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# Postoperative Pain in Dentistry: A Review

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**Abstract:** Postoperative pain in dentistry is always a task for the clinician. Subdividing broadly the pain into the field of oral surgery, endodontics and restorative dentistry it is more easily to assess the aetiology and management. This review study addressed the value of assessment using the previously mentioned subgroups as a general area of interest. It is worth noting that postoperative pain may be expected in various dental procedures. Post-surgical pain affects, in a very high degree, patients comfort and sequentially the dental job.

**Key words:** Postoperative, pain, dentistry, oral surgery, assessment, management

## INTRODUCTION

Postoperative pain in dentistry is always a task for the dentist. The dentist should always evaluate the performed procedure for giving estimation about the postoperative pain. This would enable the clinician to estimate the possibility of pain in order to inform the patient and prescribe the optimal available pain medication.

This review study described the various types of postoperative pain in dentistry including diagnosis and management in the field of proper assessment.

**Postoperative pain in oral surgery:** Pain after common oral surgical procedures is frequent. A study found that pain was reported by over 65% of day-case patients in the first 48 h after operation (Coulthard *et al*., 2000a; Nehra *et al*., 1995) and it is moderate or severe. It is widely believed that management of this kind of pain is a serious problem (Bruster *et al*., 1994) and must be direct and effective. A recent national survey of postoperative analgesia in day surgery units in England and Wales highlighted that 70% or respondents feel that pain is a problem following day surgery and 90.8% of units supply their patients with analgesic drugs to take home (Joshi *et al*., 2000; Leith *et al*., 1994).

Aetiology of postoperative pain is the progress of inflammation and swelling in the area of the procedure the magnitude of which depends on the degree of tissue damage produced and on the extent of operative trauma. Many studies, based on the research of postoperative pain after 3rd molar surgery, non-surgical extractions, placement of implants and periapical surgery, have demonstrated that pain and swelling increase with the number of the teeth treated and with the duration of surgery (Penarrocha *et al*., 2006; Smith *et al*., 1992; Seymour *et al*., 1996; Meechan and Seymour, 1993; Bamgbose *et al*., 2005; Ruta *et al*., 2000; McGrath *et al*., 2003).

A survey shows that after the placement of 510 implants in 234 patients, pain was significantly associated with the operator experience and the difficulty of operation (Al-Khabbaz *et al*., 2007). The extended ostectomy leads to higher postoperative inflammation and consequently, to more intense pain (Osborn *et al*., 1985). This kind of pain, which is exclusively caused by inflammatory progress, is maximum in the early 48 h after the operation and gradually decreased with time until it is completely missing in 7th day (in the majority of clinical occasions except for the cases where an infection has been developed) (Nehra *et al*., 1995; Penarrocha *et al*., 2006; Whitworth *et al*., 2005; Tsesis *et al*., 2003; Penarrocha *et al*., 2001; Seymour *et al*., 1985; White *et al*., 2003; Conrad *et al*., 1999). These conclusions lead us think about importance of sufficient control of inflammation which can contribute to reduction of pain. Post-surgical pain affects, in a very high degree, patients' comfort and sequentially the dental job. There are several ways to approach that in daily dental care.

The first and most important thing that every dentist must take into consideration, is treating patients using harmless surgical methods. This is correlated to the accurate knowledge of oral anatomy and the use of the most proper surgical techniques. Furthermore, operator's experience is too vital for this purpose. Large ostectomy causes greater surgical trauma and hence, produces

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increased pain and inflammation (Osborn *et al*., 1985). Also, small soft tissue damage (careful performance of incisions, safe distance from sensitive oral elements as lower alveolar nerve, sinus etc., cautious stitching) and gentle operation which protects from undesirable effects (bone fracture, neural traumatism), can contribute to minimize the possibility of severe postoperative pain.

