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Non-Surgical Management of Non-Vital Teeth with Periapical Pathosis by Conventional Root Canal Treatment: A Clinical and Radiological Evaluation

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Abstract: *Background:* Infections of the dental pulp occur as consequence of caries, operative dental procedures and trauma, and involve a mixed, predominantly Gram-negative, anaerobic bacterial flora. *Objectives:* The study was done to evaluate the success rate of non-surgical management of non-vital teeth with periapical pathosis. *Methods:* A total number of 40 infected teeth with periapical lesion were treated by Conventional Root Canal Treatment. Irritants from the root canal system was removed by mechanical instrumentation (Crown down Technique), chemical irrigation with NaOCL and by using Calcium Hydroxide as intracanal medicaments and fluid tight obturation both apically and coronally resulting repairs of inflamed periradicular tissues. Depending on the extension of tissue damage repair varies from a simple reduction and resolution of the inflammation to a more complex regeneration involving remodeling of bone, periodontal membrane and cementum. *Results:* This study present 2 years clinical and radiological follows up period. Among 40 cases 32 cases could be treated as acceptable as their responses were good both clinically and radiologically and 5 patients came back with some complications among them 3 cases were uncertain and 2 cases were unacceptable. *Conclusion:* This study suggests that Conventional root canal Treatment is an effective procedure for saving teeth with periapical pathosis.

Keywords: Non-Vital Teeth, Non-Surgical Management, Root Canal Treatment, Radiological Evaluation, Clinical Evaluation

1. Introduction

Infections of the dental pulp occur as consequence of caries, operative dental procedures and trauma, and involve a mixed, predominantly Gram-negative, anaerobic bacterial flora 1. These infections often cause total pulpal necrosis and subsequently stimulate an immune response in the periapical region. The latter is commonly referred to as a periapical lesion2. Most periapical lesions (90%) can be classified as dental granulomas, radicular cysts or abscesses3. It is generally accepted that periapical lesions cannot be differentially diagnosed as either radicular cysts or apical granuloma based on radiographic evidence alone4, 5. Various studies have shown that with a radiographic lesion size of 20 mm or larger, the incidence of cysts is equal to or greater than 92%. If the lesion is separate from the apex and with an intact epithelial lining (apical true cyst), it may have developed into a self-perpetuating entity that may not heal when treated non-surgically6,7. On other occasions, a large periapical lesion may have a direct communication with the root canal system (apical pocket cyst or bay cyst) and respond favorably to non-surgical treatment 7,8. Some clinical studies have confirmed that simple non-surgical treatment with proper infection control can promote healing of large periapical lesions 9, 10. In the past, large periapical lesions were generally managed by root canal treatment of the involved tooth or teeth and by surgical excision. This was particularly true if the periapical lesion was suspected to be

an apical true cyst. In recent years, a greater awareness of the complexities of root canal systems has led to the development of newer techniques, instruments and materials. These developments have greatly enhanced the clinician's abilities11. Therefore, fewer patients need periapical surgery. An awareness of root canal morphology and a careful interpretation of preoperative radiographs are necessary for adequate access and infection control in endodontic therapy. This is likely to have a critical bearing on the outcome. Mandibular incisors are often anatomically complex, with 45% displaying second canals12. Such teeth may fail to respond to treatment if important anatomy is missed. This paper suggests that surgical removal of periapical lesion of pulpal origin is not mandatory, and that, irrespective of the size of the lesion, every effort should be made to treat such lesions by conservative means.

