

Management of infected root canals with and without intracanal medicament in conventional root canal therapy: A comparative study

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ABSTRACT

Background: The ultimate goal of root canal treatment approaches is to create an environment in which the body's immune system can produce healing of the apical periodontal attachment apparatus. Thorough debridement and shaping are carried out of root canal system along with using intracanal medicament in adjunct to it. But the use of intracanal medicaments is still debatable. Hence, the aim of this study is to determine the success of root canal without use of intracanal medication.

Method: 61 cases of endodontically involved infected teeth were studied. 31 of them were treated by conventional root canal treatment without using intracanal medicaments (non-ICM group) and 30 were treated with intracanal medicament (ICM group). At 6 and 12 months after treatment, clinical signs with or without periapical radiograph were recorded for success and failures.

Results: 87.11% was the success in Non-ICM group (n=31), whereas 90% was the success in ICM group (n=30). Statistical analysis with Chi square tests and Fischer's exact tests showed that the success is not significant between the groups (p>0.05).

Conclusion: Non ICM group presented no significant differences in clinical and radiological findings in comparison to ICM groups.

Keywords: calcium hydroxide, cleaning and shaping, healing, intracanal medicament

INTRODUCTION

The microbial ecosystems in an infected root canal have been directly linked to both acute and chronic inflammation. The goal of clinical treatment is to completely disrupt and destroy the bacteria involved in the endodontic infection. Pulp and periapical pathosis are basically a reaction to bacteria and bacterial products. A number of studies supported this view that pulpal and/or periapical tissue pathosis don't develop without the presence of bacterial contamination.^{1,2,3} This can be a direct response to caries, microleakage of bacteria around fillings and crowns or bacterial contamination after trauma, either physical or iatrogenic.⁴

Cleaning and shaping of canal and use of canal medicament as an adjunct are needed for debridement and shaping of the canal. Most of the indications for intracanal medicaments are questionable, and should not be used as an alternative to thorough cleaning and adequate shaping of the root canal.⁵ The use of intracanal medicaments is still debatable. Thus, the purpose of this study was to compare the endodontically involved infected tooth treated by conventional root canal therapy after proper cleaning and shaping without using intracanal medicaments or using Ca(OH)₂ as intracanal medicaments.

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MATERIALS AND METHODS

This was a prospective comparative study carried out in the department of Conservative Dentistry and Endodontics, Peoples Dental College and Hospital, Kathmandu. 61 patients with infected tooth irrespective of age, sex and tooth numbers were studied. All patients included had pain, carious tooth, intraoral swelling, involved teeth were tender to percussion. Patients with irreversible pulpitis without swelling were excluded from the study. At the recall appointments, the following clinical findings were recorded: pain, presence of a swelling, presence of a fistula, and tenderness to axial percussion. Out of 61 patient, 51 cases had radiological evidence of periradicular rarefaction. Conventional root canal treatment with the use of hand files was done in all of the teeth. 31 of them were treated without using intracanal medicaments (non-ICM group) and 30 were treated with intracanal medicament (ICM group). Calcium hydroxide remained in the root canal system for a week to a month.

Radiographic examination was performed using the long-cone technique (Philips, Oralix) with the use of Rinn (Dentsply) film holder.⁶ The same X-ray unit operated by the same x-ray technician was used for all examinations and the radiographs were processed manually following the recommendations of the manufacturer. With apical radiolucencies, the size of each lesion, which was categorized into ≥ 5 mm and ≤ 5 mm, was calculated by taking the average of the lesion's largest dimension and its extent in the direction perpendicular to the largest dimension.⁷ At the follow-up, the preoperative diagnostic radiograph with that of the follow-up was compared.

