

REDUCTION OF FLARE-UP IN ROOT CANAL TREATMENT: AN IMPROVED TREATMENT

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Abstract

Flare-up in root canal treatment (RCT) is considered an alarming issue at the Kangar Dental Clinic. It causes patients to experience severe pain or swelling, leading to an impromptu visit to the clinic in distress. This quality improvement study aimed to reduce the flare-up during RCT in Kangar Dental Clinic to $\leq 10\%$ in 12 months. The 6-month census from January 2016 to June 2016 showed an incidence rate as high as 70%. The contributing factors identified were the use of improper RCT technique (96%), inter-appointment duration of more than 30 days (88%), and poor awareness and knowledge among dental personnel on recent techniques (70%). These findings were collected from the patient's card, RCT assessment form, and appointment book. Remedial measures were implemented from July to December 2016, followed by a re-evaluation from January to June 2017. A flowchart of RCT was developed via the use of rubber dam for tooth isolation, 2.5% sodium hypochlorite (NaOCl) as irrigation solution, side-end needle irrigation tip, crown-down technique application, radiographic assessment, and 0.2% chlorhexidine (CHX) as intracanal medicament. A checklist was developed and monitored to ensure that all procedures were followed. The appointment scheduling system was also improved to ensure the patient's next visit is scheduled within 30 days. The post-intervention study showed a successful reduction of flare-up by 6%, which was further sustained at 4% and later to 5% incidence, as observed in the subsequent year. In conclusion, the intervention strategies were successful in reducing the flare-up incidence in Kangar Dental Clinic.

KEYWORDS: Root canal treatment, Flare-up, Quality improvement study

Problem

Root canal treatment (RCT) or endodontic treatment is a common procedure in every dental clinic. More than 25 million root canal treatments are performed annually by dentists worldwide (1). In Malaysia, more than 3,000 teeth were endodontically treated in 2016 (2). RCT is a process of cleaning, shaping, disinfection, and sealing of the canal from bacteria, which then promotes periradicular tissue healing. However, one of the disadvantages of performing RCT is that it carries the risks of a flare-up.

Flare-up is defined as pain or swelling of the facial soft tissues or oral mucosa in the root canal area of the treated tooth (1,3-4). It can happen immediately after the procedure or later. According to many researchers, flare-up incidence in RCT varies from 1.4% to 20% (5-7). In Malaysia, there was no study reported on the incidence of flare-up; however, Kangar Dental Clinic (KDC) has had flare-up cases as high as 28 out of 40 patients (70%) from January to June 2016. This triggers a red alarm when there is at least one patient a week who will turn up to the clinic due to pain and discomfort after RCT.

Pain and discomfort in RCT, if left untreated and disregarded, can lead to severe problems such as acute orofacial swelling, which is mainly caused by an infection that is improperly treated during RCT. Such incidents are considered as medical emergencies. The high incidence of flare-up has led to prolonged RCT, as well as increased workload and cost of health care. Although there is a range of severity of signs and symptoms, they are not life threatening. They tend to be localised and usually, they do not involve structures other than oral and perioral. However, occasionally, the flare-up may be complicated. It may spread to facial spaces and even has regional temporary paraesthesia, in which both patient and dentist would wish to avoid the mishap (8).

KDC is one of the dental clinics in the district of Kangar, Perlis, a state in the northern part of Peninsular Malaysia. It has 84 staff, where 20 of them are dental officers, 18 are dental assistants, and the remaining are dental therapists, technicians, and supporting

staff. All dental officers in KDC have the privilege to perform the RCT procedure. New dental officers with less than one year of service must work under close supervision of the senior before they are credentialed to handle cases on their own.

KDC serves a population of approximately 300,000 people. It is equipped with five dental chairs, with four units for primary care and one unit for Periodontal Specialist Clinic. It is supported by a laboratory technician and one sterilisation room. This clinic has been appointed as an Endodontic Primary Care Clinic (EPCC) in Perlis, whereby it received RCT referrals from other primary dental clinics. The referral is indicated when the Restorative Dentistry Index of Treatment Need (RDITN) guideline score is 1 and 2. The RDITN has three scores: 1, 2, and 3. If the index is 1 or 2, the EPCC will take the case. If the index score is 3, the dental officer will refer the case to the Restorative Specialist. This guideline has been practiced in Kangar since 2015 for all restorative work, including RCT. KDC caters to approximately 10,000 patients per year, making it a primary dental clinic with the highest workload in Perlis.

