International Journal Dental and Medical Sciences Research
Volume 6, Issue 1, Jan-Feb 2024 pp: 451-456 www.ijdmsrjournal.com ISSN: 2582-6018

The Impact of Root Canal Treatment on the Quality of Life of Patients with Symptomatic Apical Periodontitis

Mohamed Adel [1], and Amany Elsaid Badr [2]
[1] BDS ,Department of Endodontics, Faculty of Dentistry, Mansoura University, Mansoura, Egypt.
[2] BDS, MSc, PhD Department of Endodontics, Faculty of Dentistry, Mansoura University, Mansoura, Egypt.
Corresponding Author: Mohamed Adel

Date of Submission: 08-02-2024 Date of Acceptance: 24-02-2024

ABSTRACT: This research paper is about to determine the impact of root canal treatment on the quality of life of patients with symptomatic Apical Periodontitis. Materials, and Methods: Twenty patients were diagnosed with irreversible pulpitis with symptomatic apical periodontitis, and selected from the Faculty of Dentistry, Mansoura University outpatient clinic. The selected patients filled the quality-of-life questionnaire before starting the root canal treatment. The patients received root canal treatment on two visits. After complete canal cleaning, debridement, and temporization in the first visit, they were instructed to fill another three quality of life questionnaires (after 6, 12, and 24 hours of the treatment respectively). The filled questionnaires were collected in the second visit, analysed statistically, the teeth were obturated, and restored. Results: A significantly greater impact after treatment was found for 'average pain felt' item, and other quality-of-life items ($P>0.05$). No significant difference between follow up periods (preoperative, 6 hours, 12 hours, and 24 hours) was found regarding the item 'difficulties with mouth opening'($P<0.05$). Conclusions: Root canal treatment may greatly improve quality of life of demanding patient, this is may be correlated with improvement of pain perception after the treatment.

KEYWORDS: Endodontics, Irrigation, Pain, Quality of Life, Root canal treatment.

I. INTRODUCTION

The root canal treatment is a conservative therapeutic option for teeth with pulpal or peri-radicular pathology, resulting in sustained retention of corresponding teeth.[1] Pain is the most prevalent sign of dental anxiety, and it is a crucial factor in dentistry.[2] The majority of patients seeking dental treatment are in pain, and most of this pain is caused by endodontic, and/or periodontal reasons, with endodontic origins being the most prevalent.[3] Although the fact that root canal therapy prevents long-term pain, post-operative discomfort is common.[4,5] The worry of post-endodontic pain is a prevalent concern among patients, and it is a popular misconception that root canal therapy is the most painful dental procedure.[3]

The prevalence of post-operative discomfort, and pain in the initial one or two days of endodontic treatment varied from 3% to 69.3%.[2] Mechanical, chemical, and microbiological injuries to the peri-radicular tissues are the most common causes of post-operative discomfort.[2,6–8]. Preoperative condition, treatment approaches, and the dentist's experience are also additional factors that affect post-operative pain.[9,10] The pain could be affected by a variety of variables, including the state of the pulp, and peri-radicular tissues, preoperative pain, and the existence of periapical radiolucency.[2,11,12]

Post-operative pain may impair patients' Quality of life (QoL), and impact their subjective assessment of treatment options.[13] QoL is a complicated issue connected to the patient's health, and socioeconomic, and cultural demands in the context of individual expectations, and standards.[14] Patient satisfaction is an essential factor in the supply of oral healthcare[10,13] , and QoL after dental treatment may be assessed using self-assessment tools such as questionnaires.[1] Therefore, the aim of the present study was to determine the impact of root canal treatment on the quality of life of patients with symptomatic Apical Periodontitis.

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II. MATERIALS AND METHODS:

- Ethical considerations:

This study was approved by the ethical committee of the Faculty of Dentistry, Mansoura University (Reference Number: A06071221). The study was performed according to the ethical standards of the Declaration of Helsinki. Before starting, all participants were informed about the nature, objectives, and techniques used in the study. A written informed consent was signed by the patient.

