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Post operative pain in endodontics: A systemic review

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Post operative pain is an unpleasant situation for both the dentist and the patient. The purpose of this review is to analyze the effect of certain factors like, gender, teeth type, single/multiple visits, and pre-obturation pain, on the incidence of post endodontic pain. Electronic database were searched in a systematic method according to the preferred reporting items for systematic review and meta analysis guidelines, with specified inclusion criteria to identify randomized clinical trials and exclude case reports and expert case series. Thirty eight articles were identified and included in this review. It was found out that the variables that affect post endodontic pain can be classified into gender, type of teeth, relation with pre-obturation pain, single/multiple visits, medications, instrumentation and obturation techniques and vitality of teeth. The level of evidence ranged from I (1) to V (5) for each variable. The current review suggests that the factors that influenced the post endodontic pain were interrelated and directly interdependent. Within the limitations of this review like insufficient amount of level I, it is evident to support strongly, the influence of the different factors on post endodontic pain. There is a greater need for more number of randomized clinical trials to support the effects.

Key words: Post operative pain, endodontic, clinical trials.

INTRODUCTION

The primary goal of endodontic treatment is to hermetically seal the entire root canal system by an adequate biomechanical preparation, with no discomfort to patient and provide condition of periradicular healing (Udoye and Aguwa, 2010). Even with the outmost care in performing a root canal treatment, some patients experience pain or flare up after treatment. This post operative pain is an unpleasant situation for both the dentist and patient. For the long term success of a case, postoperative pain is considered as a poor indicator. So, the integral part of endodontic treatment must be prevention and management of this post endodontic pain. According to previous published data reported, frequency of post endodontic pain ranges from 1.4 to 16% and sometimes up to 50% in some studies (Ehrmann et al., 2003; Oliveira, 2010). This difference is due to the difference in definitions of post endodontic pain. A number of factors have been related in different literatures with the incidence of post endodontic pain. Among the factors include, the gender, type of tooth, pre-obturation pain or preoperative pain and post endodontic pain, single/multiple visits, various medications used, instrumentation and obturation techniques and the vitality of the teeth. Although, microorganisms are usually

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Table 1. Inclusion and exclusion criteria.

Inclusion
English criteria
Randomized clinical trials that assess the effect of different variables on post endodontic pain
Patient who receive any medications before root canal treatment
Pain intensity and swelling occurrence within 24 to 48 h after root canal treatment
Severity of pain estimated by scales
Cohort studies
Systemic reviews of these studies
Exclusion
Case reports
Expert opinions
Pain and swelling after 48 h
Patient with systemic diseases

regarded as the most common cause of postoperative pain, other causes include mechanical or chemical injury to pulpal or periapical tissues. There is a clear indication of interactions between periapical tissues and microorganisms, because flare-ups are more likely to occur in necrotic cases than in vital cases. This could indicate a clear relationship between pulp status and postoperative pain, even after successful endodontic therapy.

Therefore, the objective of this review is to analyze critically the influence of various factors on the incidence of post endodontic pain and to document the level of evidence available for each factor.

Measurements of pain

Visual analogue scale: It contains a line from 1 to 100, from no pain to worst possible pain. The intensity of post endodontic pain ranges from 5 to 44 points.

Facial Grimace scale: Face 0, very happy (no pain); Face 1, hurts just a little bit; Face 2, hurts a little more; Face 3, hurts even more; Face 4, hurts a whole lot; Face 5, hurts as much as you can imagine.

Generally, the intensity of pain can be measured accurately when more than 1 scale is used.

MATERIALS AND METHODS

This study was registered with the research centre of Riyadh Colleges of Dentistry and Pharmacy and was given a registration number FRP/2015/168.

