

**Cost minimization and financial impact of root canal therapy techniques: manual,
rotary and reciprocating**

**Custo minimização e impacto orçamentário das técnicas de tratamento endodôntico:
manual, rotatória e recíprocante**

**Minimizar los costos y el impacto presupuestario de las técnicas de tratamiento de
endodoncia: manual, rotatorio y recíprocante**

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Abstract

The root canal therapy consists of phases aimed at cleaning and disinfection of the root canal system. The chemomechanical preparation is the one that makes use of instruments that can be used by means of mechanized techniques (rotary and reciprocation) and manual. The present study seeks to compare the three instrumentation techniques, based on cost and outcome, using the cost – minimization analysis in the perspective of the Social Service of Commerce (SESC - Brazil), and a time horizon of 10 years. The effectiveness of the techniques were raised through literature review and selection of systematic review studies. The costs were measured by the microcosting technique, in addition to the information from the SESC databases. In the analyzed period, the study shows that the use of the rotary system can increase the capacity of care by 44,67%, while the reciprocation system by 168 %. The financial impact would be R\$ 103,683.87 and R\$ 735,179.46 for the rotary and reciprocation, respectively. Using as reference the conventional technique, R\$ 44.58 more is spent for the treatment with rotary instruments and R\$ 84,03 for the reciprocation. Even with the highest allocating efficiency for the reciprocating technique with much greater coverage, the budget impact needs to be analyzed with caution. The incorporation of reciprocating technology demonstrating to be the technique with the highest allocating efficiency, best minimization cost ratio and reasonable cost of additional treatment in relation to other techniques.

Keywords: Evaluation of biomedical technology; Health economics; Preparation of the root canal.

Resumo

A terapia de canal radicular consiste em fases de desinfecção dos canais e o preparo quimiomecânico é aquele que dispõe de instrumentais que podem ser utilizados por meio de técnicas rotativas, reciprocantes e manuais. O presente estudo busca comparar três técnicas de

instrumentação, com base em custo e resultado, utilizando a análise de minimização de custos na perspectiva do Serviço Social do Comércio (SESC - Brasil), e um horizonte temporal de 10 anos. O estudo mostra que a utilização do sistema rotativo pode aumentar a capacidade de atendimento em 44,67%, enquanto a reciprocidade em 168%. O impacto financeiro seria de R\$ 103.683,87 e R\$ 735.179,46 (1 R\$ = US \$ 4,02) para o rotativo e recíproco, respectivamente. Mesmo com a maior eficiência de alocação para a técnica recíproca com cobertura muito maior, o impacto orçamentário precisa ser analisado com cautela. É necessário que os gestores do SESC avaliem se há disposição a pagar e se a incorporação deve ser feita ou não. A incorporação da tecnologia recíproca pela perspectiva do SESC / Brasil atende às suas diretrizes gerais, demonstrando ser a técnica com maior eficiência de alocação, melhor relação de custo de minimização e custo razoável de tratamento adicional em relação às demais técnicas.

Palavras-chave: Avaliação de tecnologia biomédica; Economia da saúde; Preparação do canal radicular.

Resumen

La terapia del conducto radicular consta de fases destinadas a la limpieza y desinfección del sistema del conducto radicular. La preparación quimiomecánica es la que hace uso de instrumentos que pueden ser utilizados mediante técnicas mecanizadas (rotativas y recíprocas) y manuales. El presente estudio busca comparar las tres técnicas de instrumentación, con base en costo y resultado, utilizando el análisis de minimización de costos en la perspectiva del Servicio Social de Comercio (SESC - Brasil), y un horizonte temporal de 10 años. La eficacia de las técnicas se planteó mediante la revisión de la literatura y la selección de estudios de revisión sistemática. Los costes se midieron mediante la técnica de microcostes, además de la información de las bases de datos del SESC. En el período analizado, el estudio muestra que el uso del sistema rotatorio puede incrementar la capacidad de atención en un 44,67%, mientras que el sistema de reciprocidad en un 168%. El impacto financiero sería de R\$ 103.683,87 y R\$ 735.179,46 para el rotativo y alternativo, respectivamente. Tomando como referencia la técnica convencional, se gastan R\$ 44,58 más para el tratamiento con instrumentos rotatorios y R\$ 84,03 para el recíproco. Incluso con la mayor eficiencia de asignación para la técnica recíproca con una cobertura mucho mayor, el impacto presupuestario debe analizarse con cautela. La incorporación de tecnología recíproca demostrando ser la técnica con mayor eficiencia de asignación, mejor relación de costos de minimización y costo razonable de tratamiento adicional en relación con otras técnicas.