2. Materials and Methods

This Experimental study was carried out for a period of 24 months from January 2009 to December 2010 in the Department of Conservative Dentistry and Endodontic, Faculty of Dentistry, Bangabandhu Sheikh Mujib Medical University (BSMMU), Shahbagh, Dhaka in Bangladesh. Forty patients with periapical lesion of teeth was selected requiring endodontic treatment along with a preoperative intra oral periapical radiograph considering excluding criteria like tooth with perforated pulpal floor, Radiographic evidence of excessive internal resorption , Excessive bone loss in the furcation area, Non restorable tooth, Tooth having grade III mobility the. Inclusion criteria of patient selection were include both male and female patient of any age, patient willing to give consent to take part in the study, nonvital tooth with Spontaneous pain, tender to percussion, swelling and sinus , no nvital tooth with Periradicular radiolucency and Endodonti cally treated failed tooth. After collection of data, these were screened by checking consistency, edited and were finally analyzed by software SPSS methods. The non-randomization procedure allocated 40 nonvital teeth with periapical lesion managed by Conventional Root Canal Treatment. At first visit, patient's clinical signs or symptoms and radiographic evidences were recorded. The radiographs were examined by two examiners and recorded in the data collection sheet. After isolation of teeth with cotton roll and saliva ejector, a straight line access cavity was prepared and necrotic pulp was removed with barbed broach and 5.25% sodium hypochlorite. Root canal system was prepared by crown down pressureless technique with 2% tapered SS file and irrigation was done with 2.25% sodium hypochlorite followed by dried with paper point. Calcium hydroxide was mixed with glycerin and placed into the root canal with lentulospiral as intracanal medicament followed by temporary restoration. After subsiding the clinical manifestation, the canal was reopened and irrigated with 2.25% sodium hypochlorite and dried with paper point and obturated with GP point and Calcium Hydroxide based sealer (Sealer 26) and restored with light cured composite. For clinical evaluation the patients were examined clinically for percussion pain, swelling and discharging sinus by present or absent and radiologically for Periradicular radiolucency by same, increased, decreased and absent. The patients were evaluated at 3, 6 and 12 months post operatively by maintaining a standard follow up chart.

3. Result

Total 40 non teeth with Periapical pathology were subjected to this study. Table I shows the clinical presentation of the study patients and observed that, pain and percussion pain was present in all of the study patients. However, out of 40 study patients, swelling and sinus was found 14 (35.0%) and 6 (15.0%) patients respectively. Table II shows the radiological presentation of the study patients and observed that, Periapical radiolucency was present in all of the study patients. Table III shows the clinical follow up of the study patients after 3, 6 and 12 months and observed that, out of 40 study patients, 40, 33 and 37 of the study patients were present during 3rd, 6th, and 12th months follow up respectively. Pain and percussion pain was observed in 4 patients after 3rd months follow up and in two patients after 6th and 12th months follow up period. Presence of swelling was not observed during 3rd, 6th and 12th months follow ups. Sinus was observed in one patient during 3rd, 6th, and 12th months follow up period. Table IV shows the Periapical radiolucency and found that 40 teeth (100%) had periapical radiolucency during pre-operative period. After 3 months of Root Canal therapy periradicular lesion remain increased in 2 (5%), same in 22 (55%), decreased in 16 (40%) cases. After 6 months the lesion remain increased in 2 (5.2%), same in 8 (21%), decreased in 20 (52.8%) and absent in 8 (21%) cases. After 12 months the lesion remain increased in 2(5.4), same in 3 (8.1%), decreased in 14 (37.8%) and absent in 18 (48.7%) cases. Among 37 cases treated with Root Canal therapy 32 (86.5%) cases were acceptable, 3 (8.1%) cases were uncertain and 2 (5.4%) cases were unacceptable.

Table I. *Shows the clinical presentation of the study patients.*

clinical	n	%
Pain present	40	100
Percussion pain present	40	100
Swelling present	14	35
Sinus present	6	15

Table II. *Shows the radiological presentation of the study patients.*

Periradicular radiolucency	n	%
Present	40	100
Absent	0	0.0

Table III. *Shows the clinical follow up of the study patients.*

Clinical Parameters	After 3 months			After 6 months			After 12 months		
		n	%		n	%		n	%
Pain	Present	4	10	Present	2	5.5	Present	2	5.4
	Absent	36	90	Absent	36	94.5	Absent	35	94.6
Percussion pain	Present	4	10	Present	2	5.5	Present	2	5.4
	Absent	36	90	Absent	36	94.5	Absent	35	94.6
Swelling	Present	0	00	Present	0	00	Present	0	00
	Absent	40	100	Absent	38	100	Absent	37	100
Sinus	Present	1	2.5	Present	1	2.6	Present	1	2.7
	Absent	39	97.5	Absent	37	97.4	Absent	36	97.3

