

## Original Research

### Usage of aluminum chloride for hemostasis vs anesthetic solution in periapical surgery

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#### ABSTRACT:

**Background:** Apical surgery is a procedure performed to remove lesions around the apex of a tooth with the main aim of preserving it. Many factors can influence the outcome of periapical surgery. In this context, adequate bleeding control is essential for the success of periapical surgery, since it improves visualization of the surgical site, minimizes the operating time, and is a requirement for the insertion of most retrograde filling materials. It is known that an ideal hemostatic agent for endodontic microsurgery must have a quick hemostatic effect, must be easy to handle, should be biocompatible, and must not undermine natural bony crypt healing and the surrounding tissues. **Aim of the study:** To study usage of aluminum chloride for hemostasis in periapical surgery. **Materials and methods:** The study was conducted in the Department of Conservative Dentistry and Endodontics of the Dental institution. A total of 120 patients who underwent periapical surgery at the Department of Endodontics were included in the study. The patients were divided into two groups, Group A and Group B. For patients in group A, we used gauzes impregnated in anesthetic solution with vasoconstrictor. Whereas, for patients in group B, aluminum chloride was used for hemostasis. The pain scoring of the patients was done using horizontal visual analog scale (VAS), standardized to 100 mm. The observation for pain and swelling by the patients was recorded postoperatively at 2, 4, 6 and 12 hours, and every day for first 7 days after the surgical procedure. **Results:** We observed that pain in patients decreased considerably from 2 hours postoperatively to 7 days postoperatively in both groups. By the 7<sup>th</sup> day, the pain score for Group A was 0.2 and for Group B was 0.3. We observed that the swelling in patients increased postoperatively till 24 hours, however, started to clear up after that. By the 7<sup>th</sup> day, the VAS swelling score in Group A was 0.3 and in Group B was 0.8. **Conclusion:** Within the limitations of the present study, it can be concluded that anesthetic solution with vasoconstrictor and aluminum chloride are equally efficacious for hemostasis in periapical surgery. However, the postoperative swelling was more significantly observed in patients with aluminum chloride.

**Keywords:** Periapical surgery, aluminum chloride, hemostasis, postoperative pain

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#### INTRODUCTION:

Apical surgery is a procedure performed to remove lesions around the apex of a tooth with the main aim of preserving it. This surgery is recommended:

- (a) when radiological findings of apical pathology are detected,
- (b) when extruded material is observed in a tooth with clinical or radiological findings of apical periodontitis,

- (c) in persistent apical pathology when endodontic treatment is not possible and  
 (d) in root perforation impossible to treat through a coronal access.<sup>1</sup>

Many factors can influence the outcome of periapical surgery. In this context, adequate bleeding control is essential for the success of periapical surgery, since it improves visualization of the surgical site, minimizes the operating time, and is a requirement for the insertion of most retrograde filling materials.<sup>2, 3</sup> In order to achieve treatment success (periapical tissue healing), strict surgical steps must be followed: surgical exposure of the root-end, debridement of pathological tissue, root-end resection, retrograde cavity preparation, retrograde filling and verification of root integrity.<sup>4, 5</sup> Notwithstanding, the better the bleeding control, the better the visibility of the surgical field for satisfactory filling, favoring cement setting, and for corroborating possible root fractures. Several hemostatic agents / techniques has been introduced in endodontic surgery (e.g., bone wax, collagen membranes, aluminum chloride, ferric sulfate, epinephrine). It is known that an ideal hemostatic agent for endodontic microsurgery must have a quick hemostatic effect, must be easy to handle, should be biocompatible, and must not undermine natural bony crypt healing and the surrounding tissues.<sup>6</sup> Hence, the present study was conducted to study usage of aluminum chloride for hemostasis in periapical surgery.

#### MATERIALS AND METHODS:

The study was conducted in the Department of Conservative Dentistry and Endodontics of the Dental institution. The ethical clearance for study protocol was obtained from ethical committee of the institution. A total of 120 patients who underwent periapical surgery at the Department of Endodontics were included in the study. The retrograde cavity was prepared using ultrasonic instruments and was restored with MTA. The patients were divided into two groups, Group A and Group B. For patients in group A, we used gauzes

impregnated in anesthetic solution with vasoconstrictor. Whereas, for patients in group B, aluminum chloride was used for hemostasis. The surgical procedure for all the patients was done by the same operator. The same medication was prescribed in all cases during the postoperative period. A thorough clinical history, preoperative, intraoperative, and postoperative characteristics of the patients were recorded. The pain scoring of the patients was done using horizontal visual analog scale (VAS), standardized to 100 mm. The two poles of the scale were from “no discomfort” and “intense pain”. Similarly, swelling was recorded by patient with another VAS, which was divided into 10 equal segments depicting: 0 = absence of swelling; 1-3 = mild swelling, located within the mouth in the surgical zone; 4-6 = moderate swelling, located within the mouth and with mild swelling also outside the mouth; 7-9 = intense swelling outside the mouth in the surgical zone; and 10 = very intense extra oral swelling extending beyond the surgical zone. The observation for pain and swelling by the patients was recorded postoperatively at 2, 4, 6 and 12 hours, and every day for first 7 days after the surgical procedure.