To obtain the relevant information, a unified criteria was maintained as flare up or post endodontic pain was defined as a complaint of pain with or without swelling within few hours to few days after root canal procedure. The data base search was undertaken to identify studies that deals with post obturation or post endodontic pain, using PUBmed data, Google, and medical subject headings search. The key headings used for the search strategy were “flare up”, “inter-appointment pain”, “post obturation pain", “post endodontic pain”, “post operative pain”, “antibiotibs”, ”analgesics”, ”instrumentation”, ”obturation”, ”vital”, ”nonvital”, ”single visits”, ”multiple visits”, “NSAIDs”, “gender”, and “pre-obturation pain”. Only English written articles were identified. For an initial serach, 136 articles were obtained. The related articles for the studies were also evaluated. The relevancy of these articles was evaluated by reading their titles and abstracts, from which 44 were rejected as it was not related to the study. The remaining 92 articles were then assessed at the abstract level for their eligibility, out of which 38 were excluded. Out of the remaining 54, full text articles were subjected to inclusion and exclusion criteria (Table 1). Reference lists of these articles were also evaluated. Finally, 38 articles from 1986 to 2014 were included in the quantitative synthesis in this review. These were then subjected to preferred reporting items for systemic review and meta analysis (Figure 1). The level of evidence was set according to the evidence based medicine (Table 2).

RESULTS AND DISCUSSION

From the total of 38 articles found suitable in the inclusion criteria, the articles were broadly classified into different variables or factors affecting post endodontic pain like: gender; type of teeth; relation between preoperative or pre-obturation pain and post endodontic pain; medications; single/multiple visits; instrumentation and obturation techniques; and vital and non-vital teeth.

Gender

Various studies have been done in the past to evaluate the influence of gender on post endodontic pain. Results of studies are summarized in Table 3.

