ORIGINAL RESEARCH

Surgical and Non-surgical Intervention for the Management of Radicular Cyst - A Comparative Study

Lin Jacob Varghese[1], Ajay Kumar Haridas[2], M Mubasheer[3], Shijo Dany Kurian[4], Odiyil Padikadan Naveen[5], Celestina Dawn Peter[6]

ABSTRACT

Background: Periapical cyst is slow-growing cysts and usually asymptomatic until they are secondarily infected. The choice of treatment may be determined by factors such as the lesion extension, relation with noble structures, origin, and clinical characteristics, cooperation, and patient's systemic condition. Hence, the present study was conducted to assess the surgical and non-surgical intervention for the management of radicular cyst.

Materials and Methods: A total of 28 cases of progressively increasing swelling in the anterior region were included in the study, of which 20 being males and 8 females. Radicular cyst was confirmed by clinical examination and radiograph for the entire patients. The total group was divided equally into non-surgical and surgical intervention groups. Independent sample *t*-test and Chi-square test were performed for analysis.

Results: At 1st and 6th months, the mean radiographic lesion of non-surgical group was 1.80 ± 0.31 and 0.67 ± 0.27 and surgical group was 1.55 ± 0.24 and 0.37 ± 0.29. The p values were $P < 0.027$ and $P < 0.013$ between two groups which were statistically significant. Satisfaction level did not show much significance where 11 patients in the surgical group were very satisfied after 1 month and both the groups were very satisfied after 6 months. In the surgical group, the number of patients with severe pain was slightly more but pain significantly reduced in surgical group compared to non-surgical group after the 1st month.

Conclusion: Combination methods such as the root canal and decompression yield better result in radicular cyst with non-vital pulp.

Keywords: Decompression, Healing, Radicular cyst, Root canal treatment.

How to cite this article: Varghese LJ, Haridas AK, Mubasheer M, Kurian SD, Naveen OP, Peter CD. Surgical and Non-surgical Intervention for the Management of Radicular Cyst - A Comparative Study. Int J Oral Care Res 2018;6(2):8-12.

Source of support: Nil

Conflict of interest: None

[1,6]Reader, [2]Professor and Head, [3-5]Senior Lecturer

[1-4]Department of Oral and Maxillofacial Surgery, Educare Institute of Dental Science, Malappuram, Kerala, India

[5]Department of Oral and Maxillofacial Surgery, Malabar Dental College, Edappal, Kerala, India

[6]Department of Oral Pathology, Educare Institute of Dental Science, Malappuram, Kerala, India

Corresponding Author: Dr. Lin Jacob Varghese, Reader, Department of Oral and Maxillofacial Surgery, Educare Institute of Dental Science, Chattiparamba, Malappuram – 676 504, Kerala, India. e-mail: linjacobvarghese@gmail.com

INTRODUCTION

Following the death of the dental pulp, epithelial residues (cell rests of Malassez) in the periodontal ligament generate as a consequence of inflammation and a cyst is formed called as radicular cyst. These are the most common odontogenic cystic lesions of inflammatory origin which affect the jaws. The most common location is at the apices of the involved teeth; the lateral aspects of the roots in relation to lateral accessory root canals can also be involved.[1]

Periapical cyst is slow-growing cysts and is usually asymptomatic until they are secondarily infected. A debate still exists over its management even though it represents 40–50% of all apical lesions.[2] Few authors have reported that if the intraradicular infection is eliminated through non-surgical endodontic treatment.[3] The immune system itself can promote repair of such lesion, while others suggest that surgical intervention is compulsory.[4]

Clinical studies show that the proportion of the radicular cysts increases as the periapical lesions increase in size. However, few large lesions have shown to be granulomas.[5] Only a histological examination can give the definitive diagnosis of a cyst. However, the following helps to make a preliminary clinical diagnosis of a periapical cyst: (a) One or more non-vital teeth is involved with the periapical lesion, (b) the size of the lesion >200 mm^2, (c) radiographically the lesion is a circumscribed, well-defined radiolucent area which is bound by a thin radiopaque line, and (d) on aspiration or drained through an accessed root canal system, it produces a straw-colored fluid.[6]

