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COMPARATIVE STUDY OF TREATMENT OUTCOME IN APICECTOMIES WITH OR WITHOUT ROOT-END FILLING

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ABSTRACT

Background: **High success rate has been reported widely with conventional endodontic. When failure occurs, re-treatment alone or with surgical endodontics is the recommended treatment.**

Objective: **To compare the treatment outcome following apicectomy techniques, apicectomy with and without retrograde root – end filling.**

Methods: **Fifty three patients presenting with clinical and radiological evidence of pulpal and periapical pathology ≥5mm that will require apicectomy were randomly recruited into the study groups A or B over a period of 12 month. In group A apicectomy was performed without root - end filling and in group B apicectomy was performed with root – end filling. Patients were recalled 12 months and assessed clinically and radiologically.**

Results: **35 out of 53 recruited patients reported for 12 month re-call visit. Two were excluded because of missing baseline radiographs. 33 patients that reported at 12months recall visit with complete radiographs were used for analysis. Patients age ranged from 16 – 66 years, with those in age group 21 – 30 years predominant, Majority (57.6%) were males. Forty teeth were treated, 14 had root – end filling and 26 without root – end filling. Maxillary incisors were the most frequently apicectomized teeth. 32 (80%) out of 40 apicectomized teeth were successful, 14 (88.5%) out of 26 teeth treated without root end filling were successful, while 9 (64.3%) out of 14 teeth treated with apicectomy with retrofil were successful.**

Conclusion: **Though apicectomized teeth without root-end filling had a higher percentage of success it was not statistically significant (p=0.15).**

INTRODUCTION

Apicectomy is the excision of the apical portion of the tooth and the attached soft tissues during periapical surgery.[1] It is the most common surgical endodontic therapy procedure, it often involves periapical curettage, root-end resection, root-end preparation and root-end filling[2]. Endodontic therapy is performed to maintain pulp vitality or treat necrotic pulp to maintain the tooth in the arch, thereby maintaining arch integrity.

Despite high success rates of conventional endodontic approach, failures still occur due to inadequacies in cleaning, shaping, obturation, iatrogenic events and loss of coronal seal. When failure occurs, re-treatment rather than extraction of teeth has been advocated. Re-treatment usually involves conventional (non-surgical) or surgical endodontic approach.[3]

When appropriate, conventional, nonsurgical re-treatment efforts are directed to target deficiencies or repair of pathogenic and iatrogenic defects. Non-surgical management of endodontic failures have recorded high success rates and is favored due to less discomfort and morbidity in comparison with periradicular surgery.[4] However, when periradicular lesions with diameter>5mm[4] are present, lower success rates have been recorded with non-surgical approach. Surgical endodontic management of periradicular lesions is resorted to when conventional endodontic therapy is not indicated, impossible or unsuccessful[5]. Traditionally, apicectomy procedure involves placing a root-end filling following apical resection which is favored by some authors, [6,7,8] while others[9,10] support adequate cleaning and obturation of the canal, followed by apical resection without root-end filling

as the treatment of choice. However, evidence in support of both schools of thought remains equivocal. The aim of this prospective study therefore was to compare the treatment outcome following the two apicectomy techniques: apicectomy with and without retrograde root-end filling, with a view to evaluate the technique with better prognosis.