Another, issue that attention must be paid to is the administration of analgesic drugs which is closely related to oral surgery (Coulthard *et al*., 2000b; Joshi *et al*., 2000; Seymour *et al*., 1996; Bamgbose *et al*., 2005; McQuay, 1995; Van Aken *et al*., 2004). In most cases these drugs are compulsory and very helpful. Nonsteroidal anti-inflammatory drugs (NSAID's) are clearly the analgesics of first choice. According to many reviews, these analgesic agents are the most appropriate and effective drugs for surgical incidents due to their combined analgesic and anti-inflammatory action (Seymour *et al*., 1996; Dionne, 1992; Ahmad *et al*., 1997; Comfort *et al*., 2002; Betancourt *et al*., 2004). Also, studies demonstrate that NSAID's can be combined with paracetamol, an analgesic which has great analgesic and antipyretic properties and very weak anti-inflammatory action (Seymour *et al*., 1996). This combination is effective for instant pain relief (Coulthard *et al*., 2000a).

In addition to all the above mentioned, the time when administration takes place is ambiguous. Studies suggest that NSAID's should be administrated pre-operatively because they block prostaglandins' production much more effectively and their concentration in the region is large at the time that the effect of the anaesthetic drug has been passed. Thus, postoperative pain is sensibly reduced and patients are less anxious (Moore *et al*., 2005; Jackson *et al*., 1989; Pearlman *et al*., 1997). Contrary to these, another review supports that postoperative administration of NSAID's delays effectively the beginning and intensity of pain (Vogel *et al*., 1992). Generally speaking, there are no reliable conclusions about, which time is the most appropriate for analgesic administration (McQuay, 1995). Either way, the use of analgesic drugs after the several surgical procedures appears to be necessary and in most cases, operators have to supply patients with these agents for straight pain relief.

Another, category of anti-inflammatory-analgesic drugs that can be used chiefly after procedures, which cause extended swelling is the corticosteroids. Corticosteroids must be given only when NSAID's are ineffective and there are no any contraindications for their use (Hargreaves and Abbott, 2005). Now a days, their administration is generally limited and they are primarily used for the treatment of chronic diseases.

Another, issue which is omitted by the majority of dentists is psychological support to the patients. According to a review, methods such as preparing patients before operations can reduce postoperative analgesic consumption (Justins and Richardson, 1991). The same study demonstrates that many patients, who are going to be operated, expect to be in pain. This pain is mild when patients are convinced that pain will be strongly controlled by the operator (Coulthard *et al*., 2000b). It is generally believed that a big amount of patients feel moderate to severe pain when they feel anxious before the procedure (Averill, 1973; Sternbach, 1986). Consequently, it would be preferable to avoid information about the operation when patients are present (Coulthard *et al*., 2000a). In addition to the above, it must be indicated that significantly more women that men show signs of pain (Coulthard *et al*., 2000b). Thus, need of appropriate psychological approach to patients is compulsory for normal recovery. Another, thing that is under consideration is postoperative communication between healthcare providers and patients. A research concludes that this communication can efficiently reduce pain perception and number of analgesics used for relief (Touyz and Marchand, 1998). A second study indicates that many times patients are reluctant to request analgesia perhaps because they think that their pain cannot be controlled effectively, or they consider that doctor is to busy, or they do not want to complain (Lavies *et al*., 1992). For that reason, operators must be in touch with their patients either by phone or by re-checking at the surgery. Following this protocol, doctor is able to find out if patients are truly in pain and they can check the clinical view of the surgical field, which can lead them supply patients with analgesic drugs or antibiotics. This behaviour gives patients the opportunity to trust the operator and admire his difficult work.

There are specific complications in oral surgery that can take place and block the healing of surgical trauma and consequently harm patients comfort: infection of the area and dry socket. Infection of surgical region can be caused by deficient asepsis of the field, deficient sterilization of surgical tools, existence of septic operation field, systematic diseases or by patients careless postoperative behaviour (for example consumption of diary goods, or deficient oral hygiene). Infection can be treated using antibiotics (usually for 4 days) and having a good oral hygiene. If there is an abscess, it must be channelled to help patient feel embossed. Dry socket is a late complication (usually in the 1st or in the 2nd day postoperatively) of the extraction, (surgical or not) and is a very painful situation which can be caused by infection of the socket, traumatism, local anaesthesia, existence of

very dense bone etc. Dry socket can be healed by placing a piece of cotton with eugenol into the socket which is removed and replaced every 24 h until pain is relieved, or ferment of ZnO and eugenol for 5 days, or gauze of iodoform.