The novel method of treating periapical cysts is a combination of chemomechanical preparation of root canal with repeated long-term intracanal dressing and intracanal medication with ca(OH)2 and iodoform (Metapex).[7]

There is a chance for inadvertent undesirable consequences when surgical curettage is done in case of very

extensive lesions, and hence, marsupialization or tube decompression methods are indicated. Without periapical curettage, large periapical lesions are reduced by a surgical decompression procedure called marsupialization. Healing by osseous regeneration is favored by decompression as it allows continuous drainage from periapical lesion eliminating conditions leading to expansion of periapical pathosis.[8] Therefore, this paper studies about the management of large radicular cyst with two interventions.

MATERIALS AND METHODS

Patient Selection

Progressively increasing huge swelling between the age groups of 18- and 40-year-old has been included in the study. A total of 28 cases were selected for the study, of which 20 were males and 8 were females. Clinical examination and the radiograph were done for the entire patient to confirm the presence of radicular cyst. Written consent was obtained from all the patients.

28 cases were divided equally and grouped into non-surgical and surgical intervention groups.

Non-surgical Management

The canal irrigated with 2.5% sodium hypochlorite after the caries part was removed. K-file, 30 number instrument introduced beyond the radiographic apex. At this moment, through the root canal, an abundant serum, purulent, and hemorrhagic exudates flowed. The canal was dried with paper points after the exudates stopped. The whole canal in the periapical region was filled with preformed radiopaque calcium hydroxide paste (Metapex) following which a radiograph was done.

Using the lateral condensation technique, the root canal was obturated with gutta-percha cones (Dentsply India) and zinc oxide eugenol (Dentsply India) after 1 month then a definitive restoration was placed. After 6 months, the patients were recalled for the clinical and radiographic evaluation. Radiographs were taken at baseline, 1st month, and 6 months to evaluate the periradicular healing.

Surgical Management

Local anesthesia was given using lignocaine with 2% adrenaline. Following procedures such as opening the access, pulp extirpation, determination of working length, cleaning, and shaping were done. Intracanal medicament calcium hydroxide was given for a week and later obturated.

No. 15 BP blade was used in the surgery in the present study to give vertical incision at the mucoperiosteum between root eminences. To remove granulation tissues, irrigation of the surgical site with saline and deep curettage was done. To stabilize the drain on either side, two interrupted sutures were placed. For irrigation with normal saline and to remove sutures, the patient was recalled after 48 h. The patient was asked to self-irrigate the lesion with normal saline and needle after removing the cannula.

After 1 month, the drain was removed and patients were advised to continue to irrigate the aperture. Radiographs were taken at baseline, 1st month, and 6 months to evaluate the periradicular healing.

Statistical Analysis

Independent sample *t*-test and Chi-square test analysis were performeed in SPSS version 20 software**.** When $P \leq 0.05$, results were considered statistically significant.

RESULTS

In Table 1, the comparison between the treatment groups and radiographic lesion at the baseline is shown. Both groups showed almost the same values in the mean radiographic lesion (non-surgical - 2.28 ± 0.43 and surgical - 2.20 ± 0.36). Moreover, no significant difference between the groups was found ($P > 0.608$).

The comparison between the treatment groups and radiographic lesion after 1st and 6th months is shown in Tables 2 and 3. There was a statistically significant difference in the mean radiographic lesion between the non-surgical group (1.80 ± 0.31 and 0.67 ± 0.27) and

Table 1: Comparison between the treatment groups and radiographic lesion at the baseline

Treatment	*n*	Mean	SD	SEM	*P* value
Non surgical	14	2.28	0.430	0.115	0.608
Surgical	14	2.20	0.368	0.098	

SD: Standard deviation, SEM: Standard error of the mean

Table 2: Comparison between the treatment groups and radiographic lesion after 1 month

Treatment	*n*	Mean (R lesion in mm)	SD	SEM	*P*
Non surgical	14	1.800	0.3162	0.0845	0.027*
Surgical	14	1.550	0.2442	0.0653	