PATIENTS AND METHODS

This was a prospective study of consecutive patients presenting at the Dental Hospital of the Obafemi Awolowo University Teaching Hospitals Complex,(OAUTHC) over a period of 12 months. Teeth with pulpal and periapical pathologies (with periradicular lesions ≥5mm), either as primary endodontic treatment or following failure of conventional endodontic treatment or retreatment were recruited into the study. However teeth with obliterated or blocked canals that would not allow conventional cleaning and obturation were excluded; so also were patients with any systemic conditions that would contraindicate surgery or would need special precautions. The study was approved by the Ethical and Research Committee of the OAUTHC and informed consent obtained from participants. All the fifty three patients that met the inclusion criteria and who presented within the 12 month study period were randomly assigned to either treatment group A (Apicectomy without root-end filling) and group B (Apicectomy with root-end filling) using simple random sampling technique. The patients were treated under local anesthesia using 2% lignocaine hydrochloride with 1: 80,000 adrenaline. Canals were accessed through a coronal access cavity in all cases and conventional canal debridement performed using K-type reamers and files. In cases of failed conventional root canal treatment, inadequately obturated canals, old canal obturations were removed and canal cleaning repeated. During instrumentation, canals were irrigated with 5.25% sodium hypochlorite solution.

After canal instrumentation and irrigation, surgical procedures were performed with apical access via full mucoperiosteal tissue flap. The undermining elevation flap reflection technique was used. Care was taken during tissue retraction to position and maintain the periosteal retractors on cortical bone. Generally, the cortical bone overlying the apical lesion was removed with burs at high speed using brush stroke approach under continuous normal saline irrigation until the apex of the tooth was exposed. However, in four cases, bone cutting using burs was not required because bone overlying the root apices were completely destroyed with root exposure. Curettage was accomplished with curved surgical bone curettes. Root-end resection was performed with high speed burs, with about 2 mm of resection at an angle of about 45degrees to the buccal surface for good canal visibility and access[5].

Following apical resection, root canals were irrigated with sodium hypochlorite and then dried with paper points. Canals were obturated with gutta percha and a zinc oxide eugenol- based sealer using lateral condensation technique. The placement of gutta percha was such that it protruded beyond the resected root apex. Excess filling materials were removed from the apical region using fine diamond high speed burs.

For those in group B, (apicectomy with root-end filling), a small oval root-end cavity preparation was created using diamond burs, irrigated copiously with normal saline, dried and root-end filling of Super-(ethoxybenzoic acid) EBA was placed within the cavity. Any excess or spilled over material was removed. After setting, a fine diamond bur was used to polish the filling and the apical surface. Reflected tissues were re-approximated to their original positions after irrigation and hemostasis was achieved. Tissues were compressed, stabilized and sutured with non-absorbable 3/0 black silk suture. Coronal access cavities were lined with glass ionomer cement and restored with composite.

For those in group A, (apicectomy without root end filling), the excess gutta percha protruding beyond the resected root apex were removed using gutta percha cutter and the gutta percha was burnished unto the root face with a burnisher.

Antibiotic (500mg ampiclox taken 6 hourly for 5 days) and non-steroidal anti-inflammatory analgesics (400mg ibuprofen taken 8hourly for 3 days) were prescribed and post-operative instructions given.

Patients were seen the following day (24 hours) for immediate post-operative review examinations and at one week recall, post-operative radiograph and suture removal were done. Patients were recalled at 3,6 and then at 12 months post operatively and were assessed for signs and symptoms of failure (pain, tenderness, swelling, sinus and mobility). Evidence of bone healing was radiographically assessed using standardized radiographs taken at similar angulations for comparison with pre-operative and 1 week post-operative radiographs. Patient examination and treatment were performed by the first author while treatment outcomes were jointly assessed by all the authors. Evaluation of healing results was based on clinical and radiographic observations. Clinical observations were recorded as present or absent; pain, sensitivity to percussion, evidence of fistula, swelling and tooth mobility. Radiographic evaluations were done using the classification of Rud *et al* [11] as follows:

1. Complete healing (successful): Complete bone regeneration around the apex with or without a recognizable periodontal ligament space.
2. Incomplete healing (scar tissue): A periradicular rarefaction (in comparison with a postoperative or previous follow-up radiograph), either decreased or stationary, the rarefaction is irregular and often has asymmetrical outline and an angular connection to the periodontal ligament.
3. Uncertain healing: A rarefaction located symmetrically around the apex, with a funnel shaped connection to the periodontal ligament space; the size of the rarefaction is less than it appears to be on the postoperative radiograph.
4. Unsatisfactory healing (failure): the same radiographic signs as those of uncertain healing, except that the area of the rarefaction is either enlarged or unchanged in comparison to the immediate postoperative condition.

