

## EFFECTIVENESS OF NSAIDs AULIN AND IBUPROFEN ON THE POSTOPERATIVE PAIN AT GINGIVAL GRAFT PROCEDURES – A PRELIMINARY STUDY

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### ABSTRACT

**Background:** Gingival reconstruction has recently become a routine part of the periodontal treatment. Gingival grafting is considered as predictable procedure for root coverage with a high degree of cosmetic enhancement for attached tissue augmentation and for preprosthetic treatment. Mucogingival surgery includes pedicle flaps and free gingival grafts or connective tissue grafts. These procedures are accompanied by donor site pain. NSAIDs are successfully used to affect this pain. Aulin and Ibuprofen have good analgesic and anti-inflammatory activities. Their main pharmacological action includes inhibition of prostaglandin synthesis via COX-2, reduction of cytokine-induced hyperalgesia by suppressing TNF- $\alpha$  and the synthesis of proteinase enzymes (MMPs). Postoperative administration of the drugs after gingival graft procedures and its pharmacological effect might contribute to inhibit the pain and decrease the morbidity in the postoperative period.

**Methods:** Fifteen subjects participated in this study from 18 to 62 years of age. They received Aulin and Ibuprofen twice daily x 100 and 200 mg respectively for 4 days – in the early postoperative period. The surgical interventions were performed under local anaesthesia (4% Ubistesin with epinephrine 0,006 mg/ml). A four-point verbal rating scale (VRS-4) was used to measure the level of pain. Patients were instructed to complete a pain diary every hour for the first 8 hours after the surgical procedure and three times a day on the following 3 days. Each of them received Aulin or Ibuprofen initially by the end of the first hour after intervention and 12 hours after the first dose, and then for the next 3 days twice daily x 100 and 200 mg, respectively. Patients evaluated an independent rate of their pain intensity as follows: high expression, moderate, discomfort or missing.

**Results:** In the following hours after the grafting procedure the pain in the recipient and donor sites show scores of successful inhibition from 0.33 to 1.25. This represents discomfort to missing pain. In the first day after

the surgery Aulin<sup>®</sup> shows higher scores than Ibuprofen<sup>®</sup> but both of them are lower than 1, which represents discomfort to missing pain. In the second day, the pain shows a little bit higher scores. In the third day, the pain is successfully inhibited and the pain syndrome is still between discomfort and missing pain.

**Conclusions:** Aulin<sup>®</sup> and Ibuprofen<sup>®</sup> are effective analgesics in the early postoperative healing – there was no need for additionally analgesic drug to be taken.

**Key words:** cosmetic gingival reconstruction, gingival graft procedures, NSAIDs

Nowadays, gingival tissue reconstruction is considered to be a routine part of periodontal therapy. In the last decades mucogingival surgery shows emphatic possibilities with the development of procedures for covering exposed root surfaces, augmentation of attached gingival tissues, reconstruction of alveolar ridge and for preprosthetic or pre-implant techniques (7). Mucogingival surgical techniques are widely regarded as pedicle flaps, but for reconstruction of gingival tissues and root surface coverage, the free gingival grafts and connective tissue grafts are often used (6). Contemporary modifications and the precise execution of the donor and recipient sites preparation increase the predictability of procedures. All surgical interventions for gingival graft procedures have the inconvenience of great morbidity because of the presence of two surgical sites (14). Postoperative pain after gingival graft procedures is a common occurrence from the recipient and donor site (18).

Postsurgical pain in periodontal flap procedures and regenerative therapy varies and depends on patients' individual tolerance. Clinician's behavior with the exact surgical technique can reduce trauma and postsurgical pain, respectively. There is data, showing that duration of gingival and bone surgery is associated with the intensity of postoperative pain (8). Adequate drug treatment in the healing period is able to ensure better patients' comfort and compliance in planning other surgical procedures (1, 2, 4, 9).

There are studies with enough evidence for successful treatment and control of postoperative pain with non-steroidal anti-inflammatory drugs (NSAIDs) (11, 18, 20, 16).

