Original Article

A Comparative Study of Surgical and Non-Surgical Interventions for the Management of Radicular Cysts

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Abstract

Background: Periapical cysts are slow-growing cysts that are often asymptomatic until they become secondary infections. Periapical cysts are seen in the periapical region. The choice of therapy may be influenced by a number of criteria, including the extent of the lesion, its connection to important structures, its point of origin, clinical features, the patient's level of cooperation, and the patient's overall health. As a result of this, the current research was carried out to evaluate the effectiveness of surgical and non-surgical intervention in the treatment of radicular cysts.

Materials and Methods: The investigation included a total of 28 instances, 20 of which were men and 8 of which were females. All of the patients exhibited gradually growing swelling in the anterior area. Clinical examination and radiographs of all of the patients produced conclusive evidence of the presence of a radicular cyst. Both the non-surgical intervention group and the surgical intervention group received an equal share of the overall group. For the purpose of analysis, a t-test on independent samples and a Chi-square test were carried out.

Results: The non-surgical group had a mean radiographic lesion of 1.78 + 0.1 and 0.44 + 0.11 at the first and sixth months, respectively, whereas the surgical group had a mean lesion of 1.22 + 0.11 and 0.21 + 0.12. The p values for the two groups, which showed a statistically significant difference, were P = 0.01 and P = 0.00, respectively. After one month, 11 patients in the surgical group were extremely pleased, and after six months, patients in both groups were very satisfied. However, the degree of satisfaction did not demonstrate a significant amount of relevance. The number of patients in the surgery group who had severe pain was somewhat higher than in the non-surgical group; however, after the first month, pain was much less severe in the surgical group as compared to the non-surgical group.

Conclusion: Combination procedures, such as the root canal, apicoectomy and decompression or marsupialization , have superior results in treating radicular cysts with non-vital pulp than using each one of these procedures alone.

Keywords: Decompression, Marsupialization, healing, radicular cysts, apicoectomy and root canal therapy.

INTRODUCTION

In the periodontal ligament, epithelial residues (cell rests of Malassez) may occur as a result of inflammation after the death of the tooth pulp. This can result in the formation of a cyst known as a radicular cyst. These are the most common odontogenic cystic lesions of inflammatory origin that may damage the jaws. They are cystic lesions that form on teeth. The apices of the teeth that are affected are the most prevalent area for involvement; however, the lateral features of the roots in connection with lateral accessory root canals may also be affected. [1] A periapical cyst is a cyst that grows slowly and, in most cases, does not cause any symptoms until it becomes secondarily infected. Even though it accounts for 40–50% of all apical lesions, there is still controversy over how it should be managed. [2] A limited number of publications have said that if the intramuscular infection can be eradicated with non-surgical endodontic therapy, then the situation is considered resolved. [3] While some people believe that surgical intervention is necessary, others believe that the immune system itself may help stimulate the healing of such a lesion. [4] Clinical investigations reveal that the percentage of radicular cysts rises as the extent of the periapical lesions grows. This is the case regardless of whether the cysts are present. Granulomas have only been identified in

a small number of big lesions, though. [5] The diagnosis of a cyst may only be made with absolute certainty through the use of histological analysis. Nevertheless, a preliminary clinical diagnosis of a periapical cyst may be made using the following information: (a) The periapical lesion involves one or more non-vital teeth; (b) the size of the lesion is greater than 200 mm2; (c) radiographically, the lesion appears as a circumscribed, well-defined radiolucent area that is bound by a thin radiopaque line; and (d) the lesion produces a straw-colored fluid when it is aspirated or drains through an accessed root canal system; [6] A combination of chemomechanical root canal preparation, recurrent long-term intracanal dressing, and intracanal therapy with Ca(OH)2 and iodoform is the innovative approach to the treatment of periapical cysts. This procedure was developed to treat periapical cysts (Metapex). [7]

In cases of particularly large lesions, surgical curettage carries with it the potential for unintended and unwanted consequences; as a result, marsupialization or tube decompression procedures are recommended as alternative treatment options. Large periapical lesions may be decreased using a surgical decompression treatment known as marsupialization, even when periapical curettage is not performed. Decompression helps promote healing by osseous regeneration because it eliminates situations that might lead to enlargement of periapical pathosis, hence allowing continuous drainage from periapical lesions and allowing for healing to occur by osseous regeneration. [8] As a result, the purpose of this research is to investigate the treatment of big radicular cysts using two different approaches.