Overall treatment results were classified[12] as:
Successful: Criteria for successful healing included absence of clinical signs/symptoms and a radiographic classification of complete or incomplete healing.

Doubtful: Criteria for doubtful cases included absence of clinical signs/symptoms and a radiographic classification of uncertain healing.

Unsuccessful\Failure: Criteria for failure included the presence of any clinical signs/symptoms and/or a radiographic classification of unsatisfactory healing.

All data were analyzed using SPSS for Windows version 11.0, (SPSS Inc Chicago Illinois, USA). Associations between discrete variables were tested by Chi-Square and Fisher's exact test as appropriate. Differences were taken as significant at $p \leq 0.05$.

RESULTS

Fifty-three patients were treated out of which only 35 patients reported for the 12-month recall visit. Two of these patients were excluded because of missing baseline radiographs and 33 were eventually analyzed. Patients were aged 16-66 years, with a mean age of 27.4 years (SD 10.88). More than half (57.6%) were males and the remaining (42.4%) were females giving a male to female ratio of 1.4:1. The majority (66.7%) of the patients were in the age group 21-30years while the least (3.0%) were the age-group 41-50 years.(Fig 1)

A total of forty teeth were included in the study constituting 14 apicectomies with retrograde root-end filling and 26 apicectomies without root-end filling. (Table 1)

Table 1: Treatment outcome according to gender

Gender	Successful	Doubtful		Failure	Total Teeth treated
	n	n	(%)	n	N
Male (19)	18	4	(16.0)	3	25
Female (14)	14	-	-	1	15
Total 33	32	4	(10.0)	4	40

Table 2: Distribution of apicectomized teeth

Teeth treated	n
Upper central Incisors	22
Upper lateral Incisors	9
Upper premolars	4
Lower central Incisors	4
Lower molars	1
Total	40

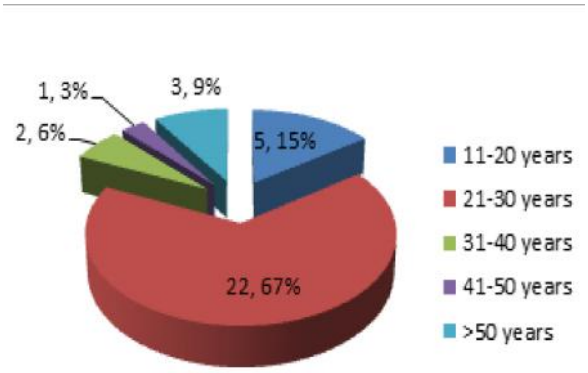

Fig 1: Age group distribution of patients treated

Table 3: Treatment outcome at 12 months recall

Treatment modality	Number of Teeth n	Successful n	Doubtful n	Failed n
Apicectomy without Retrograde Filling	26	23	2	1
Apicectomy with Retrograde Filling	14	9	2	3
TOTAL	40	32	4	4

The maxillary central incisors were the most frequently apicectomized teeth (22 ;55%) followed by the maxillary lateral incisors (9 ;22.5%) and the least (2.5%) were the lower molars. In all, thirty five (87.5%) maxillary and 5 (12.5%) mandibular teeth were treated (Table 2). Of the 40 treated teeth, 32 (80%) were classified as successful, 4 (10%) as doubtful, and 4 (10%) as failed (Table 3). Apicectomies without root-end fillings had 88.5% success while apicectomies with root-end fillings had 64.3% success which is not statistically significant across the two groups.(p=0.15).(Table 3).