Palabras clave: Evaluación de tecnologías biomédicas; Economía de la salud; Preparación del conducto radicular.

1. Introduction

The basis of endodontic therapy consists of treating teeth compromised by pulp and periapical pathologies, so that the patient can recover his natural aesthetics and function. It consists of a sequence of procedures that typically include four phases: instrumentation or mechanical preparation, irrigation, medication, and filling. Success is dependent on the prevention or elimination of apical periodontitis and patient symptoms (Chubb, 2019; Chugal et al, 2017).

The European Society of Endodontics, in its document: Guidelines for the Quality of Endodontic Treatment (Lost, 2006), states that the purpose of mechanical preparation is to remove the remains of pulp tissue, eliminate microorganisms, remove debris and shape the channels so that the root canal system (RCS) can be cleaned and filled. The desired shape is conical with the bottleneck in the crown-apex direction. Alongside with irrigation, the chemomechanical preparation (CMP) is the most important phase of endodontic treatment, since it acts on the formatting and disinfection of the RCS (Siqueira et al, 2017).

For the satisfactory preparation of the root canal, instruments that penetrate its interior are needed and, with correct movements and irrigators, promote its cleaning. Currently, traditional manual instruments, made of stainless steel, coexist with more flexible instruments, made of titanium nickel alloys (NiTi), which allow their use in equipment that promotes mechanized instrumentation. There are two types of mechanized kinematics that use nickel instruments – titanium: continuous rotation or centric rotation, called "rotation" and alternative rotation, oscillatory which is called "reciprocator" (Gavini et al, 2018).

The rotary instruments produce fast preparations, with adequate centralization and taper and lower failure rate. However, these are subject to fractures due to their continuous movement (Peralta et al, 2019). Yared (2008) proposed the use of a unique NiTi rotary file in the preparation of the root canal using, for this, an engine that promoted the movement of 120° clockwise and 30° in the opposite direction. A lower fracture rate was observed, in addition to shorter treatment time and good efficacy in endodontic preparation. In 2010, VDW (VDW, Munich, Germany) launched a system based on reciprocation movement, where the instrument is manufactured with a new NiTi alloy, M-Wire, which receives a heat treatment, providing greater flexibility and resistance to cyclic fatigue compared to

conventional alloy (Gutmann & Gao, 2012). The objective of the reciprocation instrumentation system is the usage of a single instrument in the preparation of the root canal, speeding up this phase, reducing cyclic fatigue and the chance of cross-contamination (Yared, 2008).

Numerous studies have focused on the effectiveness of manual instrumentation in the disinfection of RCS, often comparing with automated systems. The results obtained did not show significant differences (Oliveira & Oliveira, 2011; Matos et al, 2012; Del et al, 2018). For mechanized systems, in two systematic reviews, Siddique & Nivedhitha (2019) and Neelakantan et al. (2019) presented the best available current evidence, suggesting similarity between rotary and reciprocating systems with regard to bacterial disinfection and reduction of endotoxins. However, they reinforced the need for more studies with the latest instruments. Peralta et al. (2019), in a systematic review with meta-analysis of in vitro studies, comparing rotary systems with manuals, found as superior characteristics in rotary instrumentation the shortest instrumentation time, the maintenance of centralization without channel deviation and channel modeling. On the other hand, manual instrumentation obtained better results in relation to debris production, smear layer removal, lower production of dentin defects and higher number of surfaces touched during instrumentation.