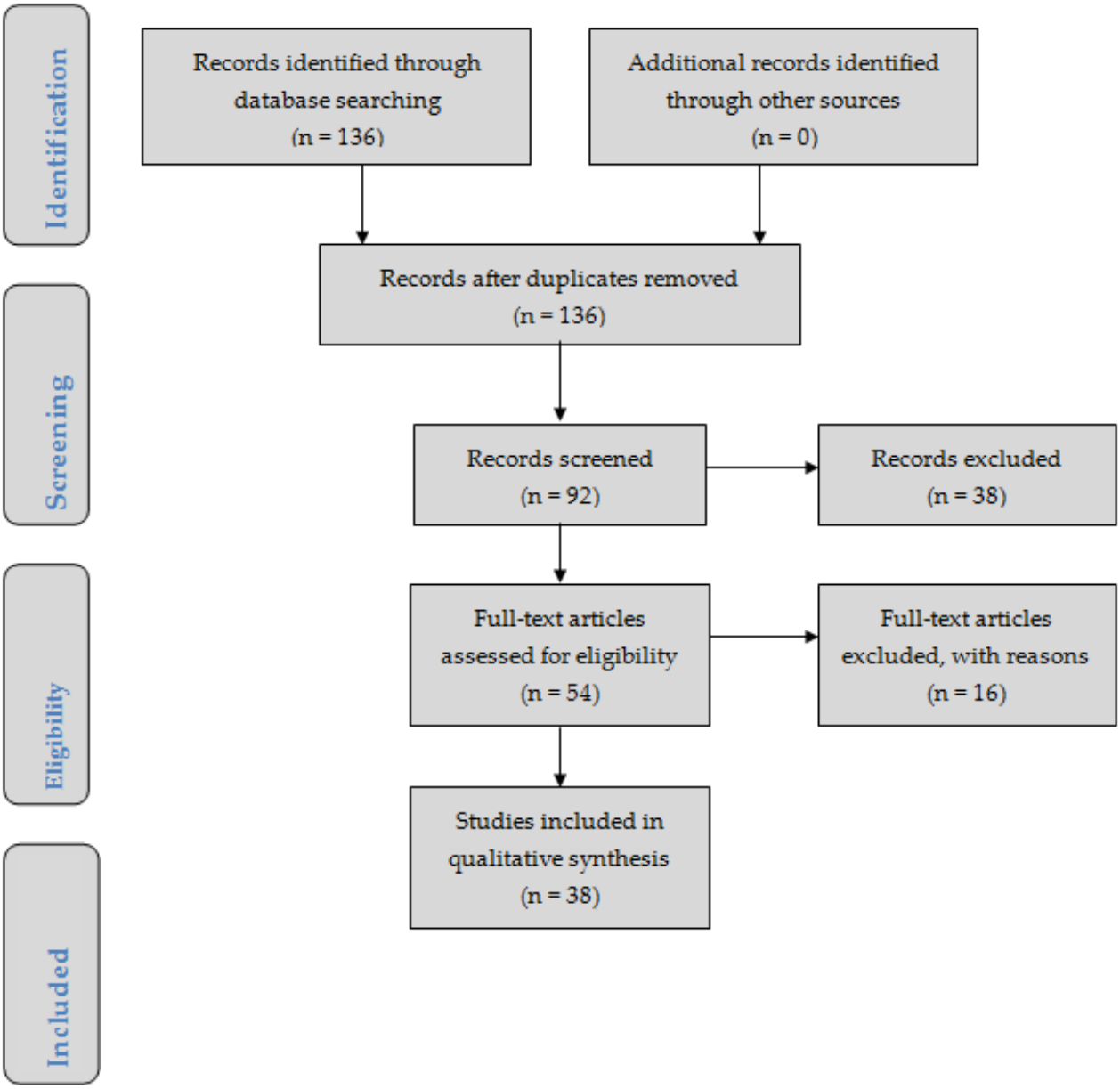

Figure 1. Preferred reporting items for systemic reviews and meta-analysis protocol used in the study.

In general, it can be concluded that women had a higher incidence of post endodontic pain when compared with men. Various studies showed that female patients have more sensitive responses to root canal treatment than male patients. This may be explained by the biological differences between genders, due to the two fluctuating hormone levels associated with change in the level of serotonin and non-adrenalin (Marcus, 1995; Dao et al., 1998). The feeling of pain is regulated by cortisol hormone which is responsible for pain. Normally, its amount excreted in male is higher than in females (Walton and Fouad, 1992; Mehrvarzfar et al., 2008). Determining whether women have different sensitivity to pain or analgesia compared with men is complicated by the hormonal cyclicity of women. In most clinical research studies, men have been used as subjects and women have been largely excluded (Greenspan and Craft, 2007). This can be justified by the effect of estrogen and the women's menstrual cycle.

Type of teeth

There have been studies on the incidence of post endodontic pain by the type of teeth treated, whether

anterior, premolar or molar. Results of studies are summarized in Table 4.

In general, it can be concluded that the incidence of post operative pain was higher in mandibular teeth as compared to maxillary teeth. This variation might be due to the reason that mandible has a dense trabeculae pattern, which causes reduced blood flow and localization of infection leading to delayed healing patterns (Syed et al., 2012). This difference may be also explained due to the greater number of canals and complex root canal morphology apically (Watkins et al., 2002; Cleghorn et al., 2006). The length of the treatment could also explain this result, taking into account the progressive decrease of the anaesthetic effect, together with the increase of the anxiety of the patient as the intervention extended (Claffey et al., 2004; Mikessel et al., 2005). In comparison of premolar teeth with anterior teeth, it was found out that theta higher incidence of pain was for premolars due to the higher prevalence of missed canal and variation in the apical canal anatomy.

Preoperative/pre-obturation pain

In the past, several attempts have been made to find whether there exists a correlation between preoperative pain and post endodontic pain. Results of studies are summarized in Table 5.

It can be concluded that there is a strong positive correlation between preoperative and post endodontic pain or post obturation pain. This finding could be explained by the presence of pretreatment infection, which can lead to secondarily infected during treatment (Risso et al., 2008).

Medications

Previous studies have shown that preoperative administration of drugs might have an effect to suppress or reduce post endodontic pain. The search criteria for the drugs yielded 5 results which are represented in Table 6.

Administration of NSAIDs before endodontic therapy can suppress post endodontic pain, before it begins. This can be explained by the action of NSAID to block COX pathway inhibiting prostaglandin synthesis by decreasing the activity of cyclo-oxygenase enzyme and pain sensation is blocked before it begins (Menke et al., 2000).

Single/Multiple visits

There have been several attempts in the past to study a relation between single visit and multiple visit on post endodontic pain. There were different schools of thought, some states a higher incidence in post endodontic pain following single visit while the other shows high incidence by multiple visits. The results are summarized in Table 7.