The use of NSAIDs in inflammatory diseases and conditions associated with pain is based on their effect on metabolism of arachidonic acid and quantity of obtained products. PGE<sub>2</sub> is an agent that has the effect of hyperalgesia stimulation. Postoperative pain after periodontal surgery is result of the synergic effect of bradykinin, complement fragments and histamine, and PGE<sub>2</sub> hyperalgesia, and the associated trauma inflammation (5, 12, 13). Most hypothesis include analgesic and anti-inflammatory effects of NSAIDs mainly by inhibiting the cyclooxygenase (COX) enzyme with reduction of the synthesis of arachidonic acid's metabolites – prostaglandins (PGE<sub>2</sub>, PGI<sub>2</sub>) and tromboxans (TxA<sub>2</sub>, TxB<sub>2</sub>). There is also evidence for efficacy of NSAIDs in the prevention of pain and discomfort after the effect of local anesthesia is gone which gives reasons for their preoperative use for reduction of PG synthesis and inflammation response associated with tissue trauma (10, 17, 21, 23, 27).

The goal of the present study is to compare the efficacy of selective COX-2 inhibitor of new class Aulin® 100 mg (Helsinn Birex Pharmaceuticals Ltd., Damastown, Muludart, Dublin 15, Ireland) widely used as analgesic drug, and non-selective COX-2 inhibitor Ibuprofen® 200 mg (Pharmaceutical Works Polfa in Pabianice, Joint Stock Co. Poland) also successfully used for pain inhibition but with some side effects.

## **MATERIALS AND METHODS**

### **Patients selection**

Fifteen subjects from 18 to 62 years of age participated in the study, with planned surgical procedure for gingival tissues augmentation with gingival graft. Inclusion criteria is the necessity to augment the gingival tissues with free gingival autograft from palate, with lack of systemic diseases, including drug allergy; oral hygiene standard of >70 % plaque-free sites (HI O'Leary et al. 1972; Lindhe 1983); gingival status with <10% bleeding on probing sites (PBI Saxer & Muhlemann 1975).

### **Surgical protocol**

All patients were treated with the same surgical procedure – increasing of attached gingival tissues in the area of the mandibular incisors or maxillar teeth and mandibular area of canine and premolars with free gingival graft from palate. After standardized infiltration anesthesia (4% Ubisthesin with epinephrine 0.006 mg/ml) on recipient site was prepared a partial-thickness flap (blade 15), fixed marginal with periosteal sutures (4/0 suturing material). The same anesthetic was used for palatal gingiva and then the

gingival graft was taken with 25 mm length and 5 mm width, the thickness being about 1-1.5 mm – from the area of the premolars to the middle of the first molar. For the harvesting of the graft was used blade 15 and anatomic tissue pliers. The graft was placed shortly in a 0.9% sterile NaCl (sterile isotonic solution of sodium chloride) and the fatty tissue was removed if needed. The immobilization of the graft in the recipient site was made with 5/0 peripheral sutures. After a routine compression on the recipient site CoePak® periodontal dressing (GC America) was placed for 10 days. The donor site was treated with Gelaspon® resorbable gelatin sponge (Ankerpharm) and compression and a periodontal dressing was also placed for 3 days, fixed on the teeth. The duration of the procedure in all patients included was from 60 to 80 minutes. All the surgical procedures were performed by one surgeon. Another one did the postoperative pain research.

The 15 patients were randomized and separated into 2 groups – 8 of them receiving Aulin® 100 mg and 7 of them receiving Ibuprofen® 200 mg. By the end of the first hour after the gingival graft procedure they received the first dose, and also on hour 12, and the next 3 days twice daily the same dose.

For pain assessment a four-point verbal rating scale (VRS-4) was used. Patients were instructed to complete a pain diary every hour for the first 8 hours after the surgery and three times a day on the following 3 days (18). They evaluated an independent rate of their pain intensity as follows: 3 – high expression, 2 – moderate, 1 – discomfort or 0 – missing. Data is inserted in a pain diary. In case any additional analgesics were needed, patients were instructed to take Paracetamol (Efferalgan) 500 mg and point that in the diary. They also registered all side effects in the period of taking the medication.

### **Statistical analysis**

We used analysis of variance (SPSS v15.0) with mean scores of pain intensity with standard deviation, t-criteria, and statistical significance of  $P < 0.05$ . The results are presented on figures 1, 2, 3 and 4 (Microsoft Excel).