Despite the large number of studies addressing the mechanical qualities of the instruments, no research was found that addressed the costs used in the different technologies. From another perspective, Schwendicke & Göstemeyer (2016) evaluated the cost – effectiveness of endodontic treatment in a single or multiple visit from the perspective of the German health system, demonstrating the importance of this type of evaluation for decision makers.

The Health Technology Assessment (ATS) is a systematic process, which aims to identify and evaluate the available scientific evidence on a given technology. The source of these studies in ATS verifies the effectiveness/efficiency, the costs of incorporating and disseminating certain technology, the consequences of disincorporation, as well as the ethical and legal implications arising from this decision. Therefore, it is up to the manager to make the decision to implement a new technology, taking into account the willingness to pay for it, based on mathematical modeling and designed according to the Economic Evaluation Guidelines of the Brazilian Health Technology Assessment Network (Vianna et al, 2009). This is particularly important because 616.481 endodontics were performed in 2019 in Brazil and thus knowing the efficiency of these techniques in terms of costs and effects are crucial

for decision-making, especially in this period of economic recession that we are going through (in Brazil for some years).

In view of the above, it is intended to perform a complete economic evaluation (cost minimization analysis), with the calculation of allocating efficiency (number of procedures in the time horizon and ICER by additional treatment) and the budgetary impact of three techniques for the mechanical preparation of the RCS, the manual, the rotary and the reciprocation, from the perspective of the Social Service of Commerce (SESC - Brazil).

2. Methodology

This study was submitted to analysis by the Research Ethics Committee (CEP) of FOP/UNICAMP and dismissed for using secondary data (letter CEP no. 004/2020).

It is an economic study, with a synthesis methodology in which costs are confronted with clinical outcomes were objective is to assess the impact of different alternatives, which aim to identify them with better treatment effects, generally, in exchange for lower cost (Brasil, 2014). The design of this research was based on a complete economic analysis in oral health of the cost-minimization type (MCA) due to the similar results of effectiveness (success rate) obtained by the procedures (Oliveira & Oliveira, 2011; Matos et al, 2012; Del et al, 2018; Siddique & Nivedhitha, 2019; Neelakantan et al, 2019).

It is important to note that economic health assessments (AES) are not clinical studies, so we must make it clear that AES values health outcomes, providing a technology efficiency data, that is, verifying the cost in relation to the effect. All data are based on parameters obtained in the literature or from primary studies and, therefore, models are constructed and not statistical analyzes to compare groups of studies or seek association of variables. Therefore, we follow the Rebrats / Ministry of Health guidelines for Budget Impact Studies and not a methodological guide for clinical or observational studies (Brasil, 2014).

The direct medical costs of three root canal therapy techniques were considered, being manual, rotary and reciprocating. The methodological standards used were from the Brazilian Health Technology Evaluation Network (REBRATS - <http://rebrats.saude.gov.br/>) (Vianna et al, 2009).

The perspective of analysis adopted was that of the SESC, starting initially from the data of the dental clinic of SESC Casa Amarela – PE/Brazil and aligning with other information from other units. The database was designed in view of the phases and sessions necessary for each endodontic technique employed. The information was obtained from the

SESC registration system, taking into account the initial pulp vitality and the average number of sessions required for root canal therapy, based on the 2018 records. For the initial diagnosis, pulp vitality was considered, being divided into pulpitis (with vitality) and pulp necrosis (without vitality). There was no record of any periapical disease that made root canal therapy unfeasible. It is important to inform that SESC offers oral health services through 236 fixed and mobile clinics and is located in all regions of Brazil.

The economic evaluation guidelines (Brasil, 2014) were considered to estimate costs, respecting the stages of identification and classification of resource items, measurement and valuation of resources consumed. The values were estimated based on direct medical costs, composed of equipment and material costs, in addition to the clinical time of the health professionals involved (Dentist/DS and Oral Health Assistant/OHA). The bottom-up microcosting methodology was used to calculate each item. This feature is considered gold - standard due to its level of accuracy in estimating costs (Etges et al, 2019). As a presupposition, non-medical direct costs (structure) were not calculated.

