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Assessment of the Prognosis of Root Canal Therapy Completed at PIDC in 2012: A Cross Sectional Survey

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Abstract

Aim: The aim of the study was to evaluate the prognosis of root canal treatment done in the year 2012 in Penang International Dental College (PIDC), a 10 year retrospective institutional study and to identify the rate of success of root canal treatment performed by faculty members and students of the institution.

Methodology: This retrospective cohort study involved a total of 136 respondents whose case files were collected and were interviewed telephonically for the follow up of 198 root canal treated teeth of those patients who came to the clinic in the year 2012, out of which 121 teeth could be followed up with and 77 teeth could not be followed up with due to the failure of reaching out to those respondents. A simple random sampling was conducted and data was collected from patients who gave consent. Information about the root canal treated tooth such as extractions, pain, swelling and infection, were collected and reasons regarding the extractions and retreatment were recorded. These reasons were considered to be failures of the root canal treatment while an intact tooth which did not require retreatment, extractions or experience any pain after 3 months of treatment were considered to be a success. The success and failures of root canal treated teeth were manually calculated and results were tabulated.

Results: The results were calculated based on number of teeth that underwent root canal treatment of those patients who were reachable. The number of teeth of female patients was 61 and male patients were 60 giving a total of 121 patients who were reachable, out of which 49 teeth were treated by faculty members and 72 teeth were treated by students. The reasons of failures were recorded as pain (faculty = 3 teeth, students = 2 teeth) giving a percentage of 4.1% total, swelling (0%), extracted (faculty = 5 teeth, students = 6 teeth) giving a percentage of 9.1% total, retreatment (faculty = 4, students=2) giving a percentage of 5.8% total and infection (faculty = 1, students = 0) giving a percentage of 0.8%. Total of 97 teeth were successful (80.2%) and a total of 24 teeth were failures (19.8%).

Conclusion: The 10 year retrospective study of the success rate of root canal treatment done in the year 2012 in PIDC is 80.2%.

Keywords: Root Canal Treatment; PIDC; Success; Failures

Introduction

This study pertains to the 7 years prognosis following root canal treatment done in Penang International Dental College (PIDC) in 2012. The recognition of dental health as an important aspect of overall health began ever since WHO expanded the definition of health in 1948 to mean "a complete state of physical, mental, social well-being, and

not just the absence of infirmity". Following the changes, the concept of dental health has changed over time from the biologist approach to the social and psychological approach which takes into account other roles of oral cavity as the influence it has in self-esteem, communication and interaction and facial aesthetics. Endodontics is the branch of dentistry that specialises in dealing with the cause, diagnoses, prevention and treatment of diseases of the dental pulp. The aim of endodontic therapy is to maintain tooth function, in particular to remove the dental pulp and to clean, shape and to obturate root canals to prevent infection or re-infection. The most common endodontic treatment done is root canal treatment, which is done on patients suffering from infected teeth which can cause very painful dental abscess. Root canal treatment is done as a multi-step treatment process that begins by injecting local anaesthesia, isolation followed by access opening, cleaning and shaping of the canals and finally obturation using gutta-percha and root canal sealer, which will prevent the bacteria from entering this space again. Finally, crown or restoration should be placed in order to restore full function of the tooth. All these steps are done over a course of multiple appointments based on healing response.

A recent retrospective study evaluating the outcomes of root canal treatment (RCT) after 5 years was done in Hospital Universiti Sains Malaysia Dental Clinic [1]. The research involved 333 randomly selected patient records at the HUSM Record Unit. The study resulted in 93.1% of success in which all the symptoms and periapical radiolucent lesions healed in about 1-3 months, and 6.9% cases of failure in which all the teeth were retreated or extracted. The reasons for failure were multifactorial including persistent signs and symptoms, foreign body reaction, fibrous healing and misdiagnoses PIDC was established in the year 2009 and is operating till date with an increase in number of patients. It offers all types of dental treatment including RCT. To date, RCT in this institution has never been reported in detail and it is hoped that this study will provide useful evidence to help administrators upgrade and improve the root canal treatment service. Thus, the aim of this study is to evaluate the 7 year prognosis of root canal treatment done in PIDC in the year 2012 for continuous improvement and evidence based decision making.