The statistical analysis of the data was done using SPSS version 11.0 for windows. Chi-square and Student's t-test were used for checking the significance of the data. A p-value of 0.05 and lesser was defined to be statistically significant.

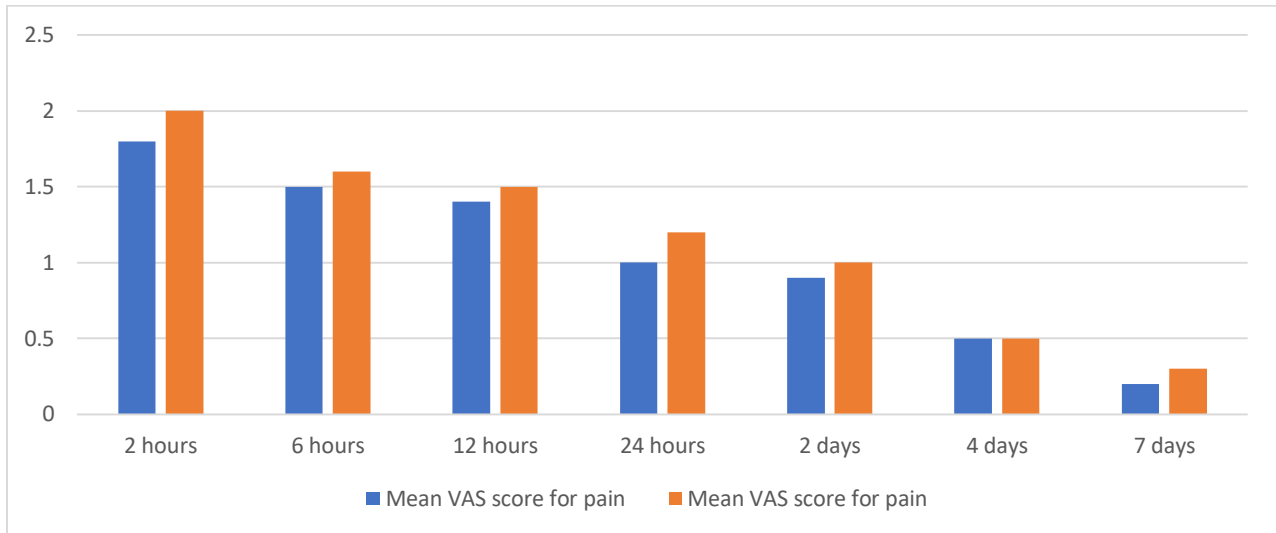
#### RESULTS:

Table 1 shows the mean VAS pain score. We observed that pain in patients decreased considerably from 2 hours postoperatively to 7 days postoperatively in both groups. By the 7<sup>th</sup> day, the pain score for Group A was 0.2 and for Group B was 0.3. The results on comparison were seen to be statistically non-significant. (Fig 1) Table 2 shows mean VAS swelling score. We observed that the swelling in patients increased postoperatively till 24 hours, however, started to clear up after that. By the 7<sup>th</sup> day, the VAS swelling score in Group A was 0.3 and in Group B was 0.8. The results were seen to be statistically significant. (Fig 2)

**Table 1: Mean VAS pain score for Group A and Group B**

Post-operative time	Mean VAS score for pain		P - value
	Group A	Group B	
2 hours	1.8	2	0.45
6 hours	1.5	1.6	
12 hours	1.4	1.5	
24 hours	1.0	1.2	
2 days	0.9	1.0	
4 days	0.5	0.5	
7 days	0.2	0.3	