The basis for evaluating the outcome of the endodontic therapy was the criteria for success or failure. The criteria for success or failure were the following:⁸

1. Complete healing (= success):

- No clinical signs and symptoms (asymptomatic) and
- Radiographically a periodontal ligament space of normal width

2. No healing (= failure):

- Clinical signs and symptoms (symptomatic) indicating an acute phase of apical periodontitis and/or
- Radiographically a persisting lesion in a follow-up time and/or
- A new lesion formed at an initially uninvolved root

The radiograph was precalibrated using reference radiographs representing the four categories of radiographic healing pattern:⁹

1. Complete (disappear) – a normal periodontal ligament space
2. Incomplete (reduced) – a reduction in size of the lesion, but no return to normal periodontal ligament space width
3. Uncertain (no change) – radiographically impossible to make definitive decision on status of postoperative healing or remained at the same size
4. Failure – a previously existing periapical lesion had increased or a previously normal periodontal ligament space had increased in width or developed into a radiolucent area

Data were compiled after a follow up period of 6 and 12 months. Differences between treatment results for groups of cases with different clinical or radiographic signs were evaluated statistically using chi-square and Fischer's exact tests, at the 5% level of significance ($p \leq 0.05$), using statistics software SPSS v16. The relationship of the treatment results to the presence or absence of clinical and radiographic signs was determined for groups of cases in which the treatment results were less than ideal.

RESULTS

61 cases of endodontically involved infected teeth characterized clinically by pain, presence of swelling, tender to percussion and presence of discharging sinus were studied irrespective of age, sex & number of teeth. 51 cases had radiolucency of whom 36 has radiolucent area ≤ 5 mm diameter (Table I).

31 teeth were treated without using intracanal medicament (non-ICM) and 30 teeth were with medicaments. 6 and 12 months after treatment,

80.64 % and 90.32 % of teeth were asymptomatic in non ICM group; and 86.66 % and 93.33 % of teeth were asymptomatic in ICM group. Radiological evaluation after 6 and 12 months showed complete resolution (disappearance of radiouency) of 20% and 72% respectively in non-ICM group; and 15.38% and 69.23% respectively in ICM group. Radiographically, the success was considered 84% and 88.46% in Non-ICM group and ICM group respectively. No significant difference was found in out-come in clinical and radiological finding when compared with ICM group ($p>0.05$) (Table II, III, IV, V)

Table I: Diameter of pre-operative periapical radiolucency

Diameter of the area	ICM	Non ICM
≤5 mm	17 (68%)	19 (73.07%)
≥5 mm	8 (32%)	7 (26.93%)

Table II: Post-operative clinical findings at 6 months (n=61)

Clinical finding at follow-up	Non-ICM (n=31)	ICM (n=30)	p value
Asymptomatic	25 (80.64%)	26 (86.66%)	p>0.05 NS
Symptomatic	06 (19.36%)	04 (13.34%)	
Pain	05 (20.00%)	02 (6.67%)	
Percussion pain	02 (6.45%)	02 (6.67%)	
Swelling	00 (00%)	01 (3.33%)	
Discharging sinus	01 (3.23%)	01 (3.33%)	

($\chi^2 = 2.278, p = 0.56, \phi = -0.03$)

Table III: Post-operative clinical findings at 12 months (n=61)

Clinical finding at follow-up	Non ICM (n=31)	ICM (n=30)	p value
Asymptomatic	28 (90.32%)	28 (93.33%)	p>0.05 NS
Symptomatic	03 (9.68%)	02 (6.67%)	
Pain	03 (12.90%)	02 (6.67%)	
Percussion pain	02 (6.45%)	02 (6.67%)	
Swelling	01 (3.23%)	01 (3.33%)	
Discharging sinus	01 (3.23%)	01 (3.33%)	

($\chi^2 = 0.185, p = 0.86, \phi = -0.03$)

Table IV: Radiological evaluation of periapical radiolucency (n=51)

Periapical radiolucency follow-up finding	Non ICM (n=25)		ICM (n=26)		p value
	No.	%	No.	%	
At 6 months					p>0.05 NS
No change	04	16%	04	15.38%	
Reduced size	15	60%	17	65.38%	
Increased size	01	4%	01	3.84%	
Disappeared	5	20%	4	15.38%	
At 12 months					p>0.05 NS
No change	03	12%	02	7.69%	
Reduced size	03	12%	05	19.23%	
Increased size	01	4%	01	3.84%	
Disappeared	18	72%	18	69.23%	

($\chi^2 = 0.226, p = 0.81, \phi = -0.03$; and $\chi^2 = 0.588, p = 0.72$)

Table V: Radiographic outcome of the study

Group	success	doubtful	failure	P value
Non - ICM (n=25)	21 (84.00%)	3 (14.28%)	1 (4.00%)	P > 0.05 NS
ICM (n=26)	23 (88.46%)	2 (7.69%)	1 (3.84%)	
Total (n=51)	44 (86.27%)	5 (9.80%)	2 (3.92%)	