Definition of the protocols: the protocols used for mechanized techniques were based on the recommendations of the instrument manufacturers (Dentsply, 2020); Dentsply (2020). Protaper Next instruments (Denstply Maillefer, Ballaigues, Switzerland) were used for the rotary technique. For the reciprocating, the Reciproc Blue R25 instrument (VDW, Munich, Germany) was used. Finally, in the manual technique, the stainless steel Kerr and Flexofile files (Denstply Maillefer, Ballaigues, Switzerland) were used. The protocol for manual instrumentation was based on the oscillatory technique of De Deus (1992). All instruments used, were 25 mm in size. As mentioned previously, there was no clinical procedure carried out, only the definition of clinical protocols to stablish the parameters for economic evaluation.

Using the Microsoft Excel program, the description of the items necessary to perform the 3 technologies (manual, rotary and reciprocating) was performed, where a panel of experts (n=6) aligned and standardized the endodontic technique most used by SESC experts. This same panel established the average number of sessions (duration of one session = 1 hour) that each technique uses to finalize a molar endodontics (upper or lower) based on the clinical records of the SESC units.

For all phases consisting from the initial consultation to the end of the treatment, the inputs were assigned, whether it's in regards to equipment, instruments, consumables and human resources, necessary for the conclusion of each stage with its respective proportion to the quantitative spent for that phase. For digital acquisition equipment, the averages of the

amounts paid in the last bids were verified as a parameter. In all stages, the reference date was 2018.

For human resources, the cost of the dentist and oral health assistant (proportional to the time spent) was considered, with a workload of forty hours per week and their respective salary sheets on the date of data collection in 2018.

The estimated number of treatment (effects) for each technique considered the number of sessions that each technique consumed in the SESC units. Thus, the number of teeth treatment with pulpitis and pulp necrosis was verified in the Casa Amarela/PE unit of SESC and it was found that 61.5% and 38.5%, respectively. Thus, for the calculation of the number of treatments, the formula was used:

Number of treatment of teeth with pulpitis for manual technique = [(n° hours month * percentage pulpitis time) * 0.9 (% productive time)] / (manual technical time in hours) = [(160 * 0.615) * 0.9] / 3.

The time horizon used was 10 (ten) years. The discount rate was 5% per year. A percentage of 10% was considered for unproductive time due to lack of patients, equipment breakage and others.

The allocating efficiency (difference in the number of treatment between the techniques, using the same clinical time), the financial impact (difference in costs between the techniques, considering the manual technique as reference) and the ICER - cost increase effectiveness (cost per additional treatment in the 10-year time horizon) were calculated.

ICER formula: = (cost technology B - cost technology A) / (number of treatments by technology B – number of treatments by technology A). Example: ICER of the reciprocating technique compared to the manual technique (reference) = (R\$ 1,770,727.39- R\$ 1,035,547.93) / (13,953.6 - 5205.6 treatments) = R\$ 84,03 for additional treatment.

The cost calculations were completed on October 30, 2019. The value of one dollar (1US\$) was 4.02 reais (R\$).

3. Results

The entire microcosting technique was based on direct medical costs (human resources, materials, instruments, equipment). Table 1 shows the average of sessions required for each treatment in a referential tooth of three conduits, considering pulp vitality. Most of the costs are related to the human resources used (DS clinical time and OHA for all techniques - R\$ 49.00), while the costs with material, instrumental and equipment were R\$ 36.27 for the treatment of endodontics by manual technique; R\$ 38.84 for the rotary technique and R\$ 66.22 for the reciprocation technique (Table 1).

Table 1. Estimated cost of each technique by initial diagnosis of pulp.

	Materials	Sessions	Materials (R\$)	%	DS/H (R\$)	OHA/H (R\$)	Prof.* /H (R\$)	Overall Prof / H (R\$)	%	Overall (R\$)
Pulpitis	Manual	3	36,27	19,79%	40,00	9,00	49,00	147,00	80,21%	183,274
	Rotary	2	38,84	28,38%	40,00	9,00	49,00	98,00	71,62%	136,84
	Reciprocating	1	66,22	57,47%	40,00	9,00	49,00	49,00	42,53%	115,22
Pulp Necrosis	Manual	4	36,274	15,62%	40,00	9,00	49,00	196,00	84,38%	232,274
	Rotary	3	38,84	20,90%	40,00	9,00	49,00	147,00	79,10%	185,84
	Reciprocating	2	66,22	40,32%	40,00	9,00	49,00	98,00	59,68%	164,22

1U\$ = R\$ 4,02 (October 30, 2019)

*Prof.: Professional.