Verification study showed 70% of which 28 out of 40 patients developed flare-ups. Most of the flare-ups occurred due to improper therapeutic procedures and incompetent dental personnel. The alarmingly high incidence of flare-up indicated an urgent need to find a solution for this issue, hence, consensus among the group members to formulate a study aimed to achieve the standard of $\leq 10\%$.

Background

Flare-up is a well-known risk of RCT. Unfortunately, its numerous preventive procedures are still being neglected. The prevention of this problem is crucial, as it causes unpleasant patient experience or worse, orofacial swelling, which is regarded as a medical emergency; this will create a misperception of clinician competency. To date, there is only one single tool established for the flare-up measurement, which is the Flare-up Index Questionnaire (FUI-Q) (3).

The global incidence of a flare-up in RCT ranges from 1.4% to 20% (5–7). The development of flare-up comprises significant pain and swelling, which can occur for a few hours to a few days after RCT. The intense pain will require the patient to make an impromptu visit for immediate treatment (5–7).

Iqbal et al. (9) reported that properly identified risk factors combined with clinician experience can improve patient management postoperatively. Causes of a flare-up are polyetiological and mostly influenced by mechanical factors (e.g., over-instrumentation, overfilled the root canal), chemical factors (e.g., irrigants, intracanal medicament, sealers) and microbiological factors (e.g., high bacteria bioburden such as that known in the case of poor dental hygiene), all of which contribute to its appearance (8).

A proper preoperative diagnosis of the tooth in concern is important, as a previous study had shown that preoperative pain is one of the major risk factors of a flare-up (8). The first visit of RCT is an important stage, where it can reduce the incidence of a flare-up when handled well (9). Many approaches and strategies have been attempted to reduce the incidence of a flare-up. Some involved strict aseptic technique and complete debridement using the crown-down technique. A study reported that the use of the crown-down technique is able to minimise extrusion of debris and necrotic pulp out of the root canal system (8). Based on the endodontology consensus report (10), this technique produces superior cleaning and shaping than the conventional one (i.e., step-back technique).

The use of a proper irrigation solution is crucial for achieving optimum cleaning of the root canal system. The use of copious and frequent irrigation using 2.5% sodium hypochlorite (NaOCl) is a must, as NaOCl is more potent in cleaning and disinfecting the root canal system (11). Placement of antimicrobial intracanal medications at inter-appointment is mandatory. Currently, 2% chlorhexidine solution is known as a potent intracanal medicament and is more effective

compared to calcium hydroxide to combat many virulent bacteria in the canal system such as *Enterococcus faecalis* (12). Following placement of intracanal medicament, a proper corona seal is mandatory to prevent direct reinfection of the root canal system if left open (13).

Psychological management (13), which is a critical aspect of treatment, involves reassurance and a good local anaesthetic. The patient must be made comfortable by breaking the pain cycle prior to the start of RCT. Furthermore, explaining the RCT and the risk of undergoing RCT is a must to the patient. Among the key strategies to improve RCT is through continuous public education. Another study conducted in the United States of America cited that to increase awareness among patients, continuous dental education to the public via pamphlet, video, or talk on RCT is paramount (14).

Measurement

In view of the alarmingly high flare-up incidence (70%) during the verification study from January to June 2016 in our setting, the urgency for intervention was identified. A questionnaire was developed to evaluate the flare-up's clinical criteria, which allows the patient to precisely describe those manifestations (Table 1). The criteria of flare-up used in the study were based on Rimmer et al. (3). Assessment of flare-up was done by using the RCT assessment form. In this form, there is a section of the flare-up questionnaire (FUQ). The section will be filled in whenever a patient comes in for an unscheduled visit. Scoring of the flare-up was done by operators who had treated the patient. A flare-up is indicated if the score is equal to or more than four. Apart from that, a questionnaire was developed and administered to identify the knowledge among the dentists and dental assistants; the results of the study showed 70% of them had poor knowledge on the recent technique of performing RCT. In this knowledge assessment, the score of more than 80% signified them as knowledgeable operators.

Table 1: Flare-up Questionnaires (FUQ)

Criteria	Finding	Finding Up Score* (Range: 0–7)
Intense Pain	No	0
	Yes	1
Number of days pain	0 day	1
	1–2 days	2
	3 days and more	3
Analgesic	Not taken	0
	Taken	1
Unscheduled dental visit	No	0
	Yes	1
Emergency treatment rendered	No	0
	Yes	1

*A flare-up is indicated if the total score equals to or more than 4.

