



Retrospective analysis of characteristics of patients presenting to the emergency room following dental treatment

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Abstract (J Korean Assoc Oral Maxillofac Surg 2024;50:326-332)

Objectives: This study is a retrospective analysis of patients who visited the emergency room (ER) following dental treatment over a period of 3 years, with the aim to enhance the understanding of emergency situations that may arise after dental procedures and to develop appropriate postoperative management and emergency care methods.

Patients and Methods: A total of 796 emergency patients whose visits were attributed to dental procedures, of 4,241 patients who visited the ER at Pusan National University Yangsan Hospital from January 2021 to January 2024, was included in the study. Patients were categorized based on the reason for visit into bleeding, inflammation, and other categories. Analysis was conducted on variables such as types of dental treatment, underlying conditions, and emergency treatment methods using ER records.

Results: Among the 796 patients, 68.4% (539 patients) were in the bleeding group, 27.7% (219 patients) in the inflammation group, and 4.8% (38 patients) in the other complications group. Among the bleeding group, there were no associations between postoperative bleeding and systemic diseases, antithrombotic medications, or dental treatments. In 36.2% of cases, compression hemostasis alone was sufficient to resolve the bleeding. In the inflammation group, 29% of the cases required extraoral incision and drainage as emergency treatment, while 53% of the cases required subsequent hospitalization. Factors associated with hospitalization included underlying diseases (especially diabetes mellitus), procedures on mandibular teeth (especially third molars), and age older than 30 years.

Conclusion: Ensuring adequate hemostasis after dental procedures is essential regardless of the patient's underlying medical conditions. Dentists must also educate patients on pressure hemostasis techniques. Patients with underlying medical conditions, such as diabetes, have a higher possibility of requiring hospitalization if inflammation occurs. Therefore, preventive measures against inflammation should be implemented in these patients.

Key words: Emergency room visit, Dental care, Postoperative complications, Postoperative hemorrhage, Dental infection control

[paper submitted 2024. 8. 30 / revised 1st 2024. 9. 30, 2nd 2024. 10. 14 / accepted 2024. 10. 15]

I. Introduction

Emergency situations in dentistry can be divided into those that occur during treatment, after treatment, and unrelated to treatment¹. During treatment, emergencies such as syncope, allergic reactions, excessive bleeding, or ingestion of foreign objects may arise, necessitating the transfer of the patient to

the emergency room (ER) or requiring additional treatment. Post-treatment complications include infection, bleeding, and inflammation, which if not managed properly, may also require ER visits. Additionally, situations unrelated to previous dental treatments such as trauma, temporomandibular joint dislocation, or severe pain may also require emergency care.

Previous studies on patients visiting dental hospitals have primarily focused on the characteristics of maxillofacial trauma or the nature of the patients themselves including age, sex, time, and chief complaints¹⁻³. The most common reasons for the visits were trauma, inflammation, and bleeding, with trauma accounting for more than half of the cases. Patients visiting in the inflammation group generally received medication and incision and drainage treatment, with approximately 16%-22% of them eventually requiring hospitalization¹⁻³. Bleeding cases were mostly due to oral surgery procedures,

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including extractions¹. However, the existing literature provides limited analysis of the underlying pathologies or specific types of minor surgeries performed in these patients.

Complications arising from dental treatment, if not managed properly and appropriately, often lead patients to seek emergency care due to pain and discomfort. This results in increased time and costs^{1,3}, highlighting the importance of understanding the epidemiological factors and duration associated with complications and hospitalizations.

Therefore, this study aims to analyze the characteristics of recent patients who visited the ER due to complications arising from prior dental treatment. By identifying the factors such as preceding dental treatments, underlying medical conditions, and procedural care, we hope to contribute to the effective management of dental emergencies and the prevention of subsequent emergency situations.

II. Patients and Methods

1. Study design and participants

This retrospective study included a total of 796 emergency patients who visited the ER at Pusan National University Yangsan Hospital due to complications arising from dental procedures. These patients were selected from a total of 4,241 ER visits for dental emergencies from January 2021 to January 2024.

2. Data collection

Patients were categorized into three groups based on primary reason for the visit: infection, bleeding, and other complications. The patient characteristics were further divided to facilitate detailed analysis using ER records and prior dental procedures, characteristics, and emergency treatment methods.

Dental procedures prior to the emergency visits were categorized as follows: (1) Implantation: First- and second-stage surgeries were grouped together; (2) Surgical treatment: This category included all soft tissue invasive procedures other than tooth extractions and implantations such as curettage, flap surgery, and free gingival grafting; (3) Endodontic treatment: This category encompassed resin restorations, endodontic therapy, and crown preparations.

