ORIGINAL ARTICLE

Comparison of Ibuprofen, Celecoxib and Tramadol in Relief of Pain after Extraction of Mandibular Third Molar Teeth

B Zamiri[1]*, K Mousavizadeh[2], M Tajoddini[1], C Mohammadinezhad[1], AM Aarabi[1]

[1]Department of Oral and Maxilofacial Surgery, School of Dentistry, Shiraz University of Medical Sciences, Shiraz, Iran, [2]Cellular and Molecular Research Center, Iran University of Medical Sciences, Tehran, Iran

Abstract

Backgound: The ultimate goal of oral health care providers is not only to restore function, but also to relieve pain. This study was undertaken to compare the analgesic efficacy of ibuprofen, celecoxib and tramadol in patients after extraction of mandibular third molar teeth.

Methods: Forty one patients entered our study and were randomly divided into three groups. Group 1 received ibuprofen (600 mg) and groups 2 and 3 received celecoxib (200 mg) and tramadol (100 mg) respectively, 8 hours and one hour before extraction of mandibular third molar teeth. The patients reported their pain severity in a questionnaire four and eight hours after the tooth extraction. To evaluate the side effects of the drug, the patients were asked to report if they had any problem using the drug.

Results: Fourteen patients received ibuprofen, 15 celecoxib and 12 tramadol for relief of pain. The pain severity in ibuprofen group, 4 and 8 hours after tooth extraction was less than celecoxib, and was less in these two groups when compared to tramadol group but no significant difference was found between the three groups. No undesirable side effects were reported in ibuprofen and celecoxib groups, but side effects such as headache, nausea, vomiting, oral dryness, drowsiness, tremor and vertigo were observed in the tramadol group. All patients who used tramadol were not satisfied from the drug while it had disturbed their daily activities.

Conclusion: Regarding the very little side effects of celecoxib and its desirable analgesic effects, it can be administered as one of the analgesic drugs of choice in dentistry.

Keywords: Ibuprofen; Celecoxib; Tremadol; Pain relief; Mandibular third molar teeth

Introduction

Pain is a common complaint often occurring with inflammatory processes after a tooth extraction,[1] while an uncontrolled pain may lead to avoid a dental treatment.[2] Non-steroidal anti-inflammatory drugs (NSAIDs) are used in treatment of pain including tooth pains for many years.[3] Even though they are effective in relief of pain, they may have adverse reactions.[3] An analgesic drug of choice must not affect the patient's consciousness or disturb his (her) normal activity.[4] So, there is a need to evaluate the efficacy and safety of NSAIDs extensively.[5] Cox-2 inhibitors were widely promoted as alternatives to both opioids and NSAIDs, mainly due to their less side effects.[6,7] However, some clinicians are cautious to their clinical value.[8,9] Ibuprofen as an NSAIDS drug was reported to control mild pains and is more tolerable than other drugs of the group,[2] and reduces the pain after tooth extraction better than aspirin, acetaminophen and acetaminophen codeine.[10-13] It was shown that ibuprofen is superior to celecoxib with regard to onset, duration of action and analgesic effect.[14,15] Celecoxib was shown to have similar analgesic effects of aspirin[16] and diclofenac[17] and more analgesic

***Correspondence:** Bordbad Zamiri, DMD, MSc, Assistant Professor of Department of Oral and Maxilofacial Surgery, School of Dentistry, Shiraz University of Medical Sciences, Shiraz, Iran. Tel: +98-917-1110362, Fax: +98-711-6271726, e-mail: zamirib@yahoo.com
Received: February 5, 2009 Accepted: May 17, 2009

effects than acetaminophen hydrocodeine[18] It was shown to reduce the pain after extraction of the wisdom tooth less than CS-706,[19] lumiracoxib,[20] rofecoxib[1,21] valdecoxib,[22] and naproxen.[1] Celecoxib was reported to have less undesirable effects on GI system than ibuprofen[1,23,24] and suggested to be used as a replacement drug when ibuprofen is not allowed to be used in presence of ulcer or bleeding in the gastrointestinal system.[2] This drug had no effect on platelet aggregation and bleeding time too.[7] Tramadol is a narcotic (opioid) used to control mild and severe pains.[25] Tramadol does not offer any particular benefits over existing analgesics for emergency pain relief situations,[26] but its combination with acetaminophen is superior to tramadol alone with respect to pain relief and duration of action.[27,28] Vertigo, nausea, vomiting, headache and xerostomia are the reported side effects of this drug.[29] So, this study was performed to compare the analgesic efficacy and safety of ibuprofen, celecoxib and tramadol in patients after extraction of mandibular third molar teeth.