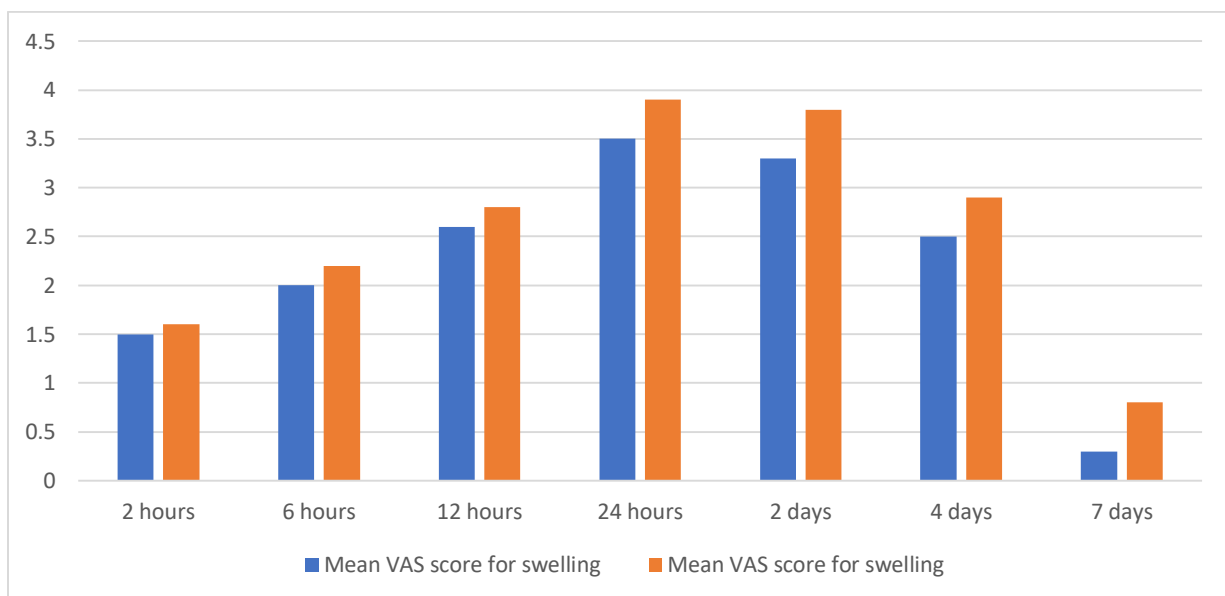
**Fig 1: Mean VAS pain score for Group A and Group B**



**Table 2: Mean VAS swelling score for Group A and Group B**

Post-operative time	Mean VAS score for swelling		P -value
	Group A	Group B	
2 hours	1.5	1.6	0.02
6 hours	2.0	2.2	
12 hours	2.6	2.8	
24 hours	3.5	3.9	
2 days	3.3	3.8	
4 days	2.5	2.9	
7 days	0.3	0.8	

**Fig 2: Mean VAS swelling score for Group A and Group B**



## DISCUSSION:

In the present study, we compared anesthetic solution with vasoconstrictor and aluminum chloride for hemostasis in periapical surgery. A total of 100 patients were included in the study and were grouped into two groups. We observed that post operative pain was similar in both the patients up to 7 days. However, post operative swelling was more significant in patients for whom aluminum chloride was used. The results on comparison were seen to be statistically significant for post-operative swelling. The results of the present study were compared with previous studies and were found to be consistent. Peñarrocha-Diago M et al evaluated the effects of different hemostatic agents upon the outcome of periapical surgery. They included patients with a minimum follow-up of 12 months, divided into two groups according to the hemostatic agent used: A) dressings impregnated in anesthetic solution with adrenalin; or B) aluminum chloride paste (Expasyl™). A total of 96 patients (42 males and 54 females) with a mean age of 40.7 years were included. No significant differences were observed between the two groups in terms of outcome after 12 months - the success rate being 58.6% and 61.7% in the anesthetic solution with vasoconstrictor and aluminum chloride groups, respectively. They concluded that the outcome after 12 months of follow-up was better in the aluminum chloride group than in the anesthetic solution with vasoconstrictor group, though the difference was not significant.<sup>7</sup> Clé-Ovejero A et al studied most effective and safest haemostatic agents to control bleeding in patients undergoing apical surgery. They report that the agents that proved more effective in bleeding control were calcium sulphate (100%) and collagen plus epinephrine (92.9%) followed by ferric sulphate (60%), gauze packing (30%) and collagen (16.7%). When using aluminium chloride (Expasyl®), over 90% of the apical lesions improved, but this agent seemed to increase swelling. Epinephrine with collagen did not significantly raise either blood pressure or heart rate.<sup>8</sup> Peñarrocha-Oltra D et al compared the efficacy of two hemostatic techniques in controlling bleeding in endodontic surgery. A randomized two-arm pilot study involving 30 patients with peri-radicular lesions in maxillary molars (first and second molars) was carried out including the following hemostatic agents: polytetrafluoroethylene (PTFE) strips as an adjunct to epinephrine impregnated gauze (test group; n = 15) and aluminum chloride (Expasyl™) (control; n = 15). Bleeding control was similar in both groups. Simple binary logistic regression analysis failed to identify variables affecting bleeding control. Only the height of the keratinized mucosal band suggested a decreased risk of inadequate bleeding control of up to 89%. They concluded that no difference in the efficacy of bleeding control was observed between PTFE strips as an adjunct