Source: Prepared by the Authors.

Based on the time required for each pulp treatment of each technique and the number of hours worked by the dentist, it is estimated that 5,205.6 root canal therapy would be performed by the manual technique, 7,531.2 by rotary technique and 13,953.6 by the reciprocating technique, which corresponds to the estimated cost of R\$ 1,035,547.93 (US\$ 4,162,902.68) in the manual technique, R\$ 1,139,231.81 (US\$ 4,579,711.88) in the rotary and R\$ 1,770,727.39 (US\$ 7,118,324.11) in the reciprocating (Table 2). The financial impact would be R\$ 103,683.87 (difference in cost estimates) between the manual and the rotary techniques, and R\$ 735,179.46 between the manual and the reciprocating techniques.

Table 2 - Calculation of incremental cost effectiveness ratio.

Tooth condition	Technique	Hours /without	% spent	N° RCT*/month	N° RCT / year	N° RCT in the period ^a	Difference in the number of people served ^b	Value of the technology ^c (R\$)	Cost (R\$)	Financial impact ^d	ICER ^e (R\$)
Pulpitis	Manual			29,52	354,24	3542,4	Ref.	183,274	649.229,82	Ref.	
	Rotary	40	61.5	44,28	531,36	5313,6	1771,2	136,84	727.113,02	77.883,21	
	Reciprocating			88,56	1062,72	10627,2	7084,8	115,22	1.224.465,98	575.236,17	
Pulp Necrosis	Manual			13,86	166,32	1663,2	Ref.	232,274	386.318,12	Ref.	
	Rotary	40	38.5	18,48	221,76	2217,6	554,4	185,84	412.118,78	25.800,67	
	Reciprocating			27,72	332,64	3326,4	1663,2	164,22	546.261,41	159.943,29	

	Manual	43,38	520,56	5205,6	Ref.	1.035.547,93	Ref.	Ref.
Overall	Rotary	62,76	753,12	7531,2	2325,6	1.139.231,81	103.683,87	44,58
	Reciprocating	116,28	1395,36	13953,6	8748,0	1.770.727,39	735.179,46	84,03

1U\$ = R\$ 4,02 (October 30, 2019)

*RCT: Root Canal Therapy

a - 10-year time horizon

b - Allocative Efficiency

c - Direct medical cost + clinical hour DS and OHA

d - Technical efficiency (Financial impact) = (difference in tested technology - reference technology)

e - ICER (Increment of cost effectiveness) - value of the additional cost per treatment = (Financial impact / different people served)

Source: Prepared by the Authors.

Taking into account the sensitivity analysis (Table 3), that is human resources costs, materials, instruments, equipment, economic variation and their inflationary adjustments in a more optimistic and more pessimistic scenario, is possible to verify that the manual technique (reference) is still the cheapest, followed by the rotary technique (middle range) and the reciprocating, the most expensive one. The budgetary impact between the manual and the rotary techniques ranges from R\$ 82,947.10 to R\$ 124,420.65, between the manual and the reciprocating techniques it ranges from R\$ 588,143.57 to R\$ 882,215.35 and between the rotary and the reciprocating techniques it varies from R\$ 505,196.47 to R\$ 757,794.70 in the period of 10 years.

Table 3 - Sensitivity analysis with an optimistic scenario with 20% lower costs and another pessimistic one with 20% higher costs.