- Subjects: A total of 20 patients were diagnosed with irreversible pulpitis with symptomatic apical periodontitis, and selected from the Faculty of Dentistry, Mansoura University outpatient clinic.
- Case's selection:

Cases were selected based on the following inclusion, and exclusion criteria:

- Inclusion criteria:
  - The age ranged from 18-55 years.
  - Patients of both genders were included.
  - Patients with clinical symptoms of irreversible pulpitis with symptomatic apical periodontitis presenting with sensitivity on tooth percussion. Also, radiographs showing no peri-radicular radiolucency.
  - Positive response to sensitivity cold testing.
  - The affected tooth should be restorable, and be in the mandibular molar or premolar areas.
- Exclusion criteria:
  - Patients out of age range.
  - Patients with hormonal disturbances such as pregnancy, and lactation periods.
  - Negative response to cold sensitivity testing, abscess formation, or apical radiolucency or tooth resorption.
  - Patients with chronic diseases or chronic medication intake.
  - Patients with low education levels or mental disability.
- Procedures:

A full medical, and dental history was recorded for each patient. The patient was asked to fill out the QoL questionnaire by making a pen mark over the answer that was corresponding to the condition of the patient before the treatment procedures. Clinical, and radiographic examination of the offending tooth to confirm the diagnosis of irreversible pulpitis with symptomatic apical periodontitis.

The main diagnostic tests were cold sensitivity test, and percussion test. After local anesthesia injection, a rubber dam was applied, and complete caries removal was carried out. Access cavity preparation was performed. After removal of the coronal pulp, and control of the bleeding, canal scouting, and apical patency were achieved, and working length determination using an electronic apex locator (Root ZX; J.Morita japan, japan) also carried out. Mechanical preparation of the canals was done using rotary shaping files (NiTi Protaper Next rotary files; Dentsply Sirona, USA) with endodontic motor (ENDO-MATE TC2 endo motor; NSK, Japan) according to manufacturer instructions till reaching file X3. (Figure1) After each file, the canal was irrigated using 3 ml of 2.5% Sodium hypochlorite solution with a plastic syringe attached to a side-vented needle (Irrigation Needle; FANTA dental materials, China) of 30 gauge. After finishing the preparation, each canal was irrigated with 3 ml of saline solution (0.9% Sodium Chloride Infusion B.P.; ULTIMATE PHARMA, Alexandria, Egypt) at room temperature to remove remnants of Sodium hypochlorite solution irrigation inside the canal.

All the canals were dried using paper points, then non-setting Calcium hydroxide paste (Well-Paste; VERICOM CO., Korea) was applied inside the canal using injection tip reaching 3 ml short of working length. Confirmed by a radiographic x-ray. A small cotton pellet was applied inside the pulp chamber, and covered by intermediate restoration (Litark; Lascod, Lascod s.p.a, Italy) till the next visit.

- Post-visit instructions:

The patient was asked to fill out three QoL questionnaires, and instructed how to fill them at home at 3 specific times after 6,12, and 24 hours of the treatment, respectively. Avoid taking painkillers till the next visit as much as possible, but if the pain was unbearable, an Ibuprofen 600mg tablet could be taken.

- 2nd visit procedures:

After one week of the first visit, the completed QoL questionnaires were collected from the patient, revised to make sure they were well filled, and kept in an envelope of the experiment with the pre-operative QoL questionnaire with the name of the patient on it. Local anesthesia was administered, isolation using a rubber dam, and removal of intermediate restoration were carried out.

Then, removal of Calcium hydroxide paste, irrigation, and obturation using cold lateral compaction technique with resin-based sealer (Adseal; META BIOMED CO., Korea). The final coronal restoration was done using composite resin (ESTELITE α, Tokuyama Dental Corporation, Japan). (Figure1)

- Statistical analysis, and data interpretation:

Data analysis was performed by SPSS software, version 25 (SPSS Inc., PASW Statistics for Windows version 25; IBM Corp., Chicago, IL,

USA.). Quantitative data were described using median (minimum, and maximum). The significance level was set at 0.05. Friedman test was used to compare between the evaluated data at different periods. Cochrane's Q test testing for differences between three or more matched sets of frequencies or proportions. Spearman's correlation coefficients (rs) were calculated for the determination of the convergent validity of the post-root canal preparation VAS score in relation to the post-root canal preparation OHIP-14 score.

III. RESULTS:

20 patients met the eligibility criteria, and root canal treatment had been carried out on two visits. The results could be summarized in the table (1).

There were statistically significant difference (P>0.05) between pre-operative and post-operative follow up periods, regarding overall quality of life scores and all asked questions except the question asked about "difficulties with mouth opening".

Preoperatively, a statistically significant positive correlation between Pain average since appearance, and Missing work / school (r=0.494, p=0.027), statistically significant positive correlation between experience any difficulties with your daily activities, and Pain average since appearance (r=0.543, p=0.013), statistically significant positive correlation between Overall quality of life score, and Pain average since appearance (r=0.446, p=0.049),

After 6 hours, there is statistically significant positive correlation between Pain average since appearance, and Experience any difficulties with chewing (r=0.494, p=0.027). A statistically significant positive correlation between Pain average since appearance, and Experience any difficulties with sleeping (r=0.636, p=0.003).