Patient characteristics included underlying diseases such as hypertension, diabetes mellitus, hyperlipidemia (HL) and diseases affecting the heart, cerebral, liver, or kidney systems.

For patients in the bleeding group, the use of antithrombotic medications (antiplatelet agents and anticoagulants) and the method of hemostasis were also investigated. Pressure hemostasis was the standard approach. However, in cases where wound dehiscence was severe from the beginning or there was no reduction in bleeding tendency after pressure hemostasis, additional specialized bleeding control methods were applied such as primary closure, local application of epinephrine, or intravenous injection of a hemostatic agent.

This study was exempted from the Institutional Review Board (IRB) of Pusan National University Dental Hospital (No. PNUDH IRB 2024-08-018). The written informed consent was waived due to the retrospective nature of the study.

3. Statistical analysis

Statistical analyses were performed using IBM SPSS Statistics version 27.0 (IBM). We used a chi-square test to analyze the differences in proportions across groups, considering *P*-values less than 0.05 as statistically significant.

III. Results

1. 3.0. Overall

The analysis was conducted by categorizing the patients into three groups based on chief complaints: bleeding, infection, and other complaints. Among the 796 patients, the majority (539, 68.4%) presented with postoperative bleeding, followed by 219 patients (27.7%) with inflammation and 38 patients (4.8%) with other complaints. For the year-over-year comparison, data from 2024 were excluded.(Table 1)

2. Bleeding

Extraction (56.0%) was the most common cause of bleeding, followed by implantation (30.8%). Among the patients,

Table 1. Annual distribution of patients by chief complaint

Year	Total	Bleeding	Inflammation	Other complaints
2023	254 (100.0)	162 (63.8)	75 (29.5)	17 (6.6)
2022	266 (100.0)	186 (69.9)	68 (25.5)	12 (4.5)
2021	244 (100.0)	169 (69.2)	68 (27.9)	7 (2.8)
Total	764 (100.0)	517 (67.7)	211 (27.6)	36 (4.7)

Values are presented as number (%).

For the year-over-year comparison, data from 2024 were excluded.

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65.7% were not taking antithrombotic medications.(Table 2) The patient's underlying disease, use of antithrombotic medications, and type of tooth undergoing the procedure all

exhibited no significant relationship with success of pressure hemostasis ($P>0.05$). Due to the overlap in underlying diseases for the individual patients, the total percentage with

Table 2. Hemostasis outcomes, intervention requirements, and patient characteristics in bleeding cases

	Total	Hemostasis with pressure alone	Additional intervention required	P-value
Dental procedure ¹				>0.05
Extraction	302 (56.0)	101 (33.4)	201 (66.5)	
Implant	166 (30.8)	71 (42.8)	95 (57.2)	
Curettage	15 (2.75)	6 (40.0)	9 (60.0)	
Scaling	14 (2.57)	5 (35.7)	9 (64.2)	
Other procedures	42 (7.8)	18 (42.9)	24 (57.1)	
Underlying disease ²				
No underlying disease	161 (31.1)	68 (42.2)	93 (57.7)	
Heart disease	119 (21.0)	33 (27.7)	86 (72.2)	>0.05
Cerebrovascular disease	35 (7.0)	12 (34.2)	23 (65.7)	>0.05
Liver disease	7 (0.9)	2 (28.5)	5 (71.4)	>0.05
Kidney disease	11 (2.8)	4(36.3)	7 (63.3)	>0.05
Hypertension	148 (27.2)	51 (34.4)	97 (65.5)	>0.05
Diabetes mellitus	91 (16.7)	34 (37.3)	57 (62.6)	>0.05
Hyperlipidemia	54 (9.9)	18 (33.3)	36 (66.6)	>0.05
Medication				
No Medication ³	355 (65.7)	134 (37.7)	221 (62.2)	
Antiplatelet(s) only ³	79 (14.6)	26 (32.9)	53 (67.0)	>0.05
Anticoagulant(s) only ³	89 (16.4)	34 (38.2)	55 (61.7)	>0.05
Antiplatelet & anticoagulant ³	17 (3.1)	2 (11.8)	15 (88.2)	>0.05
Single antiplatelet ⁴	85 (15.7)	25 (29.4)	60 (70.5)	>0.05
Dual antiplatelet therapy ⁴	11 (2.0)	3 (27.2)	8 (72.7)	
Origin Teeth				
Maxillary ⁵	247 (50.8)	94 (38.0)	153 (61.9)	>0.05
Mandibular ⁵	239 (49.2)	93 (38.2)	146 (61.0)	
Anterior teeth ⁶	91 (18.7)	36 (39.5)	55 (60.4)	>0.05
Posterior teeth ⁶	395 (81.3)	151 (38.2)	244 (61.7)	

Values are presented as number (%).