The primary outcome of this study was the percentage of a flare-up in RCT. It was calculated as the number of patients who developed flare-ups over the total number of patients who underwent RCT. In this study, a flare-up incidence of less than 10% was selected as standard based on a study by Udoye et al. (2011), which matched the clinical setting, clinician experience, and target groups of this research.

Internationally, the lowest standard set for flare-up is 1% (8). However, based on the state service approval, the standard set is equal to or less than 10%, which is in accordance with some limitations such as basic dental facilities without advanced technology, inadequate clinical experience, and limited resources.

All patients that underwent RCT in KDC were enrolled during the study period. However, patients with special needs, limited mouth opening, and those with a known allergic reaction to materials used in RCT were excluded. A six-month verification study was conducted from January to June 2016. During this period, a total of 60 patients were enrolled for RCT cases in KDC, of which 40 patients were indicated for assessment due to their fulfilment of the inclusion criteria for the study. Out of 40 patients, 28 of them (70%) had experienced a flare-up. Twenty-four patients had flare-ups at the inter-appointment time and only four were at the post-operative stage, which is defined as pain that occurred after initiation or continuation of root canal treatment.

Initial Assessment of the Problem

According to the problem analysis chart, some factors contributing to the increased incidence of a flare-up are shown in Figure 1.

The RCT/RDITN assessment was performed via observation by the Quality Assurance (QA) team member using RCT/RDITN assessment form. Operators need to follow all required steps listed in the assessment form to be considered as total compliance with the procedure. Out of 21 dentists, 95% (n=20) of them practiced improper techniques and were not fully compliant with the required RDITN criteria. The majority of the operators did not use rubber dams, in which they performed step-back techniques for canal preparation, using normal saline as irrigation solution, using improper type of irrigation needle, and delayed placement of a permanent restoration.

During the verification study, 88% (n=35) of patients were documented to be given an inter-appointment time of more than 30 days and consequently, 69% (n=24) of these patients came back with a flare-up.

Based on verification data analysis, the risk factors contributing to flare-up were low adherence to RCT guidelines, long inter-appointment time, and poor knowledge among dental personnel. A pre-test was done on all 80 dental personnel to determine their knowledge of root canal treatment; the passing mark was 80% and above. Out of 80 staff, only 26 (32.5%) of them passed the pre-test; the remaining 54 (67.5%) had failed the pre-test. After reviewing the current process of root canal procedure in KDC, the refined flowchart (Figure 2) elaborated each step, emphasising on the critical steps (based on two broad areas) that can aid in reducing flare-ups.