SD: Standard deviation, SEM: Standard error of the mean

Table 3: Comparison between the treatment groups and radiographic lesion after 6 months

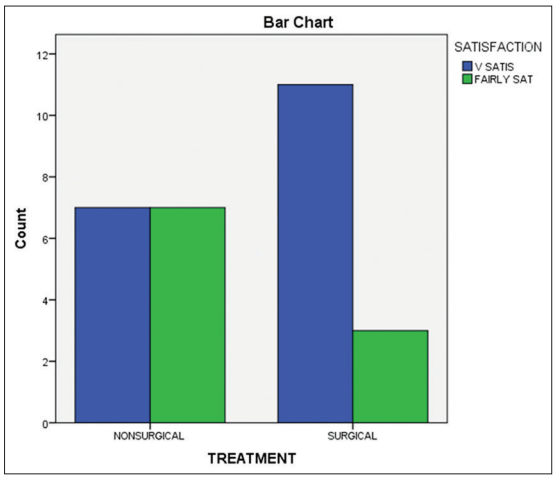
Treatment	*n*	Mean	SD	SEM	*P* value
Non surgical	14	0.671	0.278	0.074	0.013*
Surgical	14	0.379	0.299	0.080	

SD: Standard deviation, SEM: Standard error of the mean

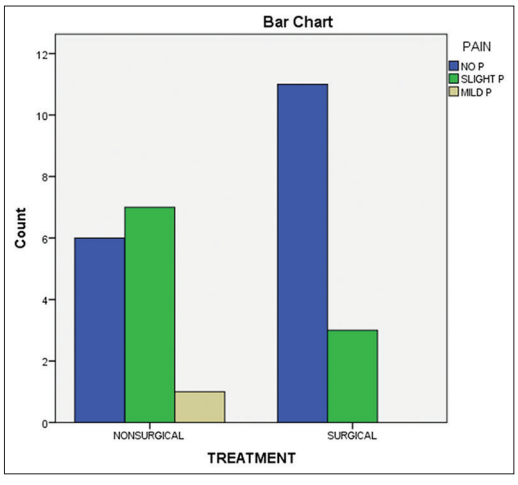
surgical group (1.55 ± 0.24 and 0.37± 0.29), $P < 0.027$ and $P < 0.013$, respectively.

Table 4 and Graph 1 depict the satisfaction grade where the majority (11 patients) of the patients in the surgical group were very satisfied after 1 month, and after 6 months, both the groups were very satisfied, but it failed to show not any significance.

There was more number of patients having severe pain in the surgical group which is depicted in Table 5 and Graph 2 but pain significantly reduced in surgical group when compared to non-surgical group after 1st month.



Graph 1: Satisfaction evaluation after non-surgical and surgical intervention



Graph 2: Pain evaluation after non-surgical and surgical intervention

DISCUSSION

There is a dilemma between surgical and non-surgical intervention for the management of a radicular cyst. Moreover, there are no much studies to compare the surgical and non-surgical management of radicular cyst. There are two distinct identities in radicular cyst, which is the True cyst and the Pocket cyst[9] where the latter is more common and is also epithelium-lined cavity which opens to the root canal space of the affected tooth and the periapex communicates with the infected root canal space. Thus, it has been accepted as the first line of treatment to remove the etiological agent from root canal system through non-surgical method which helps to creates a favorable environment for repair of the lesion.[10]

In this study, at 1st month and 6th month, the mean radiographic lesion of non-surgical group was 1.80 ± 0.31 and 0.67± 0.27 and surgical group was 1.55 ± 0.24 and 0.37 ± 0.29. These results showed similarity to the Nobuhara and del Rio,[11] as reported by Nair *et al.*[12] Nonmicrobial etiological factors such as true cystic lesions, extraradicular infection, presence of foreign bodies, and endogenous cholesterol crystals must be taken into consideration and surgically treated.