Patients and Methods

In this study performed in Department of Oral and Maxillofacial Surgery at Shiraz School of Dentistry, Shiraz, Southern Iran, 45 patients aged 18 to 40 years old from both sexes who referred for extraction of mandibular third molar teeth were enrolled. The study was approved by Ethics Committee of the school and a written consent was provided from each participant. The necessary trainings about the importance of method of drug administration to relieve their tooth pain were carried out for each patient by a single person.

Each participant was visited three times. At first, the study protocol was explained for each subject and those who were cooperative were selected. A questionnaire was used to record their demographic information including age, weight and height of patients and the findings of their physical examination and radiography. Any kind of caries, inflammation and infection around the mandibular third molar teeth diagnosed in this stage by clinical examinations and radiography (periapical with parallel technique using films no. 1 and 2) were recorded.

Out of 45 patients, 41 were cooperative until the end of the study and four patients were excluded from the study. The patients were randomly divided into three groups. 14 (34.1%) received ibuprofen (Group 1, 600 mg, Hakim Pharmaceutics Co., Iran, Group 1), 15 (36.6%) celecoxib (Group 2, 200 mg, Tehran Daru Pharmaceutics Co., Iran, Group 2) and 12 (29.3%) tramadol (Group 3, 100 mg, KRKA, Slovania, Group 3). Each group received the determined dose of the drug 8 hours and one hour before tooth extraction.

The age, height and weight means in the ibuprofen Group were 26 years, 162.1 cm and 58.6 kg while these figures for celecoxib Group were 25 years, 167.7 cm and 61.2 kg and for tramadol Group were 24.5 years, 167.6 cm and 58.3 kg (Total=25.4 years, 165.8 cm and 59.5 kg respectively). 27 patients (65.9%) were female and 14 (34.1%) were male including 9 females and 5 males in ibuprofen group while the figures for celecoxib group were 10 and 5 and for tramadol were 8 and 4 respectively.

Subjects with inadequate literacy, suffering from a systemic disease, sensitive to a drug, having any history of drug abuse, using anticoagulant drugs, having any kind of caries and infection around the mandibular third molar teeth and pregnant and nursing women were excluded from the study. The time of tooth extraction for each patient was determined and the patients were asked to use the drug on time.

The second visit was at the time of tooth extraction. The treatment steps were conducted by the same surgeon and in a similar condition and their medical and dental history and blood pressure and pulse rate were recorded again. To evaluate the side effects of the drug, the patients were asked to report if they had any problem using the drug. 2% lidocaine and 1/100000 epinephrine were used for local anesthesia in the inferior alveolar, buccal and glossopharyngeal nerves. In this stage, the number of carpules used for anesthesia, the anesthesia and operation durations were recorded. The mean number of used carpules for local anesthesia was 2.17 which was 2.14 in ibuprofen and 2.20 in celecoxib and 2.17 in tramadol group. The mean anesthesia time since injection of the anesthetic and the start of operation was 9.61 minutes, which was 9.50 min in ibuprofen, 10.20 min in celecoxib and 9.61 min in tramadol group. The mean operation time was 8.68 minutes which was 8.00, 10.67 and 7.00 minutes in ibuprofen, celecoxib and tramadol groups respectively.