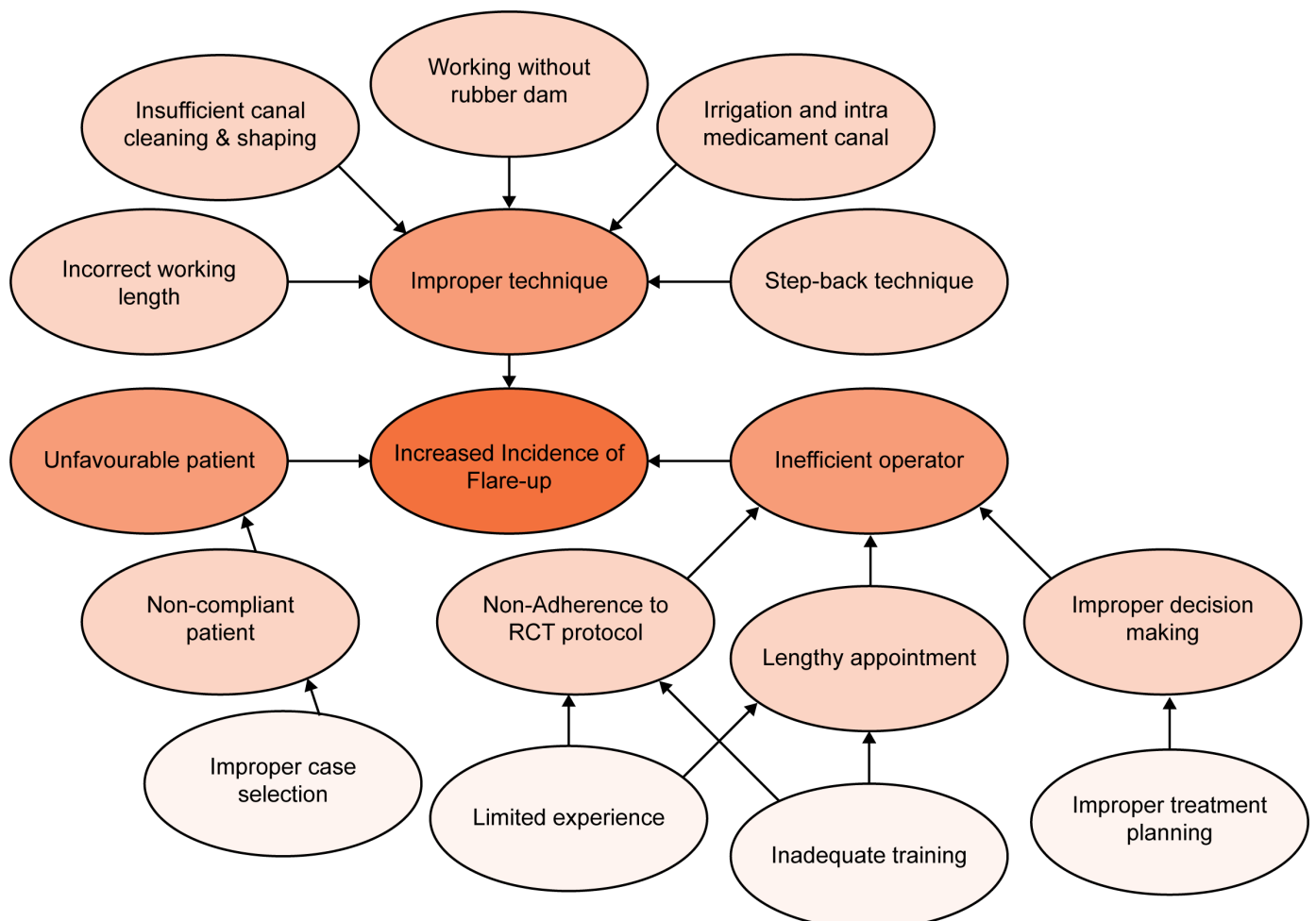


Figure 1: Cause effect analysis diagram

1. Examination and diagnosis stage, where the patient is examined and assessed for suitability to undergo RCT using RCT/RDITN assessment form. The form is divided into four sections: patient's detail, checklist of RCT procedural steps, flare-up questionnaire (FUQ), and RDITN. RDITN score is a tool to determine the complexity of the RCT case, which is divided into three scores (score 1 - low, score 2 - medium, score 3 - high). Cases with scores 1 and 2 will be managed in the primary care setting, whereas those with score 3 will be referred to Restorative Specialists. If the tooth is not indicated for RCT (e.g., poor prognosis: minimal tooth structure left, mobile tooth, and poor dental hygiene), thus, tooth extraction is indicated. In accordance with the existing practice, a preoperative radiograph was taken prior to the start of RCT to help determine the suitability of case selection regarding the complexity of the case. This is to determine whether the tooth can be treated by a dental officer or should be referred to a Restorative Specialist.
2. A prescheduled appointment that consists of several visit dates is given to the patient based on the complexity of the case (e.g., multi-rooted tooth, blockage canal). This is to ensure that the inter-appointment period was given at least within two weeks and to allow the intracanal medicament to work at full strength (15).
3. When RCT is indicated, local anaesthesia (LA) will be administered prior to the access within the cavity. The prolonged analgesic effect can help to calm the patient, as it breaks the pain cycle by blocking the sensory nerves.
4. Next, rubber dam placement for tooth isolation is mandatory, as this maintains the aseptic chain during the intracanal procedure. The microorganism is the major causative agent for flare-ups. Thus, clinicians should be aware of the need to perform RCT under strictly aseptic conditions.
5. Selection of instrumentation technique during the canal preparation that extrudes less amount of debris apically is paramount in preventing the flare-up. The crown-down technique must be implemented to remove the tissue remnants and bacteria from the canal space. While performing the canal preparation, it is essential to reach the endpoint of the root canal. One of the iatrogenic factors causing the flare-up is preparation exceeding the canal system due to the incorrectly measured working length of the canal system. Due to such an incident, prior to canal preparation, the working length of the canal is determined using a preoperative radiograph and apex locator.
6. Copious and frequent irrigation with correct solutions during canal preparation is a crucial procedure. A 2.5% sodium hypochlorite canal irrigation solution is used which is administered by using a syringe with a side end needle irrigation tip. This procedure significantly enhances the removal of necrotic pulp and debris in the canal system.
7. The antimicrobial intracanal medicament is essential in controlling flare-ups. The canals are then placed with 0.2% chlorhexidine gel/ solution as intracanal medicament.
8. A proper seal of the tooth access cavity with a temporary restoration in between appointments is important to prevent recontamination of the canal system. Thus, a good provisional restoration material is needed (e.g., Cavit, Kalzinol, IRM).
9. If there is no sign and symptom during the following appointment, the canal system is permanently sealed with a rubber-like material called gutta-percha. The RCT is now deemed complete.
10. A permanent restoration will be placed immediately after completion of RCT using available dental cement (e.g., composite and amalgam).
11. Management in the psychological aspect of the patients by reassurance is critical, perhaps the most important aspect of treatment. Reassurance, or counselling sessions, will be given by dental officers to patients prior to the start of RCT. Previously, this step was not properly addressed by operators. Thus, it was added as one of the interventions in this study. When the flare-up occurs, the patient is predictably and understandably upset and shaken by this episode. They may assume that the treatment was unsuccessful and that the extraction is needed. The dentist must explain that the situation is a risk of undergoing RCT and can sometimes occur but remain treatable.