Another, part of oral surgery is periodontal surgery. All the above mentioned aspects are valid for this kind of surgery, but there are two special features that every surgeon must take care of. The first is that surgical procedures on the supporting structure of teeth cause less intense pain and patients rarely complain about discomfort (Paraschis and Vrotsos, 1989). The second is a specific complication that almost always accompanies periodontal surgery, the dental root sensitivity, which follows unfavorable gingival recession (Vaitkeviciene *et al*., 2006; Taani and Awartani, 2002; Chabanski *et al*., 1997). A research estimated that this sensitivity occurs in half of the patients following subgingival scaling (Fischer *et al*., 1991). The reason for this complication is root and dentinal tubules exposure (Banfield and Addy, 2004; Al-Sabbagh *et al*., 2004). The main purpose in treating such a clinical condition, is to plug the dentinal tubules preventing bacterium invasion and/or fluid within tubules (Paes Leme *et al*., 2004; Kolker *et al*., 2002). Though all the materials used now a days for curing root sensitivity to greater or lesser extent provide certain desensitizing effect, none of them guarantees absolute pain relief. Most of self-care products, such as mouthwashes, toothpastes, gels containing potassium, strontium, fluoride salts can occlude dentinal tubules or make direct impact on nerve endings of dental pulp, thus obstructing the generation of nerve impulse (Yates *et al*., 2004; Sowinski *et al*., 2001; Duke and Forward, 1982). The results of earlier studies have shown that the desensitizing effect of self-care products tends to manifest itself after several days, weeks, or months of regular use (Yates *et al*., 2004; Sowinski *et al*., 2001) and their effect might be quickly reduced by the use of acid containing food and beverages (Vaitkeviciene, 2006), as well as due to dental hygiene. According, to study about the root sensitivity of 62 patients with chronic periodontitis, who required periodontal surgery, a resin based dentin sealer used as desensitizing agent was very effective. This sealer provided quick and sufficient reduction in root sensitivity after surgery and its effect lasted beyond 30 days (Vaitkeviciene, 2006). Thus, the application of this sealer could be a prosperous solution for the complication of hypersensitivity.

It enables the patient to avoid uncomfortable sensitivity after dressing has been removed and allows him to return to good oral hygiene practices quickly, thereby, avoiding new accumulation of bacteria (Hoexter, 2006). Another, review demonstrates that gingival recessions can be successfully treated by an integrated periodontal and restorative dentistry approach (Santamaria *et al*., 2007). However, longitudinal randomized controlled clinical trials must be performed to support this approach. All these studies indicate some possible solutions to root sensitivity problem after periodontal surgery. Generally speaking, it must be referred that this complication must not be a bar between patient and good oral hygiene, which is essential for preservation of postoperative result.

**Pain after endodontic treatment:** Generally speaking, it can be said that pain after root canal treatment is common with various intensity which depends on several factors (Yoldas *et al*., 2004). Genet *et al*. (1987) reports pain at 27% of his research sample, after endodontic therapy at 443 teeth (5% severe pain and 22% mild pain). In another article, pain is shown to be present at 48, 5% of 988 treated patients (Negm, 2001).

There are two different kinds of pain in endodontics and two different time periods when patients complain for discomfort. Pain can come after instrumentation to the root canals during the first visit or after root canal obturation (Siqueira *et al*., 2002). This pain can be severe but usually is moderate and does not need an emergency treatment (Mattscheck *et al*., 2001). Pain is more intense in the first 48 h and is progressively reduced as time goes by until it disappears after 7-10 days (Mattscheck *et al*., 2001). The second kind of pain is caused by pulpal breakdown and is significantly more severe than the first type of pain. This flare-up needs to be treated immediately by the dentist to release the patient of their discomfort (Yoldas *et al*., 2004). The factors that contribute to the generation of the first situation are chemical, mechanical and microbial, while the factors that lead to the second painful condition are mainly microbial. Mechanical and chemical irritants are iatrogenic and due to the excessive extrusion of endodontic instruments to the periapical tissues and due to the irritation of these tissues by the medicaments, which are inserted into the root canals at the several steps of treatment (Siqueira *et al*., 2002) Microbial factors are the infection of periapical tissues by bacteria because of the wrong use of instruments or due to bacterial micro leakage through deficient temporary restorations or finally due to incomplete instrumentation of root canals (Mattscheck *et al*., 2001). Generally speaking, it can be claimed that every technique causes an amount of extrusion of bacteria and debris. Many researchers indicate that crown down technique and the use of rotary instruments produce minimum extrusion and

thus, minimum irritation and infection of periapical tissues. Consequently, the possibility of existence of mild or severe pain is small (Al-Omari and Dummer, 1995).