P-values indicate no statistically significant differences ($P>0.05$) in the following comparisons: ¹Between dental procedure groups. ²Between the “No underlying disease” group and other disease groups. ³Between the “No medication” group and other medication groups. ⁴Between “Single antiplatelet” and “Dual antiplatelet therapy.” ⁵Between “Maxillary” and “Mandibular” teeth. ⁶Between “Anterior” and “Posterior” teeth.

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Table 3. Distribution and characteristics of patients with inflammation

	Total	Hospitalization required	No hospitalization	P-value
Dental procedure ¹				<0.001
Extraction	124 (56.6)	50 (40.3)	74 (59.7)	
Surgical procedure	32 (14.6)	10 (31.2)	22 (68.8)	
Endodontic treatment	30 (13.7)	1 (3.3)	29 (96.7)	
Others	33 (15.0)	8 (24.2)	25 (75.8)	
Underlying disease ²				
No underlying disease	145 (65.6)	38 (26.2)	107 (73.7)	
Hypertension	54 (24.4)	23 (42.5)	30 (55.5)	<0.05
Diabetes mellitus	35 (15.8)	21 (60.0)	14 (40.0)	<0.001
Hyperlipidemia	24 (10.8)	13 (54.1)	11 (45.9)	<0.05
Malignant condition	3 (1.3)	1 (33.3)	2 (66.7)	>0.01
Origin teeth				
Maxillary ³	34 (18.3)	13 (38.2)	21 (61.8)	<0.001
Mandibular ³	144 (77.4)	99 (68.8)	45 (31.2)	
1st & 2nd molars ⁴	103 (55.4)	54 (52.4)	49 (47.6)	<0.001
3rd molar ⁴	60 (32.3)	54 (90.0)	6 (10.0)	

Values are presented as number (%).

After Bonferroni correction, only “Extraction” vs. “Endodontic treatment” was statically significant.

P-values indicate statistically significant differences ($P<0.05$) in the following comparisons: ¹Between dental procedure groups. ²Between the “No underlying disease” group and other disease groups. ³Between “Maxillary” and “Mandibular” teeth. ⁴Between “Anterior” and “Posterior” teeth.

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underlying diseases exceeded 100.0%.

3. Inflammation

The most frequent cause was extraction (56.6%), followed by other surgical procedures, endodontic treatment, and other causes. (Table 3) A chi-square test revealed a significant difference among the groups ($P<0.05$), and further post-hoc analysis using Bonferroni correction demonstrated that this difference was significant only between 'Extraction' and 'Endodontic treatment' ($P<0.05$). Due to the overlap in underlying disease for individual patients, the total percentage of patients with underlying diseases exceeds 100.0%. Of the 69 patients who required hospitalization, diabetes was a significantly meaningful factor ($P<0.001$), with the presence of underlying diseases also exhibiting notable correlation ($P<0.05$). (Fig. 1) The majority of the causative teeth was mandibular teeth (77.4%), among which molars accounted for the majority. (Fig. 2) The need for hospitalization was determined to have a significant relationship with the mandible, especially third molars, and began to exhibit a significant relationship beginning from the age of 30 years.

4. Other complaints

The most common chief complaint was simple pain, reported by 13 patients, following previous dental treatment such as endodontic therapy and surgical interventions.

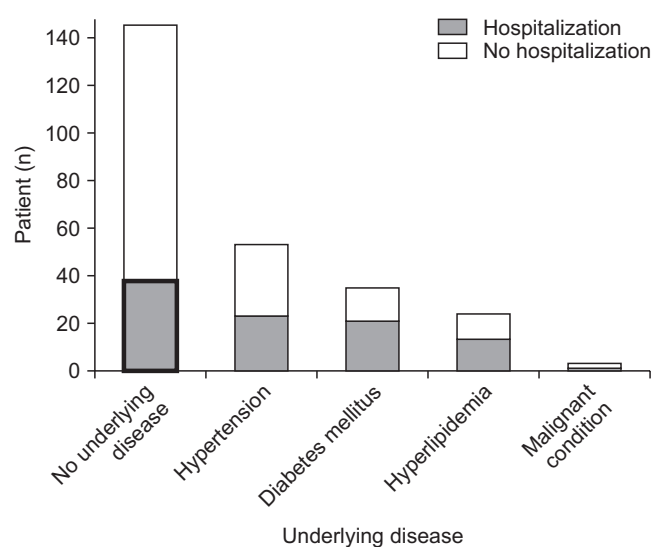


Fig. 1. Distribution of patients with inflammation – underlying disease.