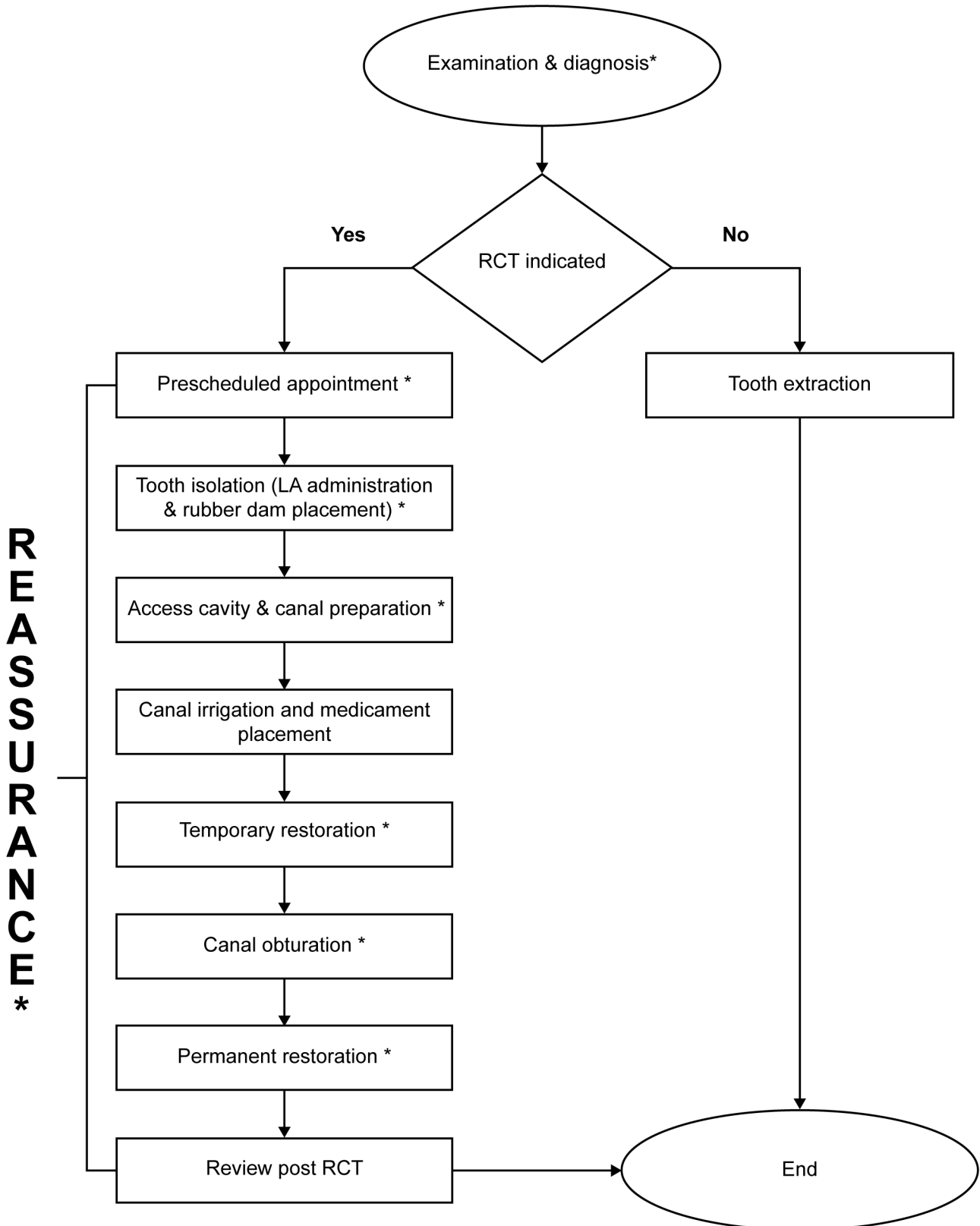


Figure 2: Flowchart of workflow on root canal treatment (* indicates critical step).