Materials and methods

Patient Selection

The research looked at people between the ages of 18 and 40 who had progressively increasing massive swelling from tertiary care centre, Chhindwara, Madhya Pradesh. For the purpose of the research, a total of 28 cases were chosen, 20 of which were men and 8 of which were girls. For the purpose of confirming the existence of a radicular cyst, both a clinical examination and a radiograph of the complete patient were performed. Everyone who participated in the study gave their written permission. There were a total of 28 instances, and they were split down the middle into two groups: surgery and non-surgical intervention.

After the carious section was removed, access opening, determination of the working length and instrumentation was done with a K-file. Soon, an abundant serum along with purulent and hemorrhagic exudates began to pour out of the root canal. After the exudates stopped coming out, the canals were thoroughly irrigated with Saline and sodium hypochlorite at a concentration of 2.5%. Paper points were used to dry it out. After the whole canal in the periapical region had been filled with premade radiopaque calcium hydroxide paste (Metapex), a radiograph was taken of the area. After one month, the root canal was obturated using gutta-percha cones (Dentsply India) and Bioroot RCS (Septodont India), which was followed by the placement of a final restoration. The lateral condensation method was used to complete the procedure. After a period of six months, the patients were brought back in for a further clinical and radiological assessment. In order to examine the periradicular healing, radiographs were collected at the beginning, during the first month, and after six months.

Surgical Management

Lignocaine, along with 2% adrenaline, was used to provide the local anesthetic. The subsequent steps included opening the access, determining the working length, cleaning, and shaping the canal. After administering the intracanal medication calcium hydroxide for a week, the canal was then obturated. During the operation that was performed for this investigation, a No. 15 BP blade was used to create a vertical incision at the mucoperiosteum between the root eminences. Irrigation of the surgical site with saline and deep curettage were both procedures that were performed in order to eliminate granulation tissues. Apicoectomy followed by retrograde filling with MTA retrograde filling material was done with the respective tooth. It was decided to apply two interrupted sutures. After forty-eight hours had passed, the patient was brought back in order to have the sutures removed and to undergo irrigation with normal saline.

In order to examine the periradicular healing, radiographs were collected at the beginning, during the first month, and after six months.

Statistics

The SPSS version 20 software was used to conduct analyses of the independent sample t-test as well as the Chi-square test. Results were judged to be statistically significant when P was less than 0.05.

RESULTS

The contrast between the various treatment groups and the radiographic lesion at the beginning of the study is shown in Table 1. Non-surgical treatment revealed values of 2.11, and surgical treatment gave values of 2.23 for the mean radiographic lesion. These results are practically identical. In addition, there was determined to be no statistically significant difference between the groups.

Table 1: Comparison between the treatment groups andradiographic lesion at the baseline

Treatment	***n***	**Mean**	**SD**	**SEM**	***P* value**
Non surgical	14	2.11	0.23	0.15	0.7
Surgical	14	2.23	0.34	0.08	
SD: Standard deviation, SEM: Standard error of the mean					

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

Treatment	***n***	**Mean (R lesion in mm)**	**SD**	**SEM**	***P***
Non surgical	14	1.56	0.32	0.05	0.01*
Surgical	14	1.34	0.42	0.03	
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	0.51	0.22	0.03	0.01*
Surgical	14	0.33	0.19	0.06	
SD: Standard deviation, SEM: Standard error of the mean					

Tables 2 and 3 provide the results of a comparison that was done between the therapy groups and the radiographic lesion after one month and six months. The radiographic mean lesion was significantly different between the non-surgical group and the surgery group. This difference was statistically significant. The level of patient satisfaction is depicted in Table 4. After one month, the majority of patients in the surgical group (11 patients) were very satisfied with the treatment, and after six months, patients in both groups were very satisfied, but this did not show any statistical significance. Although there was a greater proportion of patients in the surgical group who had severe pain, as shown in Table 5, pain dramatically decreased in the surgical group as compared to the non-surgical group after the first month of treatment.

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)	8	6	0.1

	Surgical (*n*=14)	10	4	0.5
6 months	Non surgical (*n*=14)	9	5	0.4
	Surgical (*n*=14)	11	3	

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

Group and duration	Pain	No pain	Slightpain	Mildpain	Severepain	Very severepain	*P* value
Baseline	Non surgical (*n*=14)	0	0	1	10	3	0.4
	Surgical (*n*=14)	0	0	0	11	3	0.6
1 month	Non surgical (*n*=14)	6	7	1	0	0	0.03
	Surgical (*n*=14)	13	1	0	0	0	0.01
6 months	Non surgical (*n*=14)	11	3	0	0	0	0.1
	Surgical (*n*=14)	13	1	0	0	0	