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Moreover, 4 patients presented with emphysema following restorative treatments and implantation. One patient with a pathologic fracture underwent a wide odontogenic keratocyst enucleation 7 days prior and visited the ER after normal masticatory movement. A foreign body case was due to needle fracture during block anesthesia. An intoxicated patient had been treated for oral squamous cell carcinoma and had become pessimistic and attempted to commit suicide.

IV. Discussion

This retrospective study aimed to investigate the causes and characteristics of patients visiting the ER due to complications from dental treatment and to identify factors affecting the outcomes of emergency treatment. In this study, most patients presented with bleeding, followed by inflammation. This distribution differs from that of previous studies about ER patients⁴, where trauma was the most common cause of dental emergency visits, followed by acute toothache, odontogenic infection, and oral bleeding. The difference in our study may be due to our specific focus on patients with complications from prior dental treatment. Many of the patients with bleeding were managed solely with pressure hemostasis, and there was no significant correlation between the failure rate of pressure hemostasis and systemic diseases or medications use. In the inflammation group, one-third of patients ended up being hospitalized, and a significant correlation was observed between hospitalization and systemic disease.

In this study, among the 517 patients who visited the ER for bleeding control, 185 (34.3%) were taking antithrombotic medications. The authors compared the rate of bleeding reso-

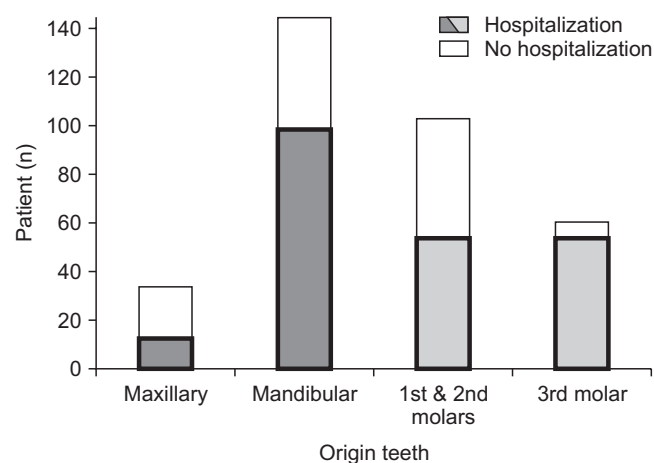


Fig. 2. Distribution of patients with inflammation – origin teeth.

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lution with pressure hemostasis alone between patients taking antithrombotic medications and those not taking medications, and no significant difference was observed. This suggests that the use of antithrombotic medications does not have a significant effect on bleeding control. However, since this study focused only on patients who visited the ER, it has limitations in assessing the overall impact of antithrombotic medications on postoperative bleeding. Additionally, due to the limitations of a retrospective study, it was difficult to assess the severity and persistence of bleeding. Therefore, the results may not be representative of the bleeding severity in patients on antithrombotic medication.

Numerous studies have been conducted on antithrombotic medications and postoperative bleeding⁵⁻⁸. In a study involving patients categorized into three groups (no medication, antiplatelets, and dual antiplatelet therapy), no significant association was observed between these medications and postoperative bleeding within three hours after dental surgery⁶. Similarly, in a study about aspirin, there was no significant relationship between aspirin and postoperative bleeding⁷. Moreover, investigations into anticoagulant use during minor dental procedures, such as implant surgeries and extractions, also reported no significant increase in postoperative bleeding⁸. Furthermore, several studies have recommended not discontinued medications for minor surgeries such as tooth extractions and implantations⁹⁻¹³. Sudden cessation of antithrombotic medications could increase the risk of potentially fatal thromboembolism⁹. Therefore, dentists should weigh the risks of hemorrhage against the risks of thromboembolism when making decisions regarding antithrombotic medications. In all cases, indiscriminate discontinuation of medication should be avoided. Instead of insisting on medication discontinuation, it is important to ensure complete hemostasis before discharging the patient, and while also educating patients on proper hemostasis knowledge. Additionally, informing patients about the necessity of medication for systemic diseases and the importance of tolerating minor bleeding is crucial. Such an education is expected to help reduce ER visits due to delayed bleeding. Among these considerations, the most important responsibility lies with the dentist in making appropriate judgments regarding the need for medication discontinuation and managing postoperative bleeding.

