

EVALUATION OF THE HEALING AFTER APICECTOMY BY USING TWO ROOT-END FILLING MATERIALS – IN VIVO STUDY

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ABSTRACT

Purpose of study: The aim of this in vivo study is to evaluate (clinically and radiographically) the healing after apicectomy by using two different materials (MTA & amalgam).

Materials and Methods: The study included 30 cases of apicectomy divided equally into two groups: Group 1: The root apex was resected by diamond bur and the root-end cavity was prepared with ultrasonic microtips and filled with MTA. Group 2: The root apex was resected by diamond bur and the root-end cavity was prepared with ultrasonic microtips and filled with Amalgam. Cases then were observed clinically and radiographically within 3 different periods (3 months, 6 months, 9 months). We depended on the last period (9 months) to evaluate the healing

Results: The overall rate of healed cases was 83.3%. It was 86.66% in group 1 and 80% in group 2. There were statistically differences between the groups ($P=0.026$). The superiority of the 1st group to the 2nd group proves the Bio-mechanical features of MTA in success of the apicectomy and improvement of the healing.

Conclusion: The use of MTA as root-end filling material is useful in raising the healing rate after the apicectomy compared with amalgam

KEY WORDS: Apicectomy, healing, MTA, amalgam, ultrasonic microtips

INTRODUCTION

Apicoectomy means the amputation or resection of the root apex and curettage of the periapical lesion by surgical operation. There are two types of apicoectomy: conventional apicoectomy and retrograde apicoectomy. Retrograde apicoectomy is indicated in some cases where there are obstacles to do conventional apicoectomy as in case the root

canal can't be adequately cleansed and filled via the pulp chamber due to presence of pulp stone, calcified root canal, imperfect obturates root canal, fractured reamer, or the affected tooth is covered by a crown or a bridge ⁽¹⁾.

Mineral Trioxide Aggregate (MTA represents a significant improvement over other materials used as root- end filling materials, it is the first

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restorative material that allows for the overgrowth of cementum and it may facilitate the regeneration of periodontal ligament. MTA is cement composed of tricalcium silicate, dicalcium silicate, tricalcium aluminate, tetracalcium aluminoferrite, calcium sulfate and bismuth oxide. It is very alkaline and hydrophilic requires moisture to set making dryness not necessary, it is mixed with sterile water to make a sandy consistency ⁽²⁾.

A review of clinical studies on dental materials used in retrofillings showed that amalgam was the most frequently used material in control groups; MTA was presented as a promising material for root-end filling^(3,4). Advantages associated with amalgam are its low cost, easier handling, and clinical success ^(4,5). However, due to the growing concern on environmental contamination by hazardous metals, several other materials have been studied to replace amalgam ⁽³⁾.

MATERIALS AND METHODS:

The research sample:

We have done 30 apicectomies on patients (18-45 years old) who have been coming to the endodontic department in dental college of HAMA university within the two years 2014-2015. The teeth involved in the study were (incisors, canines, one canal premolars) with periapical lesions didn't exceed 1 cm in diameter. The specimen was divided equally into 3 groups: Group I (15 cases) the apex of the root was resected by diamond bur and root-end cavity prepared with ultrasonic and the cavity was filled with MTA, Group II (15 cases) the apex of the root was resected by diamond bur and root-end cavity prepared with ultrasonic and the cavity was filled with amalgam.

The entry criteria (selection criteria):

- The patient is (18-45 years old) with good oral health.
- incisors, canines, one canal premolars

- The lesion doesn't exceed 1 cm in diameter.

Surgical procedures:

- Incision: An incision was extended to two neighboring teeth, a trapezoidal or triangular shape, using a scalpel with a No. 15 round head, then flap has been reflected by a sharp Elevator
- Exposing the root-end after locating accurately, through a hole in the bone by round bur with saline irrigation.
- Curetting diseased tissue in the bone hole by a sharp and a small shovel
- Resecting of the root-end (2-3) mm at an angle, as close as possible to 90 degrees with the longitudinal axis of the tooth, by using a diamond fissure bur on a high-speed handpiece (Groups I and II)
- Using a device ultrasonic for preparing a simple cavity within the root surface at depth of 2.3 mm with constant saline irrigation during preparation.
- After preparation materials (MTA in the group I and amalgam in the group II) were transferred to the prepared cavity and condensed well, and then the remains were removed by a cotton roll
- Returning the flap into place and taking an x-ray to make sure of the quality of root-end filling seal before closure and suturing procedure.
- Interrupted suture by using a 0/4 silk suture material

Observing:

All of the cases have been observed clinically and radiographically within 3 times: time 0: Immediately after surgery, time 1: after 3 months, time 2: after 6 months, time 3: after 9 months. We have depended in terms of clinical evaluation on (presence) or (absence) of any clinical symptoms or signs including pain, swelling, redness, a sense of discomfort or fistula ... etc. In the radiographic

evaluation we have depended on Rude’s standards 1972 ⁽⁶⁾ which classified it to: (complete healing, incomplete healing, uncertain healing, unsatisfactory healing).