($\chi^2 = 0.488, p=0.65$)

DISCUSSION

Endodontic treatment is a valid alternative treatment to extraction. It is always a great desire for patient to retain their natural teeth and endodontist are becoming more successful in RCT procedure. It has been shown by many author that toxic intracanal medicaments hamper periapical healing and even destroy the periapical tissue.^{10,11} So, if infected root canals are effectively treated without intracanal medicament, only by proper cleaning and shaping ensures the management of infected teeth. In this study, endodontically involved infected teeth with or without periradicular pathosis were managed by conventional RCT.

Although individual rate of effectiveness of both the therapeutic procedures (Non ICM and ICM) have been reported by many studies,^{8, 12-14} there is lack of published literature of comparison of the success rate of two treatment procedures. This study shows the comparative result of Non ICM and ICM procedure. The result shows that non ICM procedure is a valid procedure with good prognosis in comparison to ICM procedure. The result of this study is similar to that of Temple University study,¹⁵ which shows a success rate 93% in infected root canal.

The lower success rate or sustain of the clinical sign was found more in under-filled roots, which may be due to the inability to debride the apical segment of the canal or to the accumulation of infected dentin chips which may harbor persistent infections at the root apex.¹⁶ In this study, no such under-filling or under-preparation of the canal occurred in any of the case. Care has been taken care of extrusion of infectious tissue or dentin to the periradicular tissue; and no interappointment emergency were encountered in any of the case. Where calcium hydroxide as antimicrobial medicament was placed in the canal, it was kept in the root canal for at least 7 days and changed again. It is stated that after this time, calcium hydroxide achieved an optimal antibacterial effect under clinical conditions.⁸

The basis for the criteria for a successful root canal treatment⁸ had been followed. Accordingly, in the present investigation, 28 out of 31 teeth could be judged as a success in non-ICM and 28 out of 30 in ICM. 3 patients of non-ICM group and 2 patients of ICM group, at 6 and 12 months follow-up, were confused of pain symptom. They stated that the tooth felt different. As radiographically no evidence of rarefaction was seen, these were taken as success. Teeth with no new lesions formed on roots that were originally free of periapical disease radiographically were also counted as success.

It has been shown that the prognosis for treatment of large periapical lesions is not as good as that for small lesions.⁷ Strindberg¹⁷ found no significant differences in healing

frequency between lesions initially larger than 5 mm and those smaller than 5 mm. Sjogren et al.⁷ found that preoperative size of the lesions had no influence on the outcome of treatment. Though, our results are in accordance with Sjogren et al., distinctive study on the effect of the size of periapical lesion evident radiographically on the success of therapy has not been conducted. The final follow-up was made 7 to 9 years after completion of endodontic treatment in studies of Strindberg and Sjogren et al. we found the promising result in 12 months follow-up period. Concerns those teeth associated with 'incomplete healing (reduced size)' whose observation times did not reach 4 years, making a definite decision on success or failure impossible. The worst-case situation would assume that all teeth categorized as 'incomplete healing' would result in a failure after 4 years. A real case situation would assume that the majority of the lesions that decreased in size radiographically will completely resolve within 4 years.^{8,9} Although a 4-year review period is regarded as the gold standard for assessing the long-term outcome of endodontic treatment, the majority of periapical lesions are likely to be healed within 12-month time period.⁹ The size of the radiographic lesion was calculated as is done by Sjogren et al.⁷ Moreover, the same X-ray unit operated by the same x-ray technician along with the Rinn film folder was used for all radiographs, the geometric distortion by the two-dimensional nature of the images of conventional radiographs would not have been accounted much as this study compared the radiographs taken over the time period.

CONCLUSION

Use of intracanal medicament in infected root canal is widely accepted. But proper cleaning and shaping of the canal predicts the success in therapy. Clinically, in this study the success of root canal therapy in patients treated without intracanal medicament was 90.32%; and in those treated with intracanal medicament was 93.33%. In the presence of radiological rarefaction, the

success was 84% and 88.46% in patient treated without intracanal medicament and with intracanal medicament respectively. It can be concluded that it is the cleaning and shaping of the canal which decide the success rate of root canal treatment of infected teeth, not the use or nonuse of intracanal medicament.

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