## **RESULTS**

All 15 patients completed the study, and the compliance with the pain diary was 100%. No side effects were reported for any of the medications used. No statistically significant difference between pain scores of the two groups was found. In Table 1 are showed the mean  $\pm$ SD scores using VRS-4 for the pain in Aulin® and Ibuprofen® groups in the first eight hours after the surgical procedure and in Table 2 mean  $\pm$ SD scores using VRS-4 for pain in Aulin® and Ibuprofen® groups the next 3 days after the surgical procedure, respectively.

**Table 1.** Mean  $\pm$ SD Scores using VRS-4 for the pain in Aulin<sup>®</sup> and Ibuprofen<sup>®</sup> groups in the first eight hours after the surgical procedure

Time	Aulin <sup>®</sup>	Ibuprofen <sup>®</sup>	Scores for t	P Value
1 hour	1.25 $\pm$ 0.87	1 $\pm$ 0.89	0.53	P>0.10
2 hours	1.25 $\pm$ 0.87	0.67 $\pm$ 0.82	1.28	P>0.10
3 hours	1.13 $\pm$ 0.83	0.67 $\pm$ 0.52	1.27	P>0.10
4 hours	1 $\pm$ 0.76	0.5 $\pm$ 0.55	1.43	P>0.10
5 hours	0.88 $\pm$ 0.64	0.5 $\pm$ 0.55	1.19	P>0.10
6 hours	0.88 $\pm$ 0.64	0.5 $\pm$ 0.55	1.19	P>0.10
7 hours	1 $\pm$ 0.76	0.67 $\pm$ 0.52	0.96	P>0.10
8 hours	0.88 $\pm$ 0.64	0.33 $\pm$ 0.52	1.77	P=0.10

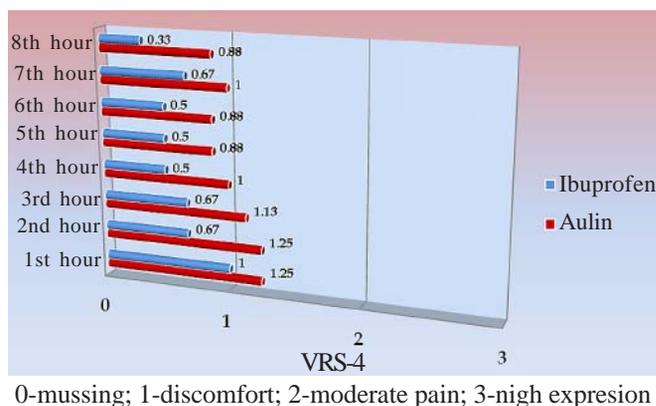
**Table 2.** Mean  $\pm$ SD Scores using VRS-4 for pain in Aulin<sup>®</sup> and Ibuprofen<sup>®</sup> groups the next 3 days after the surgical procedure

Time	Aulin <sup>®</sup>	Ibuprofen <sup>®</sup>	Scores for t	P Value
First day, morning	0.5 $\pm$ 0.53	0.67 $\pm$ 0.82	0.447	P>0.10
First day, afternoon	0.38 $\pm$ 0.52	0.67 $\pm$ 0.82	0.479	P>0.10
First day, night	0.5 $\pm$ 0.76	1.17 $\pm$ 0.75	1.646	P>0.10
Second day, morning	0.25 $\pm$ 0.46	0.67 $\pm$ 0.82	1.132	P>0.10
Second day, afternoon	0.38 $\pm$ 0.52	0.83 $\pm$ 0.75	1.327	P>0.10
Second day, night	0.63 $\pm$ 0.74	1 $\pm$ 1.09	0.718	P>0.10
Third day, morning	0.63 $\pm$ 0.74	0.67 $\pm$ 0.52	0.353	P>0.10
Third day, afternoon	0.5 $\pm$ 0.53	0.5 $\pm$ 0.55	0	P>0.10
Third day, night	0.5 $\pm$ 0.76	0.83 $\pm$ 0.75	0.810	P>0.10