Straight elevator and forceps (no. 222) were used for tooth extraction. All events during operation (root fracture, need to develop a flap, bone removal and tooth section) were recorded. A 3.0 silk suture was used to stitch after irrigation of the wound. The duration of operation was recorded in the questionnaire. The patient was asked to put small gauze on the tooth

extraction socket with a mild pressure on the area until one hour and to avoid any intake of food up to two hours. The patient could have cold and soft food thereafter. The patients were also asked not to use any other drug for his/her pain until the first 8 hours after tooth extraction and to report the severity of pain 4 and 8 hours after dental extraction on a 10 cm visual analogue scale in the questionnaire. The pain severity was recorded only at 4 and 8 hours after extraction because the peak post-operation pain usually occurred during this period. The scale consisted of a horizontal or vertical 10 cm line with two points on both sides considered as distance between pain absence (0) and intolerable pain (10). The patient could mark the pain severity on this line while the zero point of this line indicated to a numerical pain severity. The surgeon's remark on difficulty of operation was also recorded based on a scoring of 1 to 3.

The third visit was after 7 days post-dental extraction. The patients completed the questionnaire again and reported the needed information.

The data were statistically analyzed using Kruskal-Wallis test and a p value less than 0.05 was considered significant.

Results

The difference between the genders, age, weight and height of patients were not statistically significant. The overall root number mean was 1.63 which was 1.71, 1.53 and 1.67 in ibuprofen, celecoxib and tramadol groups respectively.

The pain severity mean, 4 hours after tooth extraction in ibuprofen group was 1.02±1.22 (min=0.00, max=4.25) and in celecoxib and tramadol groups were 1.33±1.72 (min=0.00, max=5.25) and 2.02±2.44 (min=0.00, max=7.00) respectively (Total=1.43±1.82) while these figures, 8 hours after tooth extraction were 1.55±1.69 (min=0.00, max=6.13), 1.68±1.43 (min=0.00, max=5.00) and 2.33±2.58 (min=0.00, max=8.13) respectively (Total=1.82±1.90).

29 patients showed no caries while in 5 and 7 patients, dentin and pulp caries were noticed (Figure 1). The pain severity in ibuprofen group, 4 and 8 hours after tooth extraction was less than celecoxib, and was less in these two groups when compared to tramadol group. In relation to pain severity, 4 and 8 hours after tooth extraction, no statistical significant difference was found between the three groups (Figure 2). No correlation was observed between age, sex, height, weight, number of roots, dental caries, number of used anesthetic carpules, and duration of anesthesia and operation and the patients' severity of pain 8 hours after tooth extraction.

On scoring of difficulty of surgery, 29 patients entered score 1 and 10 and 2 patients were in score 2 and 3. These figures for ibuprofen group were 11, 3 and 0, for celecoxib, 9, 4 and 2 and for the tremadol group were 9, 3 and 0.