In the inflammation group, more than half of the patients with diabetes and HL required hospitalization. Notably, patients with diabetes were more likely to be hospitalized due to inflammation, consistent with previous studies¹⁴⁻¹⁷. Diabetes prolongs inflammatory responses and causes abnormalities

in postoperative recovery. In uncontrolled, insulin-dependent diabetes patients, healing can be delayed and the tendency for alveolar bone destruction can be increased¹⁴, resulting in a significantly increased length of hospitalization^{15,16}. In addition, the tendency for infections and inflammatory reactions such as flare-ups occurring after dental procedures has been reported^{14-16,18,19}. Considering these previous studies, it is clear that dental treatment in diabetic patients can increase the severity of inflammation and the likelihood of hospitalization compared to healthy individuals. On the other hand, there is limited research on HL and intraoral inflammation or abscess. Instead, research on the negative impact of HL on periodontal disease has been extensively conducted²⁰⁻²⁵. Based on these indirect findings, HL may also affect inflammatory responses to some extent. Furthermore, in this study, the majority of patients had both diabetes and HL. This may be due to the metabolic defects leading to HL in diabetic patients^{26,27}, and the combination of diabetes and HL may contribute to the exacerbation of inflammation. Additionally, the hospitalization rate of hypertensive patients in the inflammation group was statistically significant. Previous literature has revealed the interaction between inflammation and hypertension²⁷⁻²⁹. Their interaction appears to determine pathological changes in vascular biology, leading to increased blood pressure through mechanisms such as alterations in vascular tone regulation during innate and adaptive immune processes. There is also the possibility that vascular damage and subsequent ischemia could increase circulating levels of inflammatory molecules. Further research is needed to elucidate the pathophysiological mechanisms underlying this relationship.

This study determined that dental procedures involving mandibular teeth were the most common cause of inflammation, consistent with several studies indicating that mandibular teeth are much more prone to infection than maxillary teeth^{16,17,30-32}, especially following surgical removal of impacted mandibular third molars³⁰⁻³². This discrepancy in post-extraction complications between maxillary and mandibular teeth can be attributed to several factors. Greater saliva retention with microbial titer, which can dissolve the blood clot³⁰, or the difference in blood supply between the maxilla and mandible, may contribute to this variation in complication rates. Notably, the hospitalization rate was higher for procedures involving mandibular teeth. This can be largely attributed to the increased frequency of extraoral incision and drainage procedures in the mandibular region. The anatomical structure of the mandible and its associated teeth renders them more susceptible to the spread of infection into deeper

fascial spaces. This propensity for infection spread is particularly concerning as it can lead to life-threatening conditions, such as dyspnea. Consequently, dentists often recommend hospitalization following such procedures to ensure close monitoring and prompt intervention.

This study has limitations due to the retrospective nature, as it could not fully access the preoperative condition of the chief complaint site. This may have led to overlooked preoperative conditions, which are important factors influencing postoperative inflammation outcomes. Various aspects of this condition, such as depth of impaction of the third molar³¹ or pre-existing inflammation and its duration³², can significantly impact postoperative inflammatory complications. Furthermore, the study sample was limited to ER visits from a dental hospital, which may limit the diversity of the study population. These limitations suggest that the findings may not comprehensively reflect the conditions of all patients.

In conclusion, further prospective and multicenter studies with larger sample sizes are necessary for a better understanding of the factors influencing complications resulting from dental treatment.

V. Conclusion

In this study, we evaluated patients who visited the ER after dental treatment and analyzed the relationship between emergency treatment and its result with the characteristics of the patients. The majority of these patients presented with bleeding (68.4%), followed by inflammation (27.7%). The use of antithrombotic medication did not exhibit a significant influence on bleeding control. In the inflammation group, diabetes and HL patients had tendency for greater inflammation and required more frequent hospitalization. Due to our retrospective nature, additional prospective and multicenter studies are necessary better understand the factors influencing complications.

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Authors' Contributions

J.Y.H., J.R., and C.M. participated in data collection. J.Y.L.

designed the study. J.Y.H. performed statistical analysis, and wrote the manuscript. J.R. and C.M. helped to draft the manuscript. All authors have reviewed and approved the final manuscript.

Funding

No funding to declare.

Ethics Approval and Consent to Participate

This study was exempted from the Institutional Review Board (IRB) of Pusan National University Dental Hospital (No. PNUDH IRB 2024-08-018). The written informed consent was waived due to the retrospective nature of the study.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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How to cite this article: Hwang JY, Ryu J, Moon C, Lee JY. Retrospective analysis of characteristics of patients presenting to the emergency room following dental treatment. *J Korean Assoc Oral Maxillofac Surg* 2024;50:326-332. <https://doi.org/10.5125/jkaoms.2024.50.6.326>