Technique	N° root canal therapy in the period	Cost (R\$)	Impact (R\$)	ICER (R\$)	Pessimistic Scenario Cost (R\$)	Impact (R\$)	ICER (R\$)	Optimistic Scenario Cost (R\$)	Impact (R\$)	ICER (R\$)
Manual	5.205,60	1,035,547.93	ref		1,242,657.52	ref		828,438.35	ref	
Rotary	7.531,20	1,139,231.81	103,683.87	44.58	1,367,078.17	124,420.65	53.50	911,385.45	82,947.10	35.67
Reciprocating	13.953,60	1,770,727.39	735,179.46	84.04	2,124,872.87	882,215.35	100.85	1,416,581.91	588,143.57	67.23

1U\$ = R\$ 4,02 (October 30, 2019)

Source: Prepared by the Authors.

Cost-effectiveness calculation considered the costs of each additional treatment. Thus, comparing the rotary with the manual technique, it is necessary to spend a value of R\$ 44.58 (US\$ 11.08) for each additional treatment (ranging from R\$ 35.67 to R\$ 53.50), while between the reciprocating and the manual technique, R\$ 84.03 (US\$ 20.90) is required (ranging from R\$ 67.23 to R\$ 100.85).

3.1 Discussion

The interest in the economic evaluation of health programs should be extended to all those who participate in the work processes of the area, from individuals to policymakers, through local managers of both public and private entities. Thus, some requirements should be followed, such as the definition of the intervention, the perspective of analysis, the possible alternatives, the identification and measurement of costs and the consequences on health. Among the possibilities of complete economic analyses, it is possible to employ cost minimization analysis, in which the effectiveness of the comparative interventions is considered similar, and the cost examination is the main component studied (Brasil, 2014).

Based on the research by Oliveira & Oliveira (2011), Matos Neto et al., (2012), Dell et al. (2018), Siddique & Nivedhitha (2019) and Neelakantan et al. (2019) (Fernandes et al, 2016), the present study used as a presupposition the similarity between the chosen outcome of the techniques employed (success rate of root canal therapy). The option for the strategy with the greatest impact on effectiveness, quality of life or financial aspect must be accompanied by quality evidence on the studied outcome (Silva et al, 2016).

The analysis of the composition of direct costs for each technique demonstrates the importance that each item has in the formation of the final cost. Despite the importance of the initial cost of implementing rotary and reciprocating technology, with the purchase of the equipment and instruments necessary to carry out each of them, the investment applied will be diluted over the 10 years of the evaluated scenario. The percentage of the engine value (item with the highest cost) for the rotary technique is 1.49% of the total value used for materials and equipment, while for the reciprocating technique is only 0.29%. This result demonstrates the fractionation of the initial value over time, making the acquisition less costly than other items such as radiographic films (9.60% for the rotary and 3.73% for the reciprocating) for example.

Despite the cost of materials commending an important portion of direct costs, the cost of human resources (DS + OHA) was predominant in most simulations performed with an

average of 69.59% of costs. The highest percentage was found in the manual technique for pulp necrosis, with a value of 84.38%, and the lowest for the reciprocating technique in teeth with a pulpitis with 42.53%, which is the only technique in which the cost of professionals is exceeded by the equipment. These values are directly linked to the number of sessions used for the completion of treatment. Almeida et al. (2017), in a systematic review with meta-analysis in which they evaluated the outcome of treatment in a single and multiple session of necrotic teeth, found positive results for the single session, especially regarding postoperative pain. Thus, in the possibility of performing the treatment in one session, in addition to the lower cost, the result may be better both for cost and outcome. Siqueira et al (2018) found positive results in the treatment in a single session of teeth with vital pulp (91.5%) and for teeth with pulp necrosis without apparent periapical disease (89.5%), with a decrease in success depending on the existence of periapical disease and its size (82,7%) . The reciprocating mechanized technique also has the manufacturer's recommendation to use the instrument only once, discarding it after use. The present study considered the use in 2 treatments and, even so, the cost of this material represents 67.79% of the microcosting survey of the technique. On the other hand, Park et al. (2014) in a study with reciprocating files, found safety in the use of such instruments in 5 different root canals. Bueno et al. (2017) found safety in the usage of the same reciprocating instrument in 3 different posterior teeth. Ehrhardt et al. (2012) concluded that the use preceded by cervical enlargement by Gates – Glidden drills can decrease the incidence of rotary instrument fracture. Thus, by associating some care with the multiple use of the instrument, the cost may be even lower for technique and make it more attractive in terms of cost minimization (in this case), and provide the manager with one more option for decision making.

