Foot Nerve Block as a Single Technique for Both Anaesthesia and Analgesia in the Hallux Valgus Percutaneous Surgery

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Abstract

Objectives and Method: The objectives were to assess the efficacy and the quality of both the surgical anesthesia and the postoperative analgesia achieved after a peripheral nerve block at the ankle level for percutaneous surgery of hallux valgus and/or metatarsalgia as ambulatory surgery. After the operation patients were given conventional intravenous analgesia and they left the hospital with a rescue analgesic regime. Postoperative analgesic control was assessed through phone calls after 24 and 48 hours.

Results and Conclusions: The peripheral nerve block at the ankle level was an effective, easy and innocuous anesthesia technique. It provided good quality and prolonged postoperative analgesia, and an excellent degree of comfort and satisfaction for the patients, thus allowing surgery without hospitalization.

Keywords: Postoperative pain control, Ambulatory surgery, Percutaneous sugery, Postoperative analgesia, Peripheral nerve block, Foot nerve block, Ankle block.

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