Strategy

A few strategies of change were implemented, aiming at improving the model of good care in the post-intervention period from July to December 2016.

A new RCT standard operating procedures to address the technical aspect was introduced based on Guidelines for Root Canal Treatment by European Society of Endodontology (16). All the operators must use a rubber dam during the procedure to ensure the practice of aseptic technique. Next, the irrigation solution was changed from normal saline (NaCl) to 2.5% sodium hypochlorite (NaOCl) (17). The NaOCl is the most effective, inexpensive readily available chemical. It is considered to be the most optimal irrigant to be used in root canal treatment as it has antibacterial and proteolytic activity. The proper effective concentration of NaOCl ranges from 2.5% to 5.25%. The negative properties of NaOCl are that it can cause soft tissue inflammation if passed outside the confined root canal. When it comes into contact with vital tissues, an acute inflammation followed by necrosis occurs. The severity of the complication depends on the concentration of the solution, its pH, and its duration of exposure. Sodium hypochlorite has a pH of 11–12.5 which causes injury by oxidation of proteins. Higher concentrations have some irritating effects on the periodontal ligament (18). Complications with the use of sodium hypochlorite can be avoided using specialised needles, avoiding excessive pressure, and not wedging the needle tip in the canal. Normal saline is ineffective in cleaning the root canal system, as it has no antimicrobial properties. In order to guarantee that the dental assistant is able to dilute the sodium hypochlorite at the correct concentration, a dilution form was constructed so that the operator can monitor it (Appendix 1). The irrigation needle was changed from an end-type needle to a side-end needle. This helped prevent the extrusion of irrigation solution out of the canal systems (11). In addition to the technical aspect, a

combination of radiograph and apex locator was used to determine a correct working length accurately. The crown-down technique was adapted to improve the quality of preparation of the root canal system. The step-back technique, which was used conventionally to clean up and to shape the canal, was shifted to the crown-down technique in this study. The crown-down technique, which differs from the step-back technique in terms of the use of Ni-Ti files, has some benefits such as less canal transportation, less post-treatment pain, and less crack propagation in instruments. Prior to the conduction of this study, step-back technique was opted by the majority of operators in Perlis, as there were limited supplies of Ni-Ti files, a problem that is now considered to be resolved. Besides that, because of the weakness of calcium hydroxide as an intracanal medicament (4,16-18), 0.2% chlorhexidine gel/solution was substituted as a recent material used.

The next intervention was the introduction of patients' prescheduled appointments where the follow-up appointments were planned ahead to ensure that interval appointments are set within 30 days. The appointments were recorded manually in the appointment book, in which the dental assistant will then remind the patient by phone a week prior to the appointment date given. RCT pamphlet was developed, which comprises the procedure, advantages, and disadvantages of RCT. These approaches help patients to have a better understanding, hence, better compliance and tolerance towards the treatment.

Finally, continuous dental education (CDE) sessions for dental officers and dental assistants were carried out, which involved theoretical and practical lessons, followed by an assessment. All CDEs were given by the senior dental officer and restorative specialist, which focused on RCT procedure, new or updated technique and material, correct dilution of irrigation solution, RDITN guideline, and method of using the RCT assessment form.

Theoretical and practical assessments were performed on the personnel involved. A total of two assessment sessions were carried out with 40 personnel covered. Theoretical assessments were conducted where personnel involved were graded by a questionnaire given. The similar questionnaire was administered to all 80 staff to determine their understanding of how the root canal treatment was done with the passing mark set at 80%. The post-test result showed all dental personnel (n=80) had passed the post-test with an achievement of more than 80%. The sessions were later followed by a practical assessment on the topics delivered by a

Restorative Specialist. Upon passing both theoretical and practical assessment with additional two RCT procedures performed under the supervision of senior dental officers and Restorative Specialist, dental officers were considered privileged to perform the RCT.

Results

The post-intervention analyses were conducted after the implementation of the remedial actions. All criteria in the model of good care (Table 2) showed an improvement after the intervention.