DISCUSSION

When it comes to the treatment of radicular cysts, choosing between surgical and non-surgical treatments might be a difficult decision. In addition, there is not a lot of research comparing the surgical care of radicular cysts with the non-surgical management. In radicular cysts, there are two unique identities: the true cyst and the pocket cyst. [9.] The former is less prevalent than the latter, which is likewise an epithelium-lined cavity that opens to the root canal space of the diseased tooth, and the periapex interacts with the infected root canal space. Therefore, removing the causative factor from the root canal system in a non-surgical manner has come to be recognised as the first step in the treatment process. This helps to establish an environment that is more amenable to the lesion being repaired. [10]

According to Nair et al., these findings demonstrated a correlation to those found in the Nobuhara and del Rio [11]. [12] It is necessary to take into account and surgically treat nonmicrobial etiological variables such as genuine cystic lesions, extraradicular infection, the presence of foreign materials, and endogenous cholesterol crystals.

As the extent of the lesion is reduced by the decompression treatment, the need for surgical intervention is eliminated, and if it is still required, it will be confined to the peri-radicular tissues of the affected teeth and their immediate surroundings. The internal osmotic pressure difference is eliminated during the decompression treatment by breaking the integrity of the lesion wall. This contributes to the healing process by encouraging osseous regeneration. [13]

The choice of therapy may be determined by criteria such as the lesion's extent, connection with noble structures, origin, and clinical features. Cooperation with medical professionals and the patient's systemic state are also important in the decision-making process. Endodontic therapy is a conservative strategy that is used by many experts to treat these cysts; however, the efficacy of this treatment is still being debated. Large lesions often need a combination of endodontic therapy, decompression, marsupialization, apicoectomy and sometimes even enucleation of the cyst in order to be successfully treated. [14]

Following surgical retreatment of periapical lesions, Venugopal et al. [15] discovered a substantial difference in the healing of periapical lesions after 12 months; however, by 48 months, this difference had almost completely disappeared between the surgical and non-surgical groups. Damage to essential tissues, the development of scar tissue, and an unpleasant experience for the patient are all drawbacks associated with surgical therapy. However, surgical intervention is still the last resort when non-surgical endodontic treatment is unsuccessful in treating a patient's condition.

Patients often do not report any discomfort associated with a radicular cyst until it becomes infected; this is the case even when periapical radiographs are obtained for teeth that are not important. On the other hand, when they do, they report a history of swellings that gradually grew in size. Despite the fact that it is initially rigid, the overlying bone will eventually become very thin as the size of the cyst rises. Later on, when the brittle exterior cortical bone splits, a characteristic known as "springiness" or "eggshell cracking" may be detected. The bone will become unstable after it has been completely eroded by the process. [16]

A limited number of investigations have shown that radicular cysts and apical granulomas are not straightforwardly differentiated radiographically. Unless the radiographic lesion is at least 2 centimetres in diameter, the size of the lesion does not contribute in any way to the diagnostic process. Density on radiographs may be used to distinguish between radicular cysts and periapical granulomas, which are two separate types of bone tumours. The radiographic appearance of a radicular cyst is that of a round or oval radiolucent lesion that is surrounded by a clearly defined radiopaque boundary. Infected cysts, which are characterised by rapidly increasing size, do not have a radiopaque margin. If the cyst extends into the maxillary sinus, the floor of the maxillary sinus may become dislodged. When contrasted with the sinus cavity, the interior anatomy of a cyst is described as being homogenous and radiopaque. On a macroscopic level, radicular cysts are characterised by the presence of cholesterol crystals that have the appearance of yellow or soft brown cheese. Radicular cysts have non-keratinized stratified squamous epithelium as their lining. [17]

Root canal dressings between sessions of root canal treatment of teeth with chronic periapical lesions play an important role in the reduction of bacteria beyond the levels that can be obtained with mechanical preparation (areas that are unreachable by instruments or irrigation solutions, such as dentinal tubules and ramifications). This is because these areas contain dentinal tubules and ramifications. [18] In their research, Leonardo and colleagues [19] discovered that calcium hydroxide, due to its hygroscopic properties, can reduce exudates. They also found that calcium hydroxide needs at least two weeks to kill bacteria. They did this by measuring the pH and the amount of calcium ions in the area around the tip of the tooth.

Experts agree that it is important to keep an eye on teeth that have been treated for periapical lesions for a long time after the treatment. [20,21] Shah recommended that patients be recalled at intervals of three months, six months, one year, and two years in order to evaluate the degree to which periapical lesions have healed. It is very necessary to do follow-up examinations for a period of at least two years since quiescent epithelial cells have the potential to be activated by instrumentation in the apical area, leading to the creation of cysts and proliferation. [22]

CONCLUSION

Based on the findings of this investigation, radicular cysts containing non-vital pulp responded well to a treatment approach that combined root canal, Apiceoctomy and decompression techniques.

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