In this study, 13 articles were found in the inclusion criteria that talked about the post endodontic pain. There was no significant difference found in the incidence of post endodontic pain in single or multiple visit endodontic treatment. This factor is very controversial and there are many opinions related to the risks of single/multiple visits (Sathorn et al., 2005). The advantages of single visit include, less number of appointments, less stress for an anxious patient, no risk of inter-appointment leakage, no temporary restorations fallings, but on the other hand its disadvantages include bacterial eradication not maximized and compromised healing rate (Spångberg, 2001). Multiple visits advantages include complete eradication of microorganisms; using calcium hydroxide, could reevaluate the tissue responses, and its disadvantages include, prolonged number of visits, inter-appointment flare ups, and patient fatigue. So, this basically depends on the vitality of teeth, use of intracanal medicaments, presence or absence of periapical radiolucency.

Instrumentation and obturation technique

No much study have investigated the patients post endodontic pain experienced after instrumentation with different techniques and by the obturation pattern within our inclusion criteria, we were able to find out only two studies, regarding this. Results of studies are summarized in Table 8.

Post endodontic pain after instrumentation is of great concern to the dentist, as due to the chances of over instrumentation, extrusion of root cleaning and filling materials increase the chances of post treatment pain (Genet et al., 1987). Step down or crown down technique produce term incidence of post endodontic pain when compared with step back technique. This may be due to the reason that step back technique; there is a high chance of pushing the debris beyond the apical foramen as stated in different studies (Ruiz et al., 1987; Al Omari and Dummer, 1995). In the step down technique, the bulk of tissue debris and microorganisms are removed before apical instrumentation is commenced, which greatly reduces the risks of extrusion causing periapical inflammation (Carrotte, 2004).

Vital and non-vital teeth

Wide variations exist in the literature concerning the incidence of post endodontic pain due to the vitality of teeth. The results of our search criteria are summarized

Table 2. Level of evidence accordind to evidence based medicine.

Explanation	Level of evidence
High quality systematic reviews of randomized controlled trials; Individual randomized controlled trials (with narrow confidence interval)	I
Systematic reviews of cohort studies; Individual cohort study or low quality randomized controlled trials	II
Systematic review of case-control studies; Individual case-control study, retrospective comparative study	III
Case-series	IV
Expert opinion without explicit critical appraisal, or based on physiology, bench research or "first principles"	V

Table 3. Studies on the influence of Gender on post endodontic pain.

Author	Sample	Conclusion	Level of evidence
Al Negrish and Habahbeh (2006)	120	Incidence of post endodontic pain in females (6%),males (3%)	III
Al bashaireh and Al Negrish (1998)	300	Incidence of post endodontic pain in females (5.2%), males (3.9%)	II
Sayeed et al. (2008)	1328	Higher incidence in females (7.4%), than males (1.8%)	I
Salma and Khurshiduzzaman (2013)	60	Incidence of post endodontic pain in females (10%), males (6.7%)	II
Talha et al. (2011)	60	Incidence of post endodontic pain in females was more than males	II

Table 4. Studies on the influence of type of teeth on post endodontic pain.

Author	Sample	Conclusion	Level of evidence
Najma et al. (2014)	60	Pain experienced in mandibular teeth were more than maxillary teeth	III
Castellanos-Cosano et al. (2012)	80	Post endodontic pain was significantly higher in molar teeth RCT	II
Salma and Khurshiduzzaman (2013)	60	More pain in premolar teeth when compared to anterior teeth	II
Segura-Egea et al. (2009)	176	Mandibular teeth had higher incidence of pain (42%) than when compared with maxillary teeth (26%)	III

Table 5. Studies on the influence of preoperative/obturation pain on post endodontic pain.

Author	Sample	Conclusion	Level of evidence
Sayeed et al. (2008)	1328	Patients with preoperative pain had more post operative pain (10.5%) when compared to patients without pain	I
Ng et al. (2004)	415	Preoperative pain had influence on post endodontic pain	III
Genet et al. (1987)	229	Higher incidence of post endodontic pain after 24 h with preoperative pain	III
Durre and Muhammad (2014)	140	Patients with preoperative pain had more (83.3%) post operative pain	III
Genet et al. (1986)	1204	Strong co-relation between preoperative and post operative pain (65%)	III

Table 6. Studies on the influence of medications on post endodontic pain.