Surgical intervention becomes unnecessary as decompression procedure reduces the size of the lesion,

Table 4: Comparison of patient's satisfaction between the groups at different intervals

Group and duration	Satisfaction grade	Very satisfied	Fairly satisfied	*P* value
1 month	Non surgical (*n*=14)	7	7	0.1
	Surgical (*n*=14)	11	3	
6 months	Non surgical (*n*=14)	11	3	0.6
	Surgical (*n*=14)	12	2	

Table 5: Comparison of patient's pain between the groups at different intervals

Group and duration	Pain	No pain	Slight pain	Mild pain	Severe pain	Very severe pain	*P* value
Baseline	Non surgical (*n*=14)	0	0	1	10	3	0.5
	Surgical (*n*=14)	0	0	0	11	3	
1 month	Non surgical (*n*=14)	6	7	1	0	0	0.04*
	Surgical (*n*=14)	13	1	0	0	0	
6 months	Non surgical (*n*=14)	11	3	0	0	0	0.13
	Surgical (*n*=14)	13	1	0	0	0	

or if necessary, it will be limited to the surrounding periradicular tissues of involved teeth. The decompression procedure eliminates internal osmotic pressure differential by disrupting the integrity of lesion wall and thus helps healing by osseous regeneration.[13]

The choice of treatment may be determined by factors such as the lesion extension, relation with noble structures, origin, and clinical characteristics, and cooperation and patient's systemic condition determine the choice of treatment. Many professionals do endodontic therapy for these cysts as a conservative method, but the treatment is still under discussion. Combination of endodontic treatment, decompression, or marsupialization or even enucleation of the cyst is necessary for the treatment in large lesions.[14]

Venugopal *et al.*[15] found a significant difference in the healing of periapical lesions following surgical retreatment at 12 months but reduced to almost no difference between the surgical and non-surgical groups by 48 months. Disadvantages of surgical management are damage to vital structures, scar formation, and unpleasant experience to the patient. However, surgical intervention remains the last option when patient is not responding to non-surgical endodontic therapy.

When periapical radiographs are taken for non-vital teeth, a radicular cyst can be discovered, and the patients usually have no complaints unless infected. However, when they have, they give a history of slowly enlarging swellings. The covering bone becomes very thin as the cyst increases in size though initially it remains hard. "Springiness" or "eggshell crackling" is found later as the fragile outer cortical bone cracks. When it completely erodes the bone, it will become fluctuant.[16]

Few studies reported that radicular cysts and apical granulomas are not easily distinguishable radiographically. The size of the lesion does not help in diagnosis unless the radiographic lesion is 2 cm in diameter or larger. Radiographic density is useful to differentiate between radicular cysts and periapical granulomas. Radiographically, radicular cyst is round or ovoid radiolucent but has a well-demarcated radiopaque margin. The radiopaque margin is absent in infected and rapidly enlarging cysts. The floor of the maxillary sinus may be displaced if the cyst involves sinus. When compared to the sinus cavity, cyst's internal structure is homogeneous and radiopaque. Grossly, radicular cysts have cholesterol crystals which appear as a soft brown or yellow cheesy. Lining of radicular cysts is non-keratinized stratified squamous epithelium.[17]

To reduce bacteria beyond the levels obtained with mechanical preparation (areas that are unreachable by instruments or irrigation solutions, such as dentinal tubules and ramifications), root canal dressings between sessions in root canal treatment of teeth with chronic periapical lesions play an important role.[18] Leonardo *et al.*,[19] in their study, found that calcium hydroxide with its hygroscopic properties reduces exudates, and they also stated that at least 2 weeks are necessary for calcium hydroxide bactericidal activity after analyzing the pH and the concentration of calcium ions in the periapical area.

Long-term observation time is important in treated teeth with periapical lesions as opined by various authors.[20,21] To assess the healing of periapical lesions, Shah suggested to recall patients at intervals of 3 months, 6 months, 1 year, and 2 years. Follow-up is extremely essential for a period of at least 2 years as quiescent epithelial cells may be stimulated by instrumentation in the apical region, resulting in proliferation and cyst formation.[22]

CONCLUSION

This study concluded that combined root canal and decompression method proved the better result in radicular cyst with non-vital pulp.