to epinephrine impregnated gauze and aluminum chloride in maxillary molars.<sup>9</sup> Peñarrocha-Diago M et al assessed pain and swelling in the first 7 days after periapical surgery and their relationship with the agent used for bleeding control. The subjects were divided into two groups according to the hemostatic agent used: A) gauze impregnated with anesthetic solution with vasoconstrictor; or B) aluminum chloride. Pain was reported to be most intense two hours after surgery. At this point 52.6% of the patients had no pain. Seventy-five percent of the patients consumed analgesics in the first 24 hours. There were no significant differences between the two groups in terms of the intensity of pain or in the consumption of analgesics. Swelling reached its maximum peak on the second day; at this point, 60.6% of the patients suffered mild or moderate swelling. The Expasyl™ group showed significantly greater swelling than the gauzes group. They concluded that the type of hemostatic agent used did not influence either the degree of pain or the need for analgesia among the patients. However, the patients belonging to the Expasyl™ group suffered greater swelling than the patients treated with gauzes impregnated with anesthetic solution with vasoconstrictor.<sup>10</sup> Mohammadi N et al evaluated the effect of the aluminum chloride hemostatic agent on the gingival margin microleakage of class V (CI V) composite resin restorations bonded with all-in-one adhesive. The teeth were randomly divided into two groups of 30. In group 1, the cavities were restored without the application of a hemostatic agent; in group 2, the cavities were restored after the application of the hemostatic agent. A statistically significant difference was observed in microleakage between the two groups. They concluded that contamination of CI V composite resin restorations bonded with all-in-one adhesive with aluminum chloride hemostatic agent significantly increases restoration gingival margin microleakage.<sup>11</sup>

## CONCLUSION:

Within the limitations of the present study, it can be concluded that anesthetic solution with vasoconstrictor and aluminum chloride are equally efficacious for hemostasis in periapical surgery. However, the postoperative swelling was more significantly observed in patients with aluminum chloride.

## REFERENCES:

1. European Society of Endodontology. Quality guidelines for endodontic treatment: consensus report of the European Society of Endodontology. *Int Endod J.* 2006;39:921–30.
2. Witherspoon DE, Gutmann JL. Haemostasis in periradicular surgery. *Int Endod J.* 1996;29:135–49.
3. Kim S, Rethnam S. Hemostasis in endodontic microsurgery. *Dent Clin North Am.* 1997;41:499–511.

4. Rigolone M, Pasqualini D, Bianchi L, Berutti E, Bianchi SD. Vestibular surgical access to the palatine root of the superior first molar: "low-dose cone-beam" CT analysis of the pathway and its anatomic variations. *J Endod.* 2003;29:773–5.
5. von Arx T, Walker WA. Microsurgical instruments for root-end cavity preparation following apicoectomy: A literature review. *Endod Dent Traumatol.* 2000;16:47–62.
6. Kim S, Rethnam S. Hemostasis in endodontic microsurgery. *Dent Clin North Am.* 1997;41:499–511.
7. Peñarrocha-Diago M, Maestre-Ferrín L, Peñarrocha-Oltra D, von Arx T, Peñarrocha-Diago M. Influence of hemostatic agents upon the outcome of periapical surgery: dressings with anesthetic and vasoconstrictor or aluminum chloride. *Med Oral Patol Oral Cir Bucal.* 2013;18(2):e272-e278. Published 2013 Mar 1. doi:10.4317/medoral.18002
8. Clé-Ovejero A, Valmaseda-Castellón E. Haemostatic agents in apical surgery. A systematic review. *Med Oral Patol Oral Cir Bucal.* 2016;21(5):e652-e657. Published 2016 Sep 1. doi:10.4317/medoral.21109
9. Peñarrocha-Oltra D, Soto-Peñaloza D, Peñarrocha-Diago M, Cervera-Ballester J, Cabanes-Gumbau G, Peñarrocha-Diago M. Hemostatic agents in endodontic surgery of maxillary molars: A randomized controlled pilot study of polytetrafluoroethylene (PTFE) strips as an adjunct to epinephrine impregnated gauze versus aluminum chloride. *Med Oral Patol Oral Cir Bucal.* 2020;25(5):e634-e643. Published 2020 Sep 1. doi:10.4317/medoral.23652
10. Peñarrocha-Diago M, Maestre-Ferrín L, Peñarrocha-Oltra D, Gay-Escoda C, von-Arx T, Peñarrocha-Diago M. Pain and swelling after periapical surgery related to the hemostatic agent used: anesthetic solution with vasoconstrictor or aluminum chloride. *Med Oral Patol Oral Cir Bucal.* 2012;17(4):e594-e600. Published 2012 Jul 1. doi:10.4317/medoral.17782
11. Mohammadi N, Kimyai S, Bahari M, Pournaghi-Azar F, Mozafari A. Effect of aluminum chloride hemostatic agent on microleakage of class V composite resin restorations bonded with all-in-one adhesive. *Med Oral Patol Oral Cir Bucal.* 2012;17(5):e841-e844. Published 2012 Sep 1. doi:10.4317/medoral.17683