The smaller number of sessions of the reciprocating technique estimated makes the cost of the technology the lowest of the three techniques evaluated, both for vital and necrotic pulp. The study shows that the costs of human resources, costing and permanent material for the treatment of pulpitis using the manual technique is R\$ 183.27, while for the technique with rotation is R\$ 136.84 and R\$115.22 for reciprocating technique. However, these values change when it comes to pulp necrosis, where R\$ 232.27 is spent with manual technique, R\$ 185.84 with the rotary technique and R\$ 164.22 for reciprocating technique. Therefore, the reciprocating technique presented the best minimization cost ratio.

Such difference is closely related to the number of sessions, which, in turn, depends on the initial diagnosis and technique employed. Moreover, several authors have found a shorter time of root canal instrumentation in rotary systems compared to conventional systems

(Peralta et al, 2019; Yared, 2008), (Guelzow et al, 2005; Vaudt et al, 2009). Others, with emphasis on single instrument reciprocant (You et al, 2010; Bürklein et al, 2012), which can impact the routine of consultations in the clinic, besides providing greater comfort to patients and professionals. Schwendicke & Göstemeyer (2016) in a cost-effectiveness study from the perspective of the German health system, evaluated the root canal therapy in a single or multiple session, concluding that it is possible that the single session generates lower initial costs, however it is important to consider scheduling aspects and preferences of patients and professionals for the definition.

With the simulation of scenarios with the different techniques, having as reference the total of endodontics in the period, of vital and necrotic pulp, it is possible to observe that the capacity of care increases by 44.67% when the rotation is used and 168% when the reciprocating technique is selected. This increase in the number of treatments would promote a financial impact of R\$ 103,683.87 and R\$ 735,179.46 for the rotary and reciprocating techniques, respectively. From these values it is possible to calculate the cost ratio - incremental effectiveness (ICER) that represents the amount spent per treatment plus (Pinto et al, 2016). Using as reference the conventional technique, R\$ 44.58 more is spent for the treatment with rotary instruments and R\$ 84,03 for the reciprocating technique. Thus, we have a clear higher allocating efficiency for the reciprocating technique with a much higher coverage, however the budget impact needs to be analyzed with caution. Since the cost threshold - effectiveness has not been determined, it is necessary that SESC managers evaluate with their technicians, professionals and clients whether there is a willingness to pay and whether the incorporation should be made or not.

We make it clear that although the value of the reciprocating technique is lower, if it is used in its allocating fullness, it will cause a budgetary impact due mainly to the greater number of treatments performed. In any case, it seems obvious to us that the manager should take a decision based on the cost-to-budget ratio. In the event of creating possible scenarios, such as using the reciprocating instrument in 3 or 4 endodontics, this would make the budget impact much smaller with substantially greater coverage.

In addition to the characteristics already pointed out, it is imperative for the manager to gather other information that can assist in the decision to incorporate. As already seen, the number of sessions has an important impact on the final cost and the agility acquired with the use of mechanized systems can contribute to the performance of a single session in both types of pathologies evaluated here, corroborating Almeida et al. (2017), who state that in clinical

dentistry the biological criteria, professional skill, patient comfort and optimization of time and resources should guide the decision of the dentist.

It is necessary to reinforce that root canal therapy requires other phases besides instrumentation. Despite all technological development in the sector, there is still no instrument that can meet all the requirements of an optimal preparation of the root canal (Gavini et al, 2018). This fact highlights the importance of choosing a good irrigator and a filling that promotes three-dimensional sealing of the RCS. It is also important to point out that the three systems are safe alternatives for root canal preparation, however, no system is an absolute substitute for manual instrumentation.

The authors declare that there are no conflicts of interests.

4. Conclusion

The incorporation of reciprocating technology for SESC/Brazil perspective meets its general guidelines, demonstrating to be the technique with the highest allocating efficiency, best minimization cost ratio and reasonable cost of additional treatment (ICER) in relation to other techniques.

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