The most important factor that leads to success is careful and accurate following of all steps (root canals access, instrumentation, obturation, restoration) in every visit. Now a days, there is a huge variety of antimicrobial and anti-inflammatory drugs, which can be applied into the canal by reducing bacteria in root canals and in periapical tissues. This reduction of bacteria contributes to a decrease in inflammation progress and consequently to less postoperative pain. These medications are combinations of corticosteroids and antibiotics, Ca $(OH)_2$ after intracanal use of sodium hypochloride and many more that have antimicrobial activities. All these medications are shown to be very effective in endodontic treatment but their use must take place only in combination with meticulous mechanical treatment of root canals and never alternatively. Studies have demonstrated the rapidity of action of medicaments containing corticosteroids (Smith *et al*., 1976; Gurney, 1974). They produce a rapid onset of inflammation reduction and thus, they offer inter-appointment pain relief that can start even in the first hour after their application (Chance *et al*., 1987). Especially, when they are combined with antimicrobial factors (neomycin, tetracycline etc.), post-treatment pain seems to be hardly eliminated. These findings must not blockade the use of other medicaments that are necessary too. In a research, there was a noticeable conclusion which demonstrates that in many occasions, no pain was reported after endodontic treatment, which did not include any use of intracanal medications (Hasselgren and Reit, 1989; Oguntebi *et al*., 1992). This result supports several times that accurate endodontic access, instrumentation and obturation are irreplaceable. This is the factor, which ensures that treatment will occur under the best conditions.

Another, possible solution to the problem of post-treatment pain is the use of analgesic drugs (per os) as Non steroidal anti-Inflammatory drugs which additionally have anti-inflammatory activities (Pollo *et al*., 2001; Bombardier *et al*., 2000; Mardini and FitzGerald, 2001; Torabinejad *et al*., 1994; Mattscheck *et al*., 2001). These drugs are mainly used in occasions where a certain inflammation in periapical or endodontal tissues exists. They are a supplementary to the classic endodontic treatment and seem to be very beneficial for pain relief (Johnsen *et al*., 1983; Penniston and Hargreaves, 1996). Additionally to the above, it must be said that acetaminophen is helpful to pain reduction especially when it is given combined with anti-inflammatory drugs (Menhinick *et al*., 2004). Acetaminophen is ineffective when a certain inflammation progress takes place because of its weak anti-inflammatory action. In a situation like this, NSAID's are preferable.

It is widely believed that post-treatment pain is affected by the presence of pre-treatment pain (Genet *et al*., 1987; Torabinejad *et al*., 1988; Imura and Zuolo, 1995). Consequently, teeth that are symptomatic before therapy would probably be symptomatic after treatment too. This assumption comes against findings of other researchers (Fava, 1994) and more surveys are required to support one of these two different conclusions. Another, review demonstrates that pain is a subjective feeling and depends on patient's comprehension, gender (women complain about discomfort more frequently) (Levin *et al*., 2006), anxiety before treatment, previous bad experience and the presence of psychological support offered by the doctor. Dentists must guarantee that patient will not feel pain postoperatively. This is a factor, which has a positive affect on patient's tolerance to pain, especially in the first 48 h when statistically pain is more frequent (Siqueira *et al*., 2002). All these findings are under further research but represent useful knowledge for dentists. They offer an alternative approach to the problem of post-treatment discomfort and can impel the dentist thoughts about prescription of analgesic drugs (even if there is no accurate indication for such a medicament) so patients can feel calm and comfortable. In addition to this, most of the times, healthy physical and psychological condition of patients is essential for the completion of treatment.