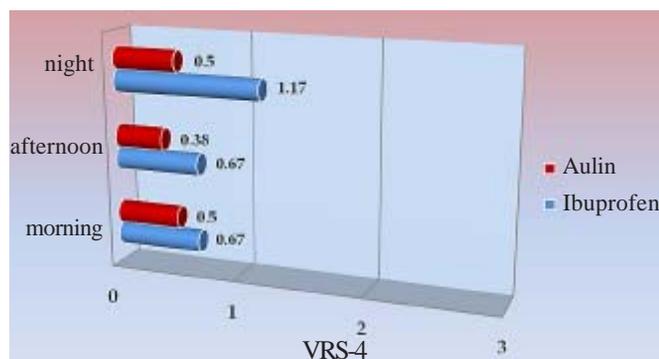
In the aftermath of the grafting procedure the pain in the recipient and donor sites shows scores of successful inhibition from 0.33 to 1.25 (Figure 1). According to the scale that we used it represents discomfort to missing pain. Scores for Aulin<sup>®</sup> are a little bit higher. In the first day after the surgery Aulin<sup>®</sup> shows lower scores compared to Ibuprofen<sup>®</sup> but both of them below 1, which represents discomfort to missing pain (Figure 2). In the second day, the morning and afternoon pain are successfully inhibited and again Aulin<sup>®</sup> shows lower scores. The same day, the night pain shows scores of 0.63 for Aulin<sup>®</sup> and 1.0 for Ibuprofen<sup>®</sup>, respectively. The pain shows a little bit higher scores (Figure 3). For Aulin<sup>®</sup> it shows discomfort to missing pain, and for Ibuprofen<sup>®</sup> – discomfort. In the third day the pain is successfully inhibited and in the night the values for Ibuprofen<sup>®</sup> show small rising but for both of them the pain syndrome is still between discomfort and missing pain (Figure 4).

None of the patients reported the highest degree of pain in the VRS-4 (pain that could not be more severe) at any time.

**Figure 2.** First eight hours after graft procedure

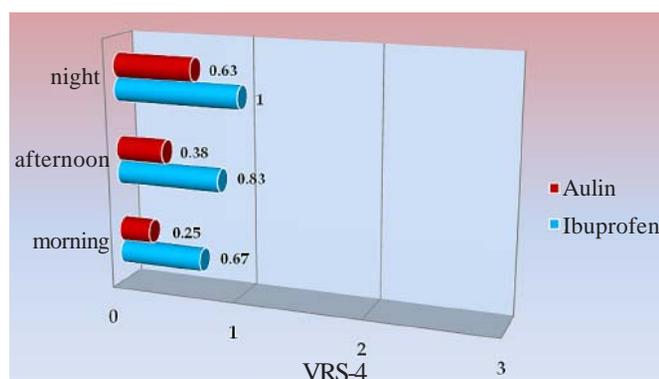


**Figure 2.** First day after graft procedure



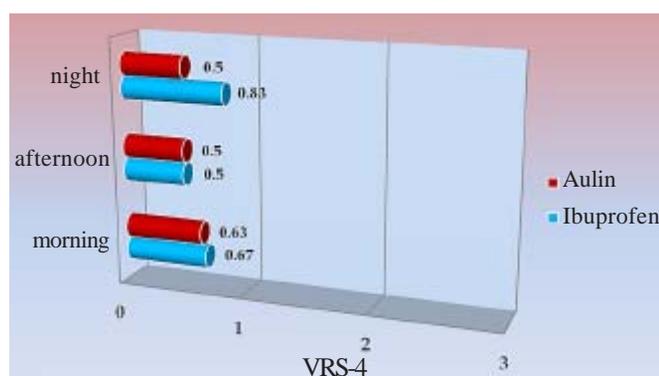
0-mussing; 1-discomfort; 2-moderate pain; 3-nigh expression

**Figure 3.** Second day after graft procedure



0-mussing; 1-discomfort; 2-moderate pain; 3-nigh expression

**Figure 4.** Third day after graft procedure



0-mussing; 1-discomfort; 2-moderate pain; 3-nigh expression

It can be summarized that both agents exhibit effective analgesia in the early postoperative healing and affection of pain syndrome associated with gingival graft's surgical procedures.

## DISCUSSION

Although the surgical extraction of impacted third molars has become the most widely accepted model to compare the efficacy of analgesics and anti-inflammatory drugs, the prevention and control of postoperative pain after periodontal surgeries are also of great concern for patients and clinicians (18).

Many studies employed a VRS-4 during a 3- to 10-hour period of pain evaluation as the method of choice for rating the patient's pain perception. In this study, pain intensity was recorded every hour for 8 hours after the procedure and also 3 days after the surgery.