Table IV. *Shows the Periapical radiolucency during different follow up of the study patient.*

Size of radiolucency	After 3 months		After 6 months		After 12 months	
	n	%	n	%	n	%
Increased	2	5	2	5.2	2	5.4
Same	22	55	8	21	3	8.1
Decreased	16	40	20	52.8	14	37.8
Absent	0	0	8	21	18	48. 7

Table V. *Final outcome of the cases in the study (n= 37).*

Evaluation parameter	n	%
Acceptable	32	86.5
Uncertain	3	8.1
Unacceptable	2	5.4

4. Discussion

When the pulp becomes necrotic, its environment becomes suitable to allow microorganisms to multiply and release various toxins into the periapical tissues, initiating an inflammatory reaction and leading to the formation of a periapical lesion[13]. Several studies have been carried out to examine the role of bacteria in the formation of periapical lesions[14,15,16]. Immunopathologic mechanisms also play a role in the initiation of periapical lesions. [17,18]. lumen of a 'bay' or 'pocket' cyst is open to the root canal, it is likely to heal after conventional root canal treatment due to the removal of intra-canal irritants[7,8]. In contrast, the tissue dynamics of a true cyst are self-sustaining by virtue of its independence of the presence or absence of irritants in the root canal. True cysts, particularly large ones, containing cholesterol crystals are less likely to be resolved by conventional root canal treatment[19]. Because it is clinically and radiographically impossible to differentiate a bay cyst from a true cyst, as it is likewise between a cyst and a granuloma[20], judicious treatment planning should favor a conservative approach to treatment [5]. The periapical tissues have a rich blood supply, lymphatic drainage and abundant undifferentiated cells. All these structures are involved in the process of inflammation and repair. Therefore, because the periapical tissues have the potential to heal, the first treatment of periapical lesions should be directed only towards the removal of the causative factors. Root canal treatment is based primarily on the removal of microbial infection from the complex root canal system. Bhaskar suggested that if instruments are extended 1 mm beyond the apical foramen, the inflammatory reaction that develops destroys the cyst lining and converts the lesion into a granuloma. Once the causative factors are eliminated, the granuloma heals spontaneously[21]. Bender added that penetration of the apical area to the centre of the radiolucency might help in resolution by establishing the drainage and relieving pressure[22]. However, the added trauma of the minimal over-instrumentation may enhance epithelial proliferation and cystic expansion, not a resolution[22, 23]. Seltzer suggested that over-instrumentation allowed the drainage of the cystic fluid, which then allowed the degeneration of the epithelial cells by strangulation because fibroblastic and collagen proliferation squeezed the capillary supply to the cystic lining[23]. The over instrumentation technique was based on the assumption that the periapical lesion could be a cyst. Although the reasons these techniques might work are only theoretical, clinical success was claimed[24]. A calcium hydroxide-based paste was used as an antibacterial dressing in this case. It is suggested that the action of calcium hydroxide beyond the apex may be fourfold: (i) anti-inflammatory activity; (ii) neutralisation of acid products; (iii) activation of the alkaline phosphatase; and (iv) antibacterial action[25]. It has also been reported that treatment with calcium hydroxide resulted in a high frequency of periapical healing, especially in young patients[26]. Similarly, in the present study, periapical healing appeared to be occurring 6 month after the root canal obturation, and continued during the 12- month observation period. 1 year after obturation bony trabeculae seen in the lesion. 18 months after obturation bony trabeculae extending inwards from the walls of the lesion towards the root surface. 2 years after obturation Complete healing with bone formation.

Radiographic signs such as density change within the lesion, trabecular reformation and lamina dura formation confirmed healing, particularly when associated with the clinical finding that the tooth was asymptomatic and the soft tissue was healthy.

5. Conclusion

It can be concluded from this study that Root canal therapy is an effective technique of endodontic technique in promoting the healing of a periapical lesion for nonvital tooth with periapical lesion for saving teeth subjected to surgical treatment or extraction.

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