Furthermore, communication between the patient and the doctor after treatment is vital and offers the dentist the opportunity to conclude if re-examination is necessary or if analgesics are required. Additionally, following this way of contact, dentists can approach patients psychologically and consequently they can reduce patients fear and anxiety about the following meetings.

**Postoperative pain in restorative dentistry:** There are plenty of reviews that have researched the occurrence of pain after restorations and their results are very useful. A study which inquires pulp responses after restorative dental treatment of 602 teeth, demonstrates that there is no indication that amalgam or resin restorations are followed by severe pain (Whitworth *et al*., 2005). Absence of discomfort prerequisites lack of micro-leakage and secondly thick residual dentine (more than 0.5 mm) (Whitworth *et al*., 2005; Unemori *et al*., 2001). This minimum thickness of 0.5 mm is able to diminish pulpal irritation and sequentially the generation of pain. Experimental studies in humans and animals conducted

during the last 15 years have shown strong association between pulpal lesions and marginal leakage of bacteria, while acidic etching and conditioning agents and dental restorative materials per se have been suggested to cause little or no clinically relevant pulp irritation (Cox and Hafez, 2001; Murray *et al*., 2002). According, to a review, pain after restorative procedures is additionally correlated with complexity of the restoration (higher frequency of sensitivity in class II MOD restorations, followed by class II MO/DO and class I restorations) (Briso *et al*., 2007), but this issue requires further research (Unemori *et al*., 2001). Another, study shows that there is higher sensitivity after restorations in cavities, which are deeper than 3 mm (Levin *et al*., 2006). It is demonstrated that deep cavities, mainly at posterior teeth, are mostly associated with intense pain when they are restored with composite resins than with amalgam (Whitworth *et al*., 2005). This possibly occurs because of the existence of micro leakage after resin restorations due to polymerization shrinkage. Resins are technique sensitive, requiring incremental buildup to prevent excessive dimensional changes during application. While, they may be able, with careful technique, to develop tight interfaces with dental tissues in the short-term, this may not reflect in their long-term clinical performance, particularly in the moist environment of the mouth under conditions of thermal and mechanical cycling (Huang *et al*., 2004; Nakabayashi, 2004). For this reason a lining or capping must be limited to a minimal area and as much dentine as possible must be left uncovered to facilitate adhesion (Fusayama, 1986).

In addition to the above mentioned, it is shown that many patients probably regard some postoperative discomfort as normal after an invasive dental procedure, but it is not possible to indicates a level above which patients would be concerned. Pragmatically, this might be a level above which patients would usually return to the dentist for emergency care (Whitworth *et al*., 2005). Another, clue which must be taken under consideration is that more women than men complain about discomfort after restorations. Furthermore, young patients feel pain more frequently than adults, mainly after restorations in deep cavities (Unemori *et al*., 2001). This event probably occurs because of the larger pulp chambers and because of the larger dentinal tubules, making it more likely that their teeth would be more sensitive to hydrodynamic stimuli.

Consequently, it can be concluded that: the most important factor which contributes to the absence of sensitivity after restorations is the absolute removal of decay and the accurate following of instructions of restorative techniques (dry operation region, careful placement of restorative materials, creation or right formed hedges, careful abrasion) to achieve the absolute aim, which is a high bond strength and thus prevent micro leakage. Dentists can be confident that pulps will be equally well protected from post-restorative irritation by composite resins and amalgam restorations, if only the placement of the materials is cautious (incremental buildup and careful polymerization for resins, gentle compression for amalgam to avoid any fracture of the tooth). After restorations of deep cavities (depth bigger than 3 mm), communication with patients is vital, especially if they are young or female or they show anxiety before the procedure. Thus, dentists are able to do something in time if a pulpal irritation is in progress or to suggest patients use analgesic drugs for pain relief.

## CONCLUSION

Postoperative pain in dentistry may be handled using proper pain-killers. Prognosis of postoperative pain is in most of the cases easy to be established. Therefore, the clinician should inform the patient prior to the procedure. A written consent form is always an easy and quick procedure about the possible postoperative outcome. Furthermore, prescribing pain-killers should decrease the intensity of the discomfort.

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