An 8-hour period seems to be appropriate for pain intensity assessment because pain was rarely reported on the following 3 days.

This study was designed to compare the efficacy of Aulin®, a selective COX-2 inhibitor, and Ibuprofen®, non-selective COX-2 inhibitor, to control postoperative pain after gingival graft procedures. The results of this study indicated that both Aulin® and Ibuprofen® were able to reduce postoperative pain for the first 8 hours, but there were no statistically significant differences between the groups.

Clinical assessment of the efficacy of Aulin® on postoperative pain in patients after periodontal surgery (access flap surgery, free gingival graft, apically displaced flaps, respective and regenerative surgery) and the use of four-point verbal rating scale (VRS-4) show no significant differences in pain intensity in the different patient groups (4, 20). The scores for registered pain with VRS-4 are under the middle score line and in most cases this means discomfort to moderate pain which represents successful inhibition of the pain syndrome in first eight hours after surgery and next three days (19).

Our results are in agreement with other NSAIDs studies on surgical models. Postoperative administration of these drugs and their good pharmacological characteristics are able to make a successful inhibition of pain and better postoperative period (3, 15, 18, 30).

In fact, NSAIDs inhibit peripheral mediators and exhibit considerable analgesic effect and it is absolutely possible that their usage is enough to control postoperative pain without any additional drugs.

## CONCLUSIONS

Despite the fact that there was no statistical significance between the two groups, Aulin® and Ibuprofen® were effective in the management of postoperative pain following gingival graft procedures. Additional studies including a higher number of patients should be carried out to clearly indicate the potential of these anti-inflammatory drugs in periodontal surgical therapy.