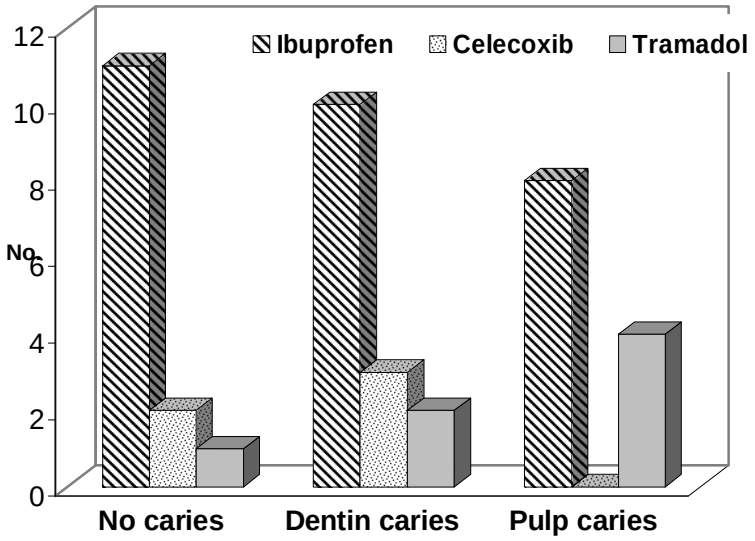

Fig. 1: Frequency of dental caries in three groups of patients

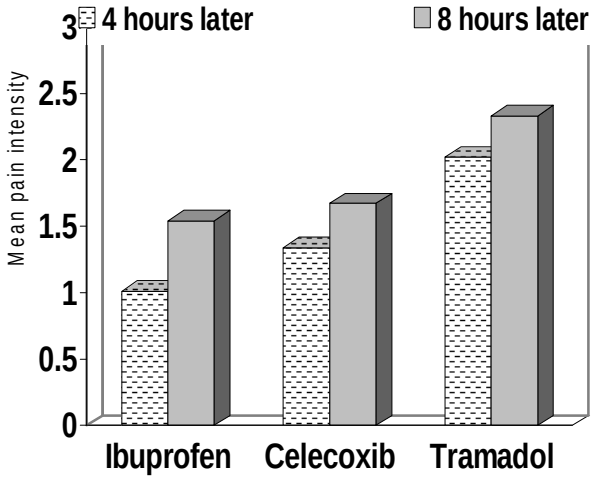

Fig. 2: The pain severity after tooth extraction in different groups

No undesirable side effects were observed in ibuprofen and celecoxib groups, but nausea (7 patients), vertigo (7 patients), vomiting (4 patients), xerostomia (4 patients), drowsiness (2 patients) and tremor (2 patients) were visible in the tramadol group. All patients who used tramadol as an analgesic drug were not satisfied (8 out of 12) becuase the drug had disturbed their daily life activities. Seven patients reported that they would never use tramadol as an analgesic.

Discussion

Many clinicians still appear confused about the clinical advantages of ibuprofen, celecoxib and tramadol even there are several reports on pain reducing effects of ibuprofen, celecoxib and tramadol.[17,30-32] The effect of these drugs on relief of pain after extraction of mandibular third molar teeth is not still clarified. In this study, we showed that the pain severity in ibuprofen group, 4 and 8 hours after tooth extraction was less than celecoxib, and was less in these two groups when compared to tramadol group but the difference was not statistically significant. The maximum severity of pain 4 hours after tooth extraction in tramadol group was 7 which was more than ibuprofen (4.25) and celecoxib groups. The maximum severity of pain 8 hours after tooth extraction in tramadol group was 8.13 which was also more than the ibuprofen (6.13) and celecoxib (5) groups.

In relation to ibuprofen, there are many reports showing that it had more analgesic activity than acetaminophen and codeins,[33] methyl prednisolen,[34] acelofenac,[35] celecoxib and rofecoxib.[1,14,15,36-39] Rofecoxib, valdecoxib, parecoxib, lumiracoxib, naproxen and diclofenax were reported to have a better analgesic activity than celecoxib[20,21,40] but acetaminophen and codeins had less analgesic activity than celecoxib.[18,41] The suppression of products of COX-2 coincident with pain suppression and the absence of COX-1 inhibition suggest that celecoxib is a relatively selective COX-2 inhibitor in vivo.[14] The analgesic activity of tramadol was shown before,[28,32,36] and was shown to have similar analgesic activity to ketoralac[34] and more than paracetamol[42] and less than aspirin, acetaminophen, codeins and bromofenac.[36,43] It does not offer any particular benefits over existing analgesics[26] and is just recommended when NSAIDs are not allowed to be administered for a patient.[44]

In some studies similar analgesic effects of ibuprofen, and aspirin were reported but aspirin was less tolerable[45] and when compared to sodium naproxen, this analgesic activity was less.[46] Our results showed that ibuprofen and celecoxib were suitable drugs in relief of pain after tooth extraction, but tramadol was not due to its undesirable side effects. Regarding the very little side effects of celecoxib which the clinician must inform the patient about, and its desirable analgesic effects in comparison to ibuprofen and tramadol, it can be recommended as one of the analgesic drugs of choice in dentistry. Perhaps more comprehensive studies are needed to show the correct time of its use

(before or after treatment) for a more efficiency.

Acknowledgments

The authors would like to thank The Office of Vice Chancellor for Research Affairs of Shiraz University of Medical Sciences for financial support.

Conflict of interest: None declared.

