysis and interpretation of data, critical revision,final approval, agreed to be accountable for all the work.

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