A statistically significant positive correlation between Pain average since appearance, and Missed your work / school (r=0.708, p=0.001). A statistically significant positive correlation between Pain average since appearance, and Experience any difficulties with your daily activities (r=0.890, p=0.001). A statistically significant positive correlation between Pain average since appearance, and Social relations, and temper affected by your pain (r=0.834, p=0.001). A statistically significant positive correlation between Pain average since appearance, and Overall quality of life score (r=0.897, p=0.001).

After 12 hours, there is statistically significant positive correlation between Pain average since appearance, and Experience any difficulties with chewing (r=0. 542, p=0. 014). A statistically significant positive correlation between Pain average since appearance, and Experience any difficulties with sleeping (r=0.615, p=0.004). A statistically significant positive correlation between Pain average since appearance, and Experience any difficulties with your daily activities (r=0.473, p=0.035). A statistically significant positive correlation between Pain average since appearance, and Social relations, and temper affected by your pain (r=0.576, p=0.008). A statistically significant positive correlation between Pain average since appearance, and Overall quality of life score (r=0.631, p=0.003).

After 24 hours, no statistically significant correlation between maximum pain felt, and all quality-of-life domains (p>0.05), also between pain average since appearance, and all quality-of-life parameters (p>0.05).

IV. DISCUSSION:

Natural dentition preservation takes precedence over extraction, and replacement of damaged teeth. This might be an aim in restorative procedures, particularly RCT techniques. When determining the success of an RCT, the functional outcomes, and the patient's subjective symptoms, such as post-treatment discomfort, and pain, should be considered since they may impact the patient's QoL, and acceptance of the therapy. Quality of life tools can be tackled through direct or telephone conversations, self-filling questionnaires, or questionnaires filled out by others if the participant that unable to answer the questions himself.

Each survey examines a different category for evaluating quality of life: General wellness, oral health, or particular health, depending on the problem under investigation.[15] On the tooth level, pulpal, and apical pre-operative evaluations have an impact on oral health related quality of life (OHRQoL), and patients who require endodontic treatment for a variety of reasons have a worse OHRQoL. Pre-operative discomfort is a key factor that has a detrimental impact on OHRQoL. A research found that patients with living pulp had considerably higher OHRQoL ratings than those with necrotic pulp.[16]

Some research established the validity, and usefulness of the OHIP-14 tool for oral health= occasionally, 3 = pretty frequently, and 4 = very frequently. The total of the points for the 14 questions yields the final OHIP 14 score, which can range between 0, and 56, with 0 indicating no negative impact, and 56 indicating the most adverse influence on oral health-related quality of life. related quality of life instruments. The respondent

must assign points to each question based on how frequently he is influenced: 0 = never, 1 = seldom, 2

A study claimed that the OHIP-14 is a reliable tool for measuring OHRQoL of dental care requirements as a result of caries, and trauma among rural Nigerian children.[17] The other study indicated that the OHIP-14 measure is reliable, valid, and responsive to third molar clinical improvements when used to evaluate OHRQoL in general dentistry practice.(18) The next one indicated that OHIP-14 works correctly in dental patient samples but is restricted in non-dental patient samples, and that it is also impacted by cultural context, and maturity.[19] Another is a psychometric network analysis, and the use of OHIP-14 structure validation in Indigenous, and non-Indigenous people.[20]

In certain studies, quality of life questionnaires can be modified to aid in the research of the issue of concern; this adaptation is applied on the OHIP-14 form to achieve the optimum instrument for the study.[21–24] This study results revealed that root canal treatment can affect positively the patient's quality of life either in pain perception or other quality of life aspects including overall quality of life score, except for mouth opening module, nearly same results had been proven in other studies[5,25,26]. The results also found a positive correlation between Pain scores, and many quality-of-life modules especially overall quality of life score after 6 hours, and 12 hours after the treatment.

V. CONCLUSION

Root canal treatment may greatly improve quality of life of demanding patient, this is may be correlated to improvement of pain perception after the treatment.