Table 2: Model of good care for reducing flare-up in root canal treatment

No	Procedure	Criteria	Standard	Pre-remedial	Post-remedial
1.	Examination and diagnosis	• RCT assessment form	100%	5%	100%
		• RDITN guideline	100%	5%	100%
		• Preoperative radiograph	100%	100%	100%
2.	Prescheduled appointment	• Appointments scheduled within 30 days	100%	5%	100%
3.	Tooth isolation	• Local anaesthesia (LA) administration	100%	5%	100%
		• Rubber dam placement	100%	5%	100%
4.	Cavity access and canal preparation	• Correct working length	100%	100%	100%
		• Using crown-down technique	100%	5%	100%
5.	Canal irrigation and medicament placement	• Using 2.5% sodium hypochlorite solution	100%	5%	100%
		• Irrigation using side end needle	100%	5%	100%
		• Placement of intracanal medicament, e.g., 2% chlorhexidine gel/solution	100%	5%	100%
6.	Temporary restoration	• Placement of provisional restoration using available temporary cement, e.g., Cavit, Kalzinol	100%	100%	100%

7.	Canal obturation	● Using gutta percha and sealer.	100%	100%	100%
8.	Permanent restoration	● Placement of permanent restoration immediately after RCT completion e.g., composite, amalgam	100%	85%	100%
9.	Reassurance	● Explanation on the risk of flare-up and other possible consequences to patients at every visit.	100%	5%	100%

From the table, the post-intervention result showed that 100% of the operators comply with all the RCT standard procedural steps except for the placement of permanent restoration following obturation (85%) due to unexpected mishap events such as broken instruments, time constraint due to multi-rooted tooth factor or equipment breakdown. Patient compliance is 100% when a prescheduled appointment was adopted. The accuracy of the data collection was ensured by having only one person collecting the data, which subsequently will be counter-checked by the restorative specialist to justify the data integrity.

Post-intervention study revealed a tremendous reduction of flare-up from 70% (January to June 2016) to 6% (January to June 2017). The first re-evaluation of six months from July to December 2017 showed that the flare-up percentage further dropped to 4% which was better than the standard set ($\leq 10\%$). In the following year, the second re-evaluation marked only 5% of flare-up incidence reported. (Figure 2).

This result concluded that the remedial actions planned successfully brought down the incidence of a flare-up in RCT.

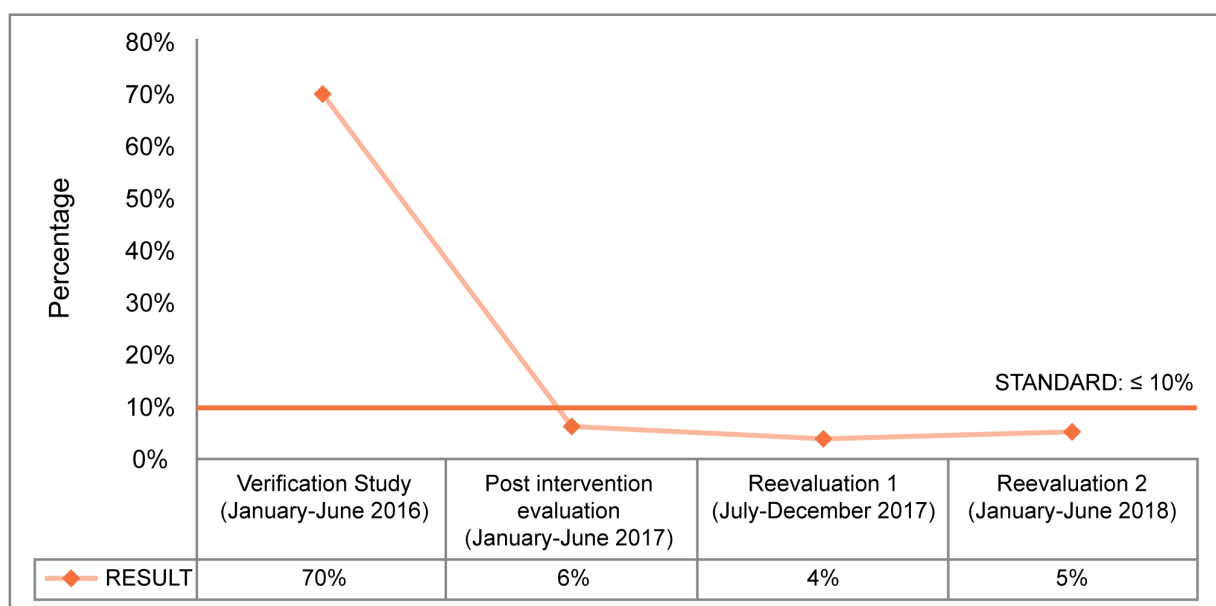


Figure 3: Percentage of flare-up case in Kangar Dental Clinic

Lessons and Limitations

Implementation of all study interventions has led to a remarkable reduction of flare-up incidence and yielded a sustainable result in subsequent re-evaluation. Additionally, the interventions were able to minimise the total cost needed for RCT. During the pre-intervention study, the total cost calculated to purchase the RCT materials (e.g., 0.2% chlorhexidine gel/solution, ProTaper files, apex locator, rubber dam set, and sodium hypochlorite solution) was RM 5,000.00 for a basic RCT set-up modality at Kangar Dental Clinic in the year of 2016. During post-intervention, the expenditure was also minimised to RM 2,000.00 yearly (rubber dam set and apex locator), thus amounting to RM 30,000.00 of cost saving in a 10-year projection.