Author	Sample	Conclusion	Level of evidence
Al-Kahtani (2014)	40	Long acting anesthetic like bupivacaine can cause less post operative pain than lidocaine	I
Sayeed et al. (2008)	39	Single dose of pretreatment analgesic did not reduce post endodontic pain	I
Priyank et al. (2014)	30	Single dose of 10mg ketorolac and 100mg tapentadol as pretreatmemt analgesic reduced the post endodontic pain	I
Hakan et al. (2011)	48	A prophylactic single dose of 20 mg tenoxicam significantly reduced the post operative pain	I
Jalalzadeh et al. (2010)	40	Single dose of prednisolone preoperatively substantially reduced the post endodontic pain	I

Table 7. Studies on the influence of single/multiple visits on post endodontic pain.

Author	Sample	Conclusion	Level of evidence
Wang et al. (2010)	100	No difference in pain levels between single and multiple visits	III
Singh and Garg (2012).	200	No difference in post operative pain between single/multiple visits	I
Prashanth et al. (2011)	32	No difference in post operative pain between single/multiple visits	III
Sumita et al. (2012)	80	Within 48 h pain for multiple visits were more	III
Krishna et al. (2013)	400	No difference in post operative pain between single/multiple visits in 48 h	III
Kavita et al. (2013)	60	No difference in post operative pain between single/multiple visits within 48 h	III
Raju et al. (2014)	110	Incidence of postoperative pain does not seem to be a valid comparison between single/multiple visits	III
Jorge et al. (2000)	150	Meticulously Instrumented One visit RCT can be as successful as two visit	I
DiRenzo et al. (2002)	72	No difference in post operative pain between single/multiple visits	II
Mulhern et al. (1982)	60	No significant difference in incidence of post operative pain between single/multiple visits	II
Rao et al. (2014)	140	No difference in post operative pain between single/multiple visits	III

Table 8. Studies on the influence of instrumentation and obturation on post endodontic pain.

Author	Sample	Conclusion	Level of evidence
Salem et al. (2009)	115	Step down technique had less post operative pain than step back technique	II
Luis-o et al. (2012)	204	Thermafil obturation produced higher incidence of pain	III

in Table 9.

Evidence of literature of the effect of vitality of the pulp on incidence of post endodontic pain remains inconclusive. The progression of pain in vital pulp might be due to the injury of periapical tissues during endodontic treatment which in turn increases the amount of prostaglandins, serotonin, histamines and bradykinis secretion (Mehrvarzfar et al., 2008). The higher incidence

Table 9. Studies on the influence of vitality of teeth on post endodontic pain.

Author	Sample	Conclusion	Level of evidence
Gotler et al. (2012)	85	Teeth with vital pulp had higher incidence of post endodontic pain than necrotic pulp	II
Oginni and Udoye (2004)	255	No relation between vitality and post operative pain	III
Farzana et al. (2010)	5	Pulp whether vital or non-vital had little effect on post endodontic pain	II
Bhagwat and Mehta (2013)	60	No significant difference between vital and non-vital teeth	II
Oginni and Udoye (2004)	60	No significant difference between vital and non-vital teeth	II
Bayram et al. (2009)	306	No significant difference between vital and non-vital teeth (p>.01)	II

of pain in non-vital pulp may be due to the presence of more microorganisms in the complex anatomy of the apical third canal and the presence of periapical bone destruction area (Ng et al., 2004).

Conclusion

The rate of post operative pain after endodontic treatment ranges from 1.4 to 1.6%.The occurrence of mild to moderate type of pain can occur even after rendering treatment of the highest standards. Its case as found from this systemic review is poli-etiological. All the factors are interrelated and directly, interdependent. Most importantly time is an important factor to consider in post endodontic pain. As evaluated and stated by different studies, minimal to moderate type of pain normally subsides with time. So, the dentist should not be over anxious or over react to an incidence of post endodontic pain and immediately initiate with retreatment or extraction.

Conflict of interest

Author has none to declare.

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