References

1 Malmstrom K, Daniels S, Kotey P, Seidenberg BC, Desjardins PJ. Comparison of rofecoxib and celecoxib, two cyclooxygenase-2 inhibitors, in postoperative dental pain: a randomized, placebo- and active-comparator-controlled clinical trial. *Clin Ther* 1999;**21**:1653-63. [10566562] [doi:10.1016/S0149-2918(99)80045-9]

2 Mehlisch DR. The efficacy of combination analgesic therapy in relieving dental pain. *J Am Dent Assoc* 2002;**133**:861-71. [12148679]

3 Klasser GD, Epstein J. Nonsteroidal anti-inflammatory drugs: confusion, controversy and dental implications. *J Can Dent Assoc* 2005;**71**:575-80. [16202197]

4 Mehlish DR. Double-blind single dose comparison of bromefanac sodium, tramadol, and placebo after oral surgery. *J Clin Pharmacol* 1998;**38**:445-62. [9602960]

5 Dionne RA, Berthold CW. Therapeutic uses of nonsteroidal anti-inflammatory drugs in dentistry. *Crit Rev Oral Biol Med* 2001;**12**:315-30. [11603504] [doi:10.1177/10454411010120040301]

6 Chen LC, Elliott RA, Ashcroft DM. Systematic review of the analgesic efficacy and tolerability of COX-2 inhibitors in post-operative pain control. *J Clin Pharm Ther* 2004;**29**:215-29. [15153083] [doi:10.1111/j.1365-2710.2004.00558.x]

7 Huber MA, Terezhalmy GT. The use of COX-2 inhibitors for acute dental pain: A second look. *J Am Dent Assoc* 2006;**137**:480-7. [16637477]

8 Topol EJ. Arthritis medicines and cardiovascular events--"house of coxibs". *JAMA* 2005;**293**:366-8. [15623849] [doi:10.1001/jama.293.3.366]

9 Graham DJ, Campen D, Hui R, Spence M, Cheetham C, Levy G, Shoor S, Ray WA. Risk of acute myocardial infarction and sudden cardiac death in patients treated with cyclo-oxygenase 2 selective and non-selective non-steroidal anti-inflammatory drugs: nested case-control study. *Lancet* 2005;**365**:475-81. [15705456]

10 Arias OR, Marquez-Orozco MC. Aspirin, acetaminophen, and ibuprofen: their effects on orthodontic tooth movement. *Am J Orthod Dentofacial Orthop* 2006;**130**:364-70. [16979495] [doi:10.1016/j.ajodo.2004.12.027]

11 Morse Z, Tump A, Kevelham E. Ibuprofen as a pre-emptive analgesic is as effective as rofecoxib for mandibular third molar surgery. *Odontology* 2006;**94**:59-63. [16998619] [doi:10.1007/s10266-006-0062-4]

12 Schleier P, Prochnau A, Schmidt-Westhausen AM, Peters H, Becker J, Latz T, Jackowski J, Peters EU, Romanos GE, Zahn B, Lüdemann J, Maares J, Petersen B. Ibuprofen sodium dihydrate, an ibuprofen formulation with improved absorption characteristics, provides faster and greater pain relief than ibuprofen acid. *Int J Clin Pharmacol Ther* 2007;**45**:89-97. [17323788]

13 Gazal G, Mackie IC. A comparison of paracetamol, ibuprofen or their combination for pain relief following extractions in children under general anaesthesia: a randomized controlled trial. *Int J Paediatr Dent* 2007;**17**:169-77. [17397460] [doi:10.1111/j.1365-263X.2006.00806.x]

14 Khan AA, Brahim JS, Rowan JS, Dionne RA. In vivo selectivity of a selective cyclooxygenase 2 inhibitor in the oral surgery model. *Clin Pharmacol Ther* 2002;**72**:44-9. [12152003] [doi:10.1067/mcp.2002.125560]

15 Doyle G, Jayawardena S, Ashraf E, Cooper SA. Efficacy and tolerability of nonprescription ibuprofen versus celecoxib for dental pain. *J Clin Pharmacol* 2002;**42**:912-9. [12162474] [doi:10.1177/009127002401102830]

16 Cooper SA, Needle SE, Kruger GO. Comparative analgesic potency of aspirin and ibuprofen. *J Oral Surg* 1977;**35**:898-903. [269932]