The added values experienced by conducting this study included improvement in inter-and-intra-departmental communications, systematic arrangement of instruments and materials, organised documentation, and service delivery. Improved communication skills between healthcare providers and patients had led to the alleviation of anxiety symptoms related to unpleasant and painful experiences (19). In addition, this research also proved to be able to enhance rapport with patients, hence, increasing their compliance with the treatment. This also motivates patients to adhere to their appointments. It was learnt that every procedure must be in accordance with evidence-based dentistry (10).

Despite the researchers' enthusiasm, this study encountered several problems when the implementation was extended to other dental clinics. The most challenging part was that the other clinics have inadequate up-to-date instruments (e.g., apex locator, X-ray facility, hand ProTaper) to start a proper RCT. Hence, to meet the standard of RCT procedure, the cost was increased by one-fold. Moreover, it was also a challenge to convince the senior staff to embrace the new protocol of RCT in the clinic. The interventions implemented in this study were considered worthy enough to be practiced by primary

clinics in Perlis and nationwide due to the comparable facilities as the Kangar Dental Clinic. Continuous update of RCT course to the Deputy State Health Director (Dental) of Perlis's management office in terms of cost-effectiveness and clinical outcomes will encourage the management to continue supplies of instrument and basic needs, as required in the interventions listed in this study.

This study would never have achieved its goal without the full support of the Deputy State Health Director (Dental) of Perlis, Perlis Restorative Specialist Unit, and the commitment from everyone involved directly or indirectly in this project. Since this study ensured the involvement of all related parties throughout the process, group discussion sessions, and considered the collective views of the team members in designing the implementation process, it has successfully resulted in a sustainable and user-friendly procedure, leading to improved delivery and patient care.

Conclusion and the Next Steps

Flare-up is a well-established and widely-studied issue in dental practice. It is common and has been reported to occur between 1.4% to 20% in other centres (5,8). In Kangar Dental Clinic, the flare-up incidence was found to be alarmingly high at 70%, thus presenting the need for interventions to be carried out. With specific interventions, the incidence of flare-up was able to be improved to 6%, which was comparable to the international standard mentioned above.

The study had revealed the contributing factors leading to a flare-up of RCT in this facility. Thus, specific interventions were identified and implemented to overcome the contributing factors. The flare-up incidence was able to be maintained below the standard set with full commitment at all departmental levels to comply with intervention strategies, continuous efforts, and great teamwork. Compliance with standard RCT procedure shall be continuously monitored to ensure the long-term sustainability of the achieved outcomes. Furthermore, this study allows

participation, contribution, and suggestions as a proactive approach in addressing issues promptly to give better outcomes in achieving long-term goals of zero flare-up target in all dental clinics in Perlis. In view of the success of this initiative, a guideline of root canal treatment has been endorsed by the Perlis Public Health Dental Specialist and distributed to all primary care dental clinics in Perlis, hence, the authors of this study would like to bring this initiative to the national level for replication in the near future.

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Conflict Of Interest

The authors declare that there is no conflict of interest.

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Appendix 1

Sodium Hypochlorite Dilution Form

UNIT KEPP (KLINIK ENDODONTIK PERGIGIAN PRIMER) KP KANGAR			
Bil :		Tarikh :	
Nama Persediaan	Larutan Sodium Hypochlorite (2.5%)		
Kekuatan	2.5%		
Kuantiti	1 liter		
Bahan-bahan	Kuantiti	Tandatangan Penyukat	Tandatangan Penyemak
Sodium Hypochlorite (2.5%)	25ml		
Distilled water	1000ml		
PROSEDUR PERCAMPURAN		DISAHKAN OLEH	
1. Sukat sodium hypochlorite			
2. Selaraskan isipadu akhir			
3. Masukkan ke dalam bekas dan label			
Disediakan oleh		Disemak oleh	
Kod Persediaan		Tarikh luput	
Contoh Label			