## REFERENCES:

1. Bennett A., G.Villa. Nimesulide: an NSAID that preferentially inhibits COX-2, and has various unique pharmacological activities. *Exp Opin Pharmacother*, 2000, 1:277-286.
2. Bevilacqua M., E. Magni. Recent contributions to knowledge of mechanism of action of Nimesulide. *Drugs*, 1993;46 (suppl.1):40-4.
3. Betancourt J., L. Kupp., S. Jasper and O. Farooqi. Efficacy of Ibuprofen-Hydrocodone for the treatment of postoperative pain after periodontal surgery. *J Periodontol* 2004;75:872-876.
4. Björnsson G., H. Haanæs & L. Skoglund. A randomized, double-blind crossover trial of Paracetamol 1000 mg four times daily vs Ibuprofen 600 mg: effect on swelling and other postoperative events after third molar surgery. *Br J Clin Pharmacol*, 2003, 55,405-412.
5. Buduneli N., S. Vardar, T. Sorsa and H. Baylas. Gingival crevicular fluid matrixmetalloproteinase-8 levels following adjunctive use of meloxicam and initial phase of periodontal therapy. *J Periodontol* 2002;73:103-109.
6. Camargo P.M., Melnick P.R., Kenney E.B. The use of the free gingival grafts for aesthetic purposes. *Periodontology* 2000, Vol. 27, 2001, 72-96.
7. Cohen, E.S. Atlas of cosmetic and reconstructive periodontal surgery, Third edition, 2007.
8. Curtis JW, McLain JB, Hutchinson RA. The incidence of complications and pain following periodontal surgery. *J Periodontol* 1985;56:597-601.
9. Dionne RA, Campbell RA, Cooper SA, Hall DL, Buckingham B. Suppression of postoperative pain by preoperative administration of ibuprofen in comparison to placebo, acetaminophen, and acetaminophen plus codeine. *J Clin Pharmacol* 1983;23:37-43.
10. Fakhreddin J. & C. Kunz-Dober. Pain-mediated altered absorption and metabolism of ibuprofen: an explanation for decreased serum enantiomer concentration after dental surgery. *Br J Clin Pharmacol*, 47:391-396.
11. Ferreira S. et al. The role of interleukins and nitric oxide in the mediation of inflammatory pain and its control by peripheral analgesics. *Drugs*, 1993 (Suppl.1):1-9.
12. Heasman P., R. Seymour. The effect of systemically administered non-steroidal anti-inflammatory drug (flurbiprofen) on experimental gingivitis in humans. *J Clin Periodontol* 1989; 16 (9): 551-556.
13. Hargreaves K., P. Abbott. Drug for pain management in dentistry. *Aust Dent J* 2005; 50; Suppl 2:S14-S22.
14. Lindhe J., Karring T., Lang N.P. Clinical Periodontology and Implant Dentistry, 5th edition, 2008, Blackwell Munksgaard, 955-1011.
15. Menhinick K., J. Gutmann, J. Regan, S. Taylor & P. Buschang. The efficacy of pain control following nonsurgical root treatment using Ibuprofen or a combination of Ibuprofen and Acetaminophen in a randomized, double-blind, placebo-controlled study. *International Endodontic Journal* 2004;37:531-541.
16. O'Brien T., M. Roszkowski, L. Wolff, J. Hinrichs and K. Hargreaves. Effect of a nonsteroidal anti-inflammatory drug on tissue levels of immunoreactive prostaglandin E2, immunoreactive leukotriene and pain after periodontal surgery. *J Periodontol* 1996;67:1307-16.
17. Ottonello L., P. Dapino, F. Gatti, G. Guidi and F. Dallegrì. Nimesulide as a downregulator of the activity of the neutrophil myeloperoxidase pathway. *Drugs* 1993; 46 (Suppl.1):29-33.
18. Pilatti G., A. Bianchi., R. Cavassim and C. Tozetto. The use of Celecoxib and Dexamethasone for the prevention and control of postoperative pain after periodontal surgery. *J Periodontol* 2006; 77:1809-1814.
19. Popova Chr., A. Mlachkova. Effectiveness of NSAID Aulin on the postoperative pain at periodontitis surgical procedures. *Journal of IMAB Annual Proceeding (Scientific Papers) ISSN: 1312-773X (Online) Issue:2007; Book 2, part Dentistry, page 12-15.*
20. Ragot P. et al. Controlled clinical investigation of acute analgesic activity of Nimesulide in pain after oral surgery. *Drugs* 1993; 46 (Suppl.1):162-7.
21. Rosin M., S. Kähler, M. Hessler, Ch. Schwahn, A. Kuhr and T.Kocher. The effect of a dexibuprofen mouth rinse on experimental gingivitis in humans. *J Clin Periodontol* 2005; 32:617-621.
22. Salo D., R. Lavery, V. Varma, J. Goldberg, T. Sharpiro and A. Kenwood. A randomized, clinical trial comparing oral Celecoxib 200mg, Celecoxib 400mg, and Ibuprofen 600mg for acute pain. *ACAD EMERG MED* 2003; 10:22-30.
23. Seymour RA. Efficacy of paracetamol in reducing postoperative pain after periodontal surgery. *J Clin Periodontol* 1983;10:311-316.
24. Singla A., M.Chawla, A.Singh. Nimesulide: some pharmaceutical and pharmacological aspects – an update. *J Pharm Pharmacol* 2000; 52(5):467-86.
25. Sriwatanakul K, Kelvie W, Lasagna L, Calimlim JF, Weis OF, Mehta G. Studies with different types of visual analogue scales for measurement of pain. *Clin Pharm Ther* 1983;34:234-238.
26. Sycha T., B. Gustorff, S. Lehr, A.Tanew, Hans-Georg Eichler & L. Schmetterer. A simple pain model for the evaluation of analgesic effects of NSAIDs in healthy subjects. *Br J Clin Pharmacol* 2003; 6:1-8.
27. Taiyeb Ali T. and I.M. Waite. The effect of systemic ibuprofen on gingival inflammation in humans. *J Clin Periodontol* 1993;20 (10):723-728.
28. Trombelli L.,G. Schincaglia, F. Zangari, C.Scapoli and G. Calura. Effect of pretreatment with Ketorolac tromethamine on post-operative pain following periodontal surgery. *J Clin Periodontol* 1996; 23:128-13.
29. Whitefield M., C. O'Kane and S. Anderson. Comparative efficacy of a proprietary topical Ibuprofen gel and oral Ibuprofen in acute soft tissue injuries: a randomized, double-blind study. *Journal of Clinical Pharmacy and Therapeutics*, 2002; 27:409-417.
30. Zelenakas K., J. Fricke, S. Jayawardene, D. Kellstein. Analgesic efficacy of single oral doses of lumiracoxib and ibuprofen in patients with postoperative dental pain. *Int J Clin Pract* 2004, 58(3):251-256.

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