REFERENCES

1. Narula H, Ahuja B, Yeluri R, Baliga S, Munshi AK. Conservative non-surgical management of an infected radicular cyst. Contemp Clin Dent 2011;2:368-71.
2. Bhaskar SN. Nonsurgical resolution of radicular cysts. Oral Surg Oral Med Oral Pathol 1972;34:458-68.
3. Maalouf EM, Gutmann JL. Biological perspectives on the non-surgical endodontic management of periradicular pathosis. Int Endod J 1994;27:154-62.
4. Kumar JA, Achuthan N, Loganathan K, Augustine D. Effective management of a large radicular cyst with surgical enucleation. Oral Maxillofac Pathol J 2014;5:459-61.
5. Natkin E, Oswald RJ, Carnes LI. The relationship of lesion size to diagnosis, incidence, and treatment of periapical cysts and granulomas. Oral Surg Oral Med Oral Pathol 1984;57:82-94.
6. Fernandes M, de Ataide I. Nonsurgical management of periapical lesions. J Conserv Dent 2010;13:240-5.
7. Devakumari S, Rekha NB, Dominic MN. Non surgical management of periapical cysts – A review. IOSR J Dent Med Sci 2016;15:39-42.
8. Tandri SB. Management of infected radicular cyst by surgical decompression. J Conserv Dent 2010;13:159-61.
9. Simon JH. Incidence of periapical cysts in relation to the root canal. J Endod 1980;6:845-8.
10. Maalouf EM, Gutmann JL. Biological perspectives on the nonsurgical endodontic management of periradicularpathosis. Int Endod J 1994;27:154-62.
11. Nobuhara WK, del Rio CE. Incidence of periradicularpathoses in endodontic treatment failures. J Endod 1993;19:315-8.
12. Nair PN, Sjögren U, Figdor D, Sundqvist G. Persistent periapicalradiolucencies of root-fi lled human teeth, failed endodontic treatments, and periapical scars. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 1999;87:617-27.

13. Samuels HS. Marsupialization: Effective management of large maxillary cysts. Oral Surg Oral Med Oral Pathol 1965;20:676-83.
14. Danin J, Linder LE, Lundqvist G, Ohlsson L, Ramsköld LO, Strömberg T. Outcomes of periradicular surgery in cases with apical pathosis and untreated canals. Oral Surg Oral Med Oral Pathol 1999;87:227-32.
15. Venugopal P, Kumar SA, Jyothi KN. Successful healing of periapical lesions with non-surgical endodontic approach. J Dent Sci Res 2011;2:1-6.
16. Raval RD, Nyklesh V, Patel HM, Naik PS, Patel PP. Management of infected radicular cyst in maxillary anterior region: A case report. Int J Adv Health Sci 2015;1:8-11.
17. Shear M, Speight P. Cysts of the Oral and Maxillofacial Regions. Oxford: Wiley-Blackwell; 2007. p. 123-42.
18. George MV, Thomas G, Kuttappa MA, Govind GK. Management of a large periapical cyst (apical matrix and surgical complications) - A case report. Endodontology 2009;21:84-9.
19. Leonardo MR, Silveira FF, Silva LA, Tanomaru Filho M, Utrilla LS. Calcium hydroxide root canal dressing. Histopathological evaluation of periapical repair at different time periods. Braz Dent J 2002;13:17-22.
20. Sjogren U, Hagglund B, Sundqvist G, Wing K. Factors affecting the long-term results of endodontic treatment. J Endod 1990;16:31-7.
21. Lee YL, Hong CY, Kok SH, Hou KL, Lin YT, Chen MH, *et al.* An extract of green tea, epigallocatechin-3-gallate, reduces periapical lesions by inhibiting cysteine-rich 61 expression in osteoblasts. J Endod 2009;35:206-11.
22. Shah N. Nonsurgical management of periapical lesions: A prospective study. Oral Surg Oral Med Oral Pathol 1988;66:365-71.