17 McKenna F, Borenstein D, Wendt H, Wallemark C, Lefkowith JB, Geis GS. Celecoxib versus diclofenac in the management of osteoarthritis of the knee. *Scand J Rheumatol* 2001;**30**:11-8. [11252686] [doi:10.1080/030097401750065265]

18 Gimbel JS, Brugger A, Zhao W, Verburg KM, Geis GS. Efficacy and tolerability of celecoxib versus hydrocodone/acetaminophen in the treatment of pain after ambulatory orthopedic surgery in adults. *Clin Ther* 2001;**23**:228-41. [11293556] [doi:10.1016/S0149-2918(01)80005-9]

19 Moberly JB, Xu J, Desjardins PJ, Daniels SE, Bandy DP, Lawson JE, Link AJ, Truitt KE. A randomized, double-blind, celecoxib- and placebo-controlled study of the effectiveness of CS-706 in acute postoperative dental pain. *Clin Ther* 2007;**29**:399-412. [17577461] [doi:10.1016/S0149-2918(07)80078-6]

20 Kellstein D, Ott D, Jayawardene S, Fricke J. Analgesic efficacy of a single dose of lumiracoxib compared with rofecoxib, celecoxib and placebo in the treatment of post-operative dental pain. *Int J Clin Pract* 2004;**58**:244-50. [15117090] [doi:10.1111/j.1368-5031.2004.00155.x]

21 Rømsing J, Møiniche S. A systematic review of COX-2 inhibitors compared with traditional NSAIDs, or different COX-2 inhibitors for post-operative pain. *Acta Anaesthesiol Scand* 2004;**48**:525-46. [15101847] [doi:10.1111/j.0001-5172.2004.00379.x]

22 Christensen KS, Cawkwell GD. Valdecoxib versus rofecoxib in acute postsurgical pain: results of a randomized controlled trial. *J Pain Symptom Manage* 2004;**27**:460-70. [15120774] [doi:10.1016/j.jpainsymman.2004.02.001]

23 Whelton A, Fort JG, Puma JA, Normandin D, Bello AE, Verburg KM; SUCCESS VI Study Group. Cyclooxygenase-2--specific inhibitors and cardiorenal function: a randomized, controlled trial of celecoxib and rofecoxib in older hypertensive osteoarthritis patients. *Am J Ther* 2001;**8**:85-95. [11304662] [doi:10.1097/00045391-200103000-00003]

24 Gibofsky A. Clinical profiles of celecoxib and rofecoxib in the rheumatic diseases. *J Hypertens Suppl* 2002;**20**:S25-30. [12683424]

25 Pozos-Guillen A, Martinez-Rider R, Aguirre-Banuelos P, Perez-Urizar J. Pre-emptive analgesic effect of tramadol after mandibular third molar extraction: a pilot study. *J Oral*

Maxillofac Surg 2007;**65**:1315-20. [17577495] [doi:10.1016/j.joms.2006.10.079]

26 Close BR. Tramadol: does it have a role in emergency medicine? *Emerg Med Australas* 2005;**17**:73-83. [15675908] [doi:10.1111/j.1742-6723.2005.00671.x]

27 Jung YS, Kim DK, Kim MK, Kim HJ, Cha IH, Lee EW. Onset of analgesia and analgesic efficacy of tramadol/acetaminophen and codeine/acetaminophen/ibuprofen in acute postoperative pain: a single-center, single-dose, randomized, active-controlled, parallel-group study in a dental surgery pain model. *Clin Ther* 2004;**26**:1037-45. [15336468] [doi:10.1016/S0149-2918(04)90175-0]

28 Kumara R, Zacharias M. Effectiveness of tramadol as an analgesic in oral surgery. *N Z Dent J* 2002;**98**:9-11. [12017904]

29 Gibson TP. Pharmacokinetics, efficacy, and safety of analgesia with a focus on tramadol HCl. *Am J Med* 1996;**101**:47S-53S. [8764760]

30 Ekman EF, Fiechtner JJ, Levy S, Fort JG. Efficacy of celecoxib versus ibuprofen in the treatment of acute pain: a multicenter, double-blind, randomized controlled trial in acute ankle sprain. *Am J Orthop* 2002;**31**:445-51. [12216965]