RESULTS

The overall rate of healed cases was 83.3%. It was 86.66% in group 1 and 80% in group 2. There were statistically significant differences between the groups (P=0.026). The superiority of the 1st group to the 2nd group proves the Bio-mechanical features of MTA in success of the apicectomy and improvement of the healing.

DISCUSSION

Total cure rate in the group (1): 86.66%, the ratio approved the results of previous studies that have shown that the rate of healing of apicectomy by using MTA is located between [84-92]% (Table 1)

The healing rate in the group (2) has reached 80.0%. The ratio was consistent with results of previous studies that have shown that healing ratio when using amalgam is between [58-85]% (Table 2).

TABLE (1): Summary of Clinical Studies Comparing MTA with other Root-end Filling Materials in Apical Surgery

| Authors/year | Study design | Final material | Follow-up period | Successful healing |
|--------------------------------------|------------------------------|---|------------------|---|
| Chong et al/2003 ⁽⁷⁾ | Randomized controlled trial | n = 108 (MTA, n = 61; IRM, n = 47) | 2 y | MTA, 92%; IRM, 87% (P > .05) |
| Lindeboom et al/ 2005 ⁽⁸⁾ | Randomized controlled trial | n = 100 (MTA, n = 50; IRM, n = 50) | 1 y | MTA, 92%; IRM, 86% (P < .05) |
| Kim et al/2008 ⁽⁹⁾ | Retrospective clinical study | n = 188 (MTA, n = 47; IRM, n = 9; SuperEBA, n =132) | >1 y up to 5 y | MTA, 92%; IRM, 89%; SuperEBA, 92% (P < .05) |
| Von Arx et al., 2010 ⁽¹⁰⁾ | Prospective clinical study | n = 339 (MTA, n = 173; Retroplast, n = 166) | 1 y | MTA, 91%; Retroplast, 80% (P = .003) |
| Present study | Prospective clinical study | n = 30 (MTA, n = 15; Amalgam, n = 15) | 9 m | MTA=86.66% , Amalgam=80.0% (P < .05) |

Table (2): Summary of Clinical Studies used Amalgam as Root-end Filling Materials in Apical Surgery

| Authors/year | Study design | Final material | Follow-up period | Successful healing (Amalgam) |
|---|------------------------------|----------------------------|------------------|--|
| Testori et al., 1999 ⁽¹¹⁾ | Retrospective clinical study | n = 181 (Amalgam, n = 95) | 6 y | 77.5% |
| Peñarrocha et al., 2000 ⁽¹²⁾ | Retrospective clinical study | n = 61 (Amalgam, n = 61) | 1 y | 85% |
| Wesson and Gale, 2003 ⁽¹³⁾ | Prospective clinical study | n = 790 (Amalgam, n = 790) | 5 y | 62% |
| Bowen et al., 2004 ⁽¹⁴⁾ | Retrospective clinical study | n = 71 (Amalgam, n = 71) | 6 m – 12 m | 6 th M:63% , 12 th M:84.%2 |
| Present study | Prospective clinical study | n = 30 (Amalgam, n = 15) | 9 m | %80.0 |

The cure rate in the group I (86.66%) are closer to the minimum values of previous studies, which amounted to [84-92]%, due to the short observation period, which amounted to 9 months. It is expected to increase this percentage to the highest values in the event of continued surveillance for longer periods, as observed in the study of Chong et al., 2003. In this study the healing rate of the material of the MTA in the first year of monitoring 84%. This percentage increased in the second year of monitoring of up to 92%. Similarly for IRM's where healing rate rose from 76% to 86% between the first and second year of observation.

The healing rate for the amalgam in our study (80.0%) close somewhat to previous studies that used the same material despite their different observation periods. Yet it is far from the healing rate in the study of Wesson & Gale, 2003 who studied the role of amalgam when used at molars, which led to a decline in healing rate clearly.

When comparing the two groups, there were significant differences ($P = 0.026$) between them, which excelled group I over group II by healing totaled 86.66% versus 80.0%. These data agreed with the majority of studies that confirm the superiority of the MTA on other materials, which have many features. It is the first material that permits the growth of cementum over it and can facilitate the proliferation of ligament around⁽¹⁵⁾. As well as the excellent ability to plug in the presence of moisture⁽¹⁶⁾, and mechanical properties suitable as a dam peak⁽¹⁷⁾.

CONCLUSIONS

The use of MTA as root-end filling material is useful in raising the healing rate after the apicectomy compared with amalgam.

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