Objectives

- To evaluate the prognosis for root canal treatment done by undergraduate Students.
- To evaluate the prognosis for root canal treatment done by the faculty members.
- To determine the factors influencing the failures of root canal treatment.

Materials and Methods

Any patient who had at least a single tooth endodontically treated or retreated by the faculty or students of Penang International Dental College (PIDC) at Department of Endodontics and Department of General Dentistry in 2012 was included in the study.

The Inclusion Criteria for the study were

- Patients of both gender between 15-60 years of age
- Patients in good systemic health
- Anterior and posterior teeth which required endodontic treatment, & Root canal treated teeth free from severe periodontitis during treatment.

The Exclusion Criteria were

- Patients with severe periodontal disease during treatment
- Loss of root canal treated tooth due to trauma
- Not able to contact the patient due to various reason
- Patients who cannot remember receiving the treatment and Demise of the patient

The sampling method used was simple random sampling where the sample was taken from an overall number of patients who underwent root canal treatment in 2012.The total randomly selected sample was 198 out of 441 root canal treated teeth in which 121 patients could be reached and their feedback was recorded. The variables studied were sex and age groups, type of tooth treated, education level of operator, oral health awareness, pain, success rates and failure rate. Data was extracted from patient records obtained at the PIDC Record Unit after approval of the Dean of PIDC and Chief Executive Officer of PIDC. Patient identification and details of their medical conditions were kept confidential.

A telephonic interview using a questionnaire comprising 18 questions was designed to assess the current condition of the selected sample. The questionnaire contained items related to symptoms experienced by patient, absence or presence of treated tooth, mobility of treated tooth, and overall health condition of patient, oral health care awareness and willingness of patient to come for radiographic examination. The questionnaire also enquired about the respondents' demographic and background information. Their privacy and confidentiality were maintained. The data was analysed and tabulated based on the variables to display the results obtained. Percentages were calculated for the study variables based on data collected.

Results

The results were grouped based on different problems and aspects encountered by the patients after the 7-year period through questionnaire. The information collected from the questionnaire was analysed manually which were grouped by categories showing descriptive statistics. The sample size of 441 patients who did root canal treatment in year 2012 were targeted initially, however only 198 sample size (based on number of teeth) in the form of record files were found possible to be retrieved by the researchers. The statistically processed data was used to answer the research questions. The findings are displayed according to the sequence of the research questions for the sake of clarity.

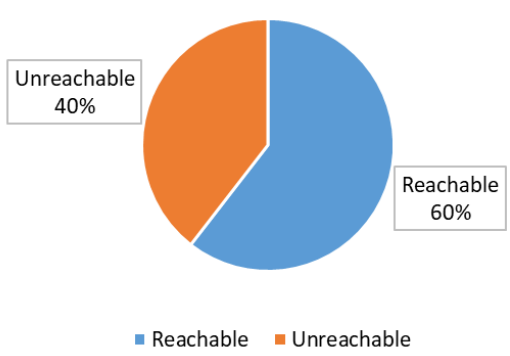

Figure 1: Reachable and Unreachable Patients from Total Sample.

Figure 1 shows that from the total sample size of 198, only 121 (60%) sample size were reachable, who were contacted during questionnaire session and 79 (40%) were unreachable due various reasons such as inability to contact patient, patient inability to remember receiving the treatment back in PIDC clinic, & 2 (1.0%) deaths of patients were recorded. Thus, the unreachable patients were excluded from the study. The data of the reachable patients was further collected and analysed in Figure 2.

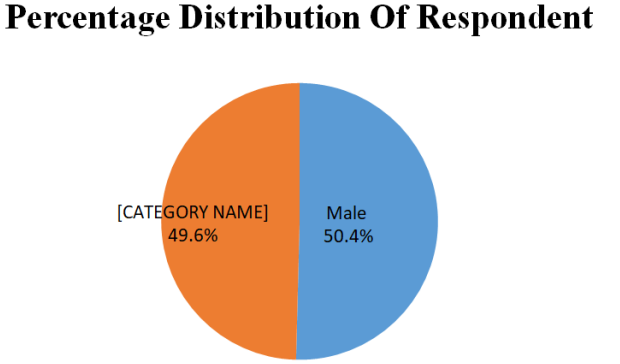

Figure 2: Percentage Distribution of Respondent.

Figure 2 above shows the percentage distribution according to gender of the respondents who were reachable male: 61 number of respondents (50.4%) and female: 60 respondents (49.6%).