31 Barden J, Edwards JE, McQuay HJ, Moore RA. Single dose oral celecoxib for postoperative pain. *Cochrane Database Syst Rev* 2003;**(2)**:CD004233. [12804506]

32 Shipton EA, Roelofse JA, Blignaut RJ. An evaluation of analgesic efficacy and clinical acceptability of intravenous tramadol as an adjunct to propofol sedation for third molar surgery. *Anesth Prog* 2003;**50**:121-8. [14558587]

33 Primosch RE, Nichols DL, Courts FJ. Comparison of preoperative ibuprofen, acetaminophen, and placebo administration on the parental report of postextraction pain in children. *Pediatr Dent* 1995;**17**:187-91. [7617493]

34 Troullos ES, Hargreaves KM, Butler DP, Dionne RA. Comparison of nonsteroidal anti-inflammatory drugs, ibuprofen and flurbiprofen, with methylprednisolone and placebo for acute pain, swelling, and trismus. *J Oral Maxillofac Surg* 1990;**48**:945-52. [2395047] [doi:10.1016/0278-2391(90)90007-O]

35 Seymour RA, Frame J, Negus TW, Hawkesford JE, Marsden J, Matthew IR. The comparative efficacy of aceclofenac and ibuprofen in postoperative pain after third molar surgery. *Br J Oral Maxillofac Surg* 1998;**36**:375-9. [9831059] [doi:10.1016/S0266-4356(98)90650-7]

36 Moore PA, Hersh EV. Celecoxib and rofecoxib. The role of COX-2 inhibitors in dental practice. *J Am Dent Assoc* 2001;**132**:451-60. [11315375]

37 Malmstrom K, Fricke JR, Kotey P, Kress B, Morrison B. A comparison of rofecoxib versus celecoxib in treating pain after dental surgery: a single-center, randomized, double-blind, placebo- and active-comparator-controlled, parallel-group, single-dose study using the dental impaction pain model. *Clin Ther* 2002;**24**:1549-60. [12462285] [doi:10.1016/S0149-2918(02)80059-5]

38 Wynn RL. The new COX-2 inhibitors: rofecoxib (Vioxx) and celecoxib (Celebrex). *Gen Dent* 2000;**48**:16-20. [11199547]

39 Diunne R. Relative efficacy of selective COX-2 inhibitors compared with over-the-counter ibuprofen. *Int J Clin Pract Suppl* 2003;**(135)**:18-22. [12723742]

40 Bertin P, Béhier JM, Noël E, Leroux JL. Celecoxib is as efficacious as naproxen in the management of acute shoulder pain. *J Int Med Res* 2003;**31**:102-12. [12760313]

41 Watcha MF, Issioui T, Klein KW, White PF. Costs and effectiveness of rofecoxib, celecoxib, and acetaminophen for preventing pain after ambulatory otolaryngologic surgery. *Anesth Analg* 2003;**96**:987-94. [12651647] [doi:10.1213/01.ANE.0000053255.93270.31]

42 Pendeville PE, Von Montigny S, Dort JP, Veyckemans F. Double-blind randomized study of tramadol vs. paracetamol in analgesia after day-case tonsillectomy in children. *Eur J Anaesthesiol* 2000;**17**:576-82. [11029125]

43 Medve RA, Wang J, Karim R. Tramadol and acetaminophen tablets for dental pain. *Anesth Prog* 2001;**48**:79-81. [11724223]

44 Courtney MJ, Cabraal D. Tramadol vs. diclofenac for posttonsillectomy analgesia. *Arch Otolaryngol Head Neck Surg* 2001;**127**:385-8. [11296045]

45 Jain AK, Ryan JR, McMahon FG, Kuebel JO, Walters PJ, Noveck C. Analgesic efficacy of low-dose ibuprofen in dental extraction pain. *Pharmacotherapy* 1986;**6**:318-22. [3547351]

46 Kiersch TA, Halladay SC, Koschik M. A double-blind, randomized study of naproxen sodium, ibuprofen, and placebo in postoperative dental pain. *Clin Ther* 1993;**15**:845-54. [8269451]