DISCUSSION

In this study, 18 (34.0 %) of the treated patients failed to turn up for the 12-month recall visit. This is in consonance with the generally observed poor compliance of Nigerian patients to recall visits, especially when there are no symptoms.[13] This percentage is much higher than reported by Peñarrocha-Diago M *et al*,[12] and Mohammed and Shehab[14] 12% and 23.8% respectively. The difference may be due to better compliance with recall visits in industrialized and western countries.

In this study, as in most other studies,[5,6] maxillary incisors were the most frequently apicectomized teeth (55.0% and 22.5% for centrals and laterals respectively). In the previous studies of traumatized anterior teeth in both rural [15] and urban [16] areas of Nigeria, maxillary central incisors were quoted as the most frequently traumatized teeth. The natural sequelae of traumatized teeth if left untreated or poorly managed , include chronic apical infection, apical granuloma and radicular cysts. Hence, this could account for the reason why maxillary incisors were the most apicectomised teeth Although both groups recorded high success rates, retrofilled roots showed a lower success rate of 64.3% against 88.5% in those without root-end filling which was not statistically significant (p=0.15). Studies have shown that root-end preparation opens more apical dentinal tubules to the apical tissues, shortens the length of root canal obturation and disturbs the apical seal of the obturating materials.[15, 17]. Also, no root-end sealing materials have been found to perfectly seal the apex from periapical tissues. These factors probably explain the higher failure rate of root-end filled apicectomized teeth compared with those without root-end filling. The result of this study corroborates that of Molven *et al* [18], who reported a 27% failure rate for retrofilled roots compared with 3.6% in cases without root-end filling.

However, other studies have reported higher success rates in apicectomy with retrograde root-end filling than those without it.[14,19,20] Such studies recommend the placement of root-end filling especially when an unsuccessful root canal therapy was corrected by an apicectomy rather than by re-treatment. Routine apicectomy with root-end filling has also been recommended when canal access is blocked by calcification, post or broken instruments.[14,18]

Although no root-end sealing materials have been found to perfectly seal the apex from periapical tissues, super-EBA has been recommended for its tissue compatibility and excellent healing.[21,22,23] The use of super-EBA as the root-end filling material in this study achieved a success rate of 64.3% as against 88.5% when retrograde fillings were not included. The results corroborate the findings that leakage from the canal may occur in spite of the retro-fillings either through the margin or through the dentinal tubules.[20]

The general success rate of this study (80.0%), is consistent with the upper limits of different cited reports; 46-95.2%[24] and 53-98%[25]. This wide range of success could possibly be due to differences in variables employed in different studies such as case selection and differences in healing evaluation criteria. In this study, cases were classified as successful after one year in the absence of clinical signs and symptoms and radiographic classification of complete and incomplete healing, as suggested by Grung *et al* [9] and Molven *et al* [18]. The incomplete healing category (scar tissue) was characterized in this study by a decreasing

rarefaction generally located asymmetrically in relation to the root apex.[11]

The uncertain/doubtful healing group may progress later to complete healing radiographically which may further increase the success rate. If there is loss of both buccal and palatal bone around the root, the defect may be filled with fibrous tissue and complete bony regeneration may not occur.[17] A proportion may progress to failure hence increasing the existing failure rate of 10% in the long term. Four (10.0%) of the cases in this study failed based on the adopted diagnostic criteria used in this study. Among these, one conventional re-treatment was performed and three referred for extraction and prosthetic replacement. The clinical findings associated with these cases were pain, discharging sinus, mobility and/or tenderness to percussion. Radiographically, the cases showed increased or no change in the periapical lesion when compared with pre-operative radiographs. Whilst all of these features make the diagnosis of failed surgical case very easy, the actual cause of the failure is oftentimes elusive. The fact that the majority of the failures exhibited pain, mobility, discharging sinus, or tenderness to percussion would tend to indicate the possible persistence of specific anaerobic micro-organisms as a major cause of failure.[26,27]

CONCLUSION

There was no significant difference when apicectomy procedures were performed with or without root-end filling. However further studies with larger sample sizes are recommended.

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