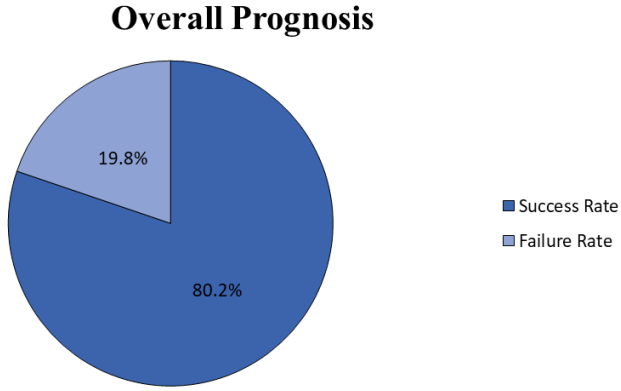

Figure 3: Overall Prognosis of Root Canal Treatment in 2012.

Figure above shows overall success rate of 97 cases (80.2%) whereas failure rate of 24 cases (19.8%) recorded for root canal treatment in the year of 2012 Table 1.

Case treated by	Faculty n=49 (%)	Students n=72 (%)
Success Rate	36 (73.5)	61 (84.7)
Failure Rate	13 (26.5)	11 (15.3)

Table 1: Success Rate and Failure Rate by Faculty and Students.

The table above shows 49 (40.5%) cases treated by faculty in year 2012 having success rate of 36 (73.5%) which clearly shows no signs and symptoms of failure whereas only 13 (26.5%) shows failure of root canal treated teeth which have been categorized in Table 2. The number of cases treated by students in year 2012 were 72 (59.5%), out of which 61 (84.7%) had success rate of root canal treatment and failure rate of only 11 (15.3%) which is categorized in Table 2.

Causes of Failure	Faculty n=13(%)	Student n= 11(%)	n= 121 (%)
Pain	3 (23.1)	2 (18.2)	5 (4.1)
Swelling	-	-	-
Extracted	5 (38.5)	6 (54.5)	11 (9.1)
Retreated	4 (30.8)	3 (27.3)	7 (5.8)
Infection	1 (7.7)	-	1 (0.8)

Table 2: Causes of Failure in Root Canal Treatment.

Table above shows causes of failure which have been recorded and grouped from the Questionnaire. Pain from the cases treated by faculty were 3 (23.1%) from total sample size and treated by the students were 2 (18.2%) which is 5 (4.1%) from the overall failure cases. For swelling, there was no reading obtained from total number of failure cases. Failure due to extraction for cases done by the faculty were 5 (38.5%) and by the students were 6 (54.5%), which add to a total sum of 11 (9.1%) of root canal treatment case which have been extracted and indicate failure of RCT. Retreatment cases of RC treated tooth by the faculty were 4 (30.8%) whereas done by the students were 3 (27.3%), total of 7 (5.8%) cases of root canal treatment tooth were retreated due to failure of RCT. Only 1 (0.8%) case of root canal treatment done by faculty failed due to infection of root canal treatment Table 3.

Disease	Successful		Failure	
	Faculty	Student	Faculty	Student
Hypertension	1	4	-1	-
Diabetes Mellitus	-	1	1	-
Hypertension and Diabetes	1	1	1	-

Table 3: Systemic Disease Which Could Influence Prognosis of RCT.

Table 3 shows factors which could influence the prognosis of RC treated tooth. Patients with hypertension show 1 successful treatment done by faculty and 4 successful treatments by the student. Only 1 case shows failure which is done by the student. Patient with diabetes mellitus show 1 successful treatment done by the student and 1 failure treatment by the faculty. Patient with combined hypertension and diabetes mellitus shows 1 successful treatment by the faculty and student each whereas 1 failure recorded in the case treated by faculty.

Discussion

This study sought to find out the success rate of root canal treatment (RCT) performed by the institute in 2012. Additionally, it ascertained the skills of faculty and students in RCT. According to Weiger, et al. [2] an endodontically induced lesion will only be healed completely within the first 3 years after root canal therapy. A survey done in school of dental medicine, University of Tubingen, Germany in the year 1998 reported 70% and 95% success rate of conventional RCT. However research done in University of Aljouf, Kingdom of Saudi Arabia, Iqbal A [3] reported that endodontic treatment done by General Dental Practitioners had shown the highest failure rate (78.8%). He concluded that, endodontic failure is a common problem in dentistry. The success of endodontic and re-endodontic treatment depends on many factors. These includes periodontal disease, root fractures, residual necrotic pulp tissue, presence of peri-radicular infection, broken instruments, mechanical perforations, root canal under fillings, root canal overfilling's, missed canals or unfilled canals.

Over the last two decades, innovations in instrumentation, obturation, visualization, and surgical techniques are enabling clinicians to provide better long-term prognoses for their patients' teeth after endodontic treatment. Rotary nickel-titanium files have provided dentists with a more consistent, efficient, and effective means of performing endodontic treatment in comparison to stainless-steel hand filing [4]. Morgan, et al. [5] states that along with the change in the metal component of a file, rotary endodontic files have increased taper and various cross-sectional designs as compared to hand files. These file refinements help rotary instruments to better shape and prepare a canal for irrigation and obturation. In 2015, a sample size of 346 treated teeth was used in a retrospective study to obtain the frequency of procedural errors in rotary versus conventional root canal treated teeth. Results showed that procedural errors for rotary method were 28.9% while conventional method showed higher percentage error of 32.8% [6].

The objective of endodontic obturation is to provide a complete seal along the length of the root canal system, thereby ensuring the healing and sustained health of the peri-radicular tissue [7]. The root canal filling material should provide a barrier that prevents bacteria from the oral cavity from travelling down the root canal [8]. Weine FS stated that, Gutta-percha (GP) is the most commonly used root canal obturation material. It is compressible, inert, dimensionally stable, tissue tolerant, radiopaque, and becomes plastic when heated [9].

The purpose of this study was to evaluate the 5-year prognosis of root canal treated teeth done by undergraduate students and faculty members in Penang International Dental College and to investigate the factors influencing the success of endodontic therapy. Our main objectives, which were finding out the prognosis of root canal treatment done by faculty members and the students were achieved, however, our third objective which was to assess the factors on failures of root canal treatment done, could not be assessed as all patients were not compliant in returning to the clinic for a radiographic examination to be done for the purpose of radiographic interpretation, hence face-to-face examination could not be done. Besides that, some of the case files were not retrievable due to multiple record-keeping areas and analogue record keeping. Based on the results obtained through a telephonic interview using a questionnaire survey, the data of 121(60%) root canal treated teeth were collected. The data of 77(40%) teeth could not be collected because the respondents were unreachable, this was due to several reasons, such as patients who changed their mobile numbers, patients who passed away 2(1.0%) and mobile numbers which were no longer in service. 97 root canal treated teeth were successfully intact (80.2%) and 24 root canal treated teeth underwent failure (19.8%) due to multiple reasons such as pain, extractions, retreatment, and infection. Results were calculated manually and no correlation tests were conducted as there were no need of comparison between gender of respondents or between faculty members and students. The factors compromising the success of root canal treatment could include persistence of bacteria, bacteria harboured in root canal areas such as isthmuses, dentinal tubules and ramifications. A study performed by Lin et al. on 236 cases of endodontic treatment failures found a correlation between the presence of bacterial infection in the canals and peri radicular rarefaction in endodontic failures [10,11].

The number of failures for treated teeth were, pain (faculty = 3 teeth, students = 2 teeth) giving a percentage of 4.1%, Swelling = 0%, Extractions (faculty= 5, students = 6) giving a percentage of 9.1%, retreatment (faculty = 4, students = 2) giving a percentage of 5.8%, and infection (faculty = 1, students = 0) giving a percentage of 0.8%. This totals up to 13 failed root canal treated teeth performed by faculty members and 8 failed root canal treated teeth performed by students in the year 2012 (19.8%). Extractions were due to mobility of the tooth and retreatments were due to pain. The incidence of failures of root canal treatment done by faculty members pertaining to the factors of failures were in higher numbers as compared to root canal treatment done by students. It was then estimated that the higher incidence of failures by faculty members was probably due to the fact that cases treated by them were more complicated since it involved multiple rooted teeth such as molars, and complexity of canals rendered it more difficult to treat. Pertaining to systemic diseases, patients having diabetes mellitus, hypertension and a combination of both, had 1 root canal treatment failure each, adding up to a total of 3 teeth which failed due to significant patient factors. Other reasons of failures could be due to patient's oral hygiene habits. Most patients claimed that they brushed teeth twice daily and most of them did not floss or use a particular mouthwash.

Conclusion

This retrospective study investigated the 7-years prognosis of RCT done in Penang International Dental College in 2012. The interesting finding observed was the high percentage of success rate, (80.2%). Failure cases in which the teeth were retreated or extracted were significantly low. The faculty and students had both contributed to the rate of success and failure of the treatment.

Limitations

- Some of the case files were not retrievable due to multiple record-keeping areas and analogue record keeping.
- Out of 198 cases retrieved, only 121 cases could be reached by telephone. Some of the subjects were unreachable due to changes in phone number.
- Face-to-face examination could not be done as the clinic is only open Monday to Friday from 9am to 5pm, and the subjects cannot attend during weekdays.
- The prognosis of treatment done by the faculty staffs and students cannot be compared due to the nature of the tooth treated, in which the faculty members always take on more difficult cases.

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Structured Telephonic interview

Name: Phone number:

Age: IC Number:

Sex:

Date of treatment:

This question is referring to tooth that has undergone root canal treatment.
(soalan-soalan ini merujuk kepada gigi yang telah mendapat rawatan akar)

1) Do you remember receiving root canal treatment in PIDC? [ ] Yes [ ] No
(adakah anda pernah mendapat rawatan akar di PIDC)

2) If yes, please specify which tooth/teeth _____
(jika ya, sila nyatakan gigi tersebut)

3) Do you recall which doctor did the procedure and when? _____
(adakah rawatan tersebut dilakukan oleh doktor atau pelajar)

4) Did you experience any pain with the RC treated tooth? [ ] Yes [ ]No
(Adakah anda pernah mengalami rasa sakit pada gigi yang telah menjalani rawatan akar tersebut)

Please specify when(yrs)
[ ] 0-1
[ ] 1-3
[ ] 3-5

5) If yes, how will you rate the pain? Please specify
Scale 0 – 10
(jika ya, sila nyatakan skala kesakitan) _____

6) Have you seen any swelling in relation to the RC treated tooth any time after treatment? [ ] Yes [ ] No
(adakah anda melihat sebarang bengkak di kawasan yang melibatkan gigi tersebut selepas rawatan dibuat?)

7) Is the RC treated tooth still intact? If no, please specify why [ ] Yes [ ] No
(adakah gigi tersebut masih ada? Jika tidak, nyatakan mengapa.) _____

8) Is there any mobility of the RC treated tooth? [ ] Yes [ ] No
(adakah gigi tersebut longgar?)

9) Is there any sensitivity in the RCT treated tooth more than 3 months after treatment? [ ] Yes [ ] No
(adakah anda merasa sensitif pada gigi yang telah dirawat lebih tiga bulan daripada tempoh rawatan?)

10) Did you get the tooth treated again? If yes, why? [ ] Yes [ ] No
(adakah gigi tersebut dirawat semula?Jika ya, mengapa?)

11) Can you come to the clinic for further examination? [ ] Yes [ ] No, why
(*bolehkah anda datang ke klinik untuk pemeriksaan selanjutnya?*) _____

12) Are you having any health problems? If yes, state what, and since when?
(adakah anda menghidap sebarang penyakit? Jika ya, nyatakan penyakit tersebut dan bila anda mula menghidap penyakit tersebut) [ ] Yes [ ] No
_____

13) Are you under any medication? If yes, state what, and since when? [ ] Yes [ ] No
(adakah anda sedang mengambil sebarang ubat?
Jika ya, apa dan bila mula ambil) _____
14) Do you brush your teeth daily and how often? [ ] Yes [ ]No
(adakah anda memberus gigi dan berapa kali sehari?)
15) Do you floss on a regular basis? [ ] Yes [ ] No
(adakah anda floss gigi)
16) Do you brush your teeth for at least 2 minutes? [ ] Yes [ ] No
(adakah anda memberus gigi sekurang-kurangnya 2 minit?)
17) Are you using any mouthwash? [ ] Yes [ ] No
(adakah anda menggunakan ubat kumur?)
18) Are you using fluoridated toothpaste? [ ] Yes [ ] No
(adakah anda menggunakan ubat gigi berflorida?)

Thank You for spending time with us.