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		PRE-OPERATIVE	6 HOURS.	12 HOURS	24 HOURS	Friedmann test , p value	Cochrane test , p value
Pain average		6(1-9)	4(1-7)	3(0-5)	2(0-3)	<0.001*	-
Mouth opening	0-NOT AT ALL	9(45)	5(25)	8(40)	12(60)	-	0.166
	1-VERY LITTLE	8(40)	11(55)	8(40)	6(30)		
	2-SOME	3(15)	4(20)	4(20)	2(10)		
	3-QUITE A BIT	0	0	0	0		
	4-VERY MUCH	0	0	0	0		
Chewing	0-NOT AT ALL	0	0	0	2(10)	-	<0.001*
	1-VERY LITTLE	0	10(50)	14(70)	18(90)		
	2-SOME	5(25)	7(35)	6(30)	0		
	3-QUITE A BIT	5(25)	3(15)	0	0		
	4-VERY MUCH	10(50)	0	0	0		
Speaking	0-NOT AT ALL	12(60)	18(90)	20(100)	20(100)	-	<0.001*
	1-VERY LITTLE	6(30)	2(10)	0	0		
	2-SOME	2(10)	0	0	0		
	3-QUITE A BIT	0	0	0	0		
	4-VERY MUCH	0	0	0	0		
Sleeping	0-NOT AT ALL	0	4(20)	8(40)	16(80)	-	<0.001*
	1-VERY LITTLE	0	7(35)	12(60)	4(20)		
	2-SOME	2(10)	7(35)	0	0		
	3-QUITE A BIT	4(20)	2(10)	0	0		
	4-VERY MUCH	14(70)	0	0	0		
Missed work/school	0-NOT AT ALL	6(30)	14(70)	20(100)	20(100)	-	<0.001*
	1-VERY LITTLE	0	2(10)	0	0		
	2-SOME	6(30)	4(20)	0	0		
	3-QUITE A BIT	6(30)	0	0	0		
	4-VERY MUCH	2(10)	0	0	0		
Daily activities	0-NOT AT ALL	2(10)	10(50)	18(90)	18(90)	-	<0.001*
	1-VERY LITTLE	2(10)	2(10)	2(10)	2(10)		
	2-SOME	4(20)	8(40)	0	0		
	3-QUITE A BIT	6(30)	0	0	0		
	4-VERY MUCH	6(30)	0	0	0		
Social relation/ temper	0-NOT AT ALL	3(15)	8(40)	16(80)	18(90)	-	<0.001*
	1-VERY LITTLE	3(15)	8(40)	4(20)	2(10)		
	2-SOME	8(40)	2(10)	0	0		
	3-QUITE A BIT	1(5)	2(10)	0	0		
	4-VERY MUCH	5(25)	0	0	0		
Overall QOL		17(5-24)	5(1-14)	3(1-6)	1(0-5)	<0.001*	-

Table (1): Pain, and quality of life scores over the evaluation periods:
***indicates statistically significant difference at P<0.05**

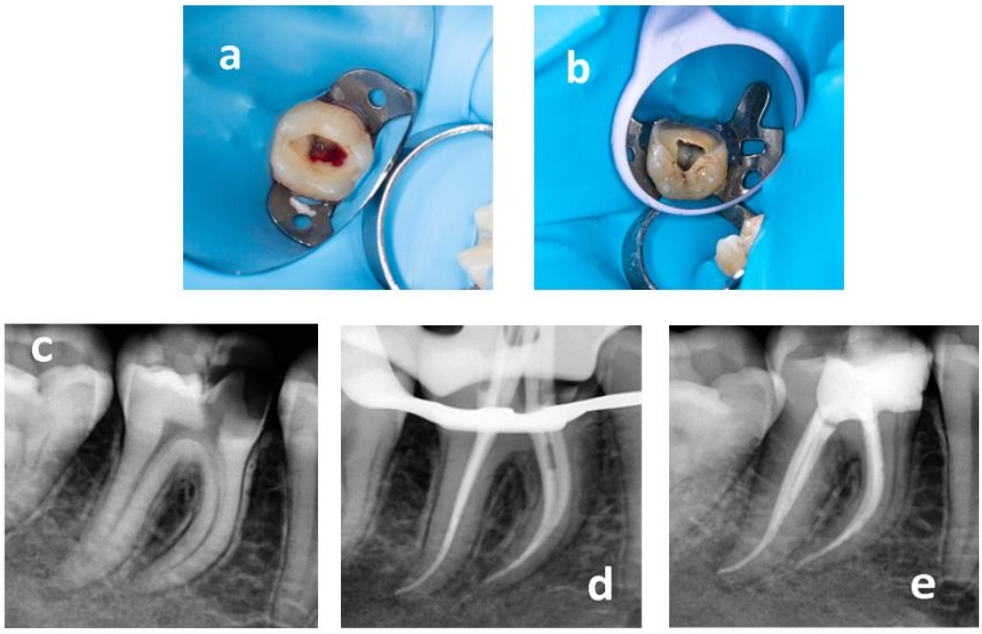

Figure1 : Steps of root canal treatment had been done during the study work,

(a) Clinical picture showing the bleeding from the pulp as a prove of pulp vitality, (b) An isolated tooth after cleaning , and
(b) shaping,(c,d,e) Radiographic pictures showing steps of root canal treatment : pre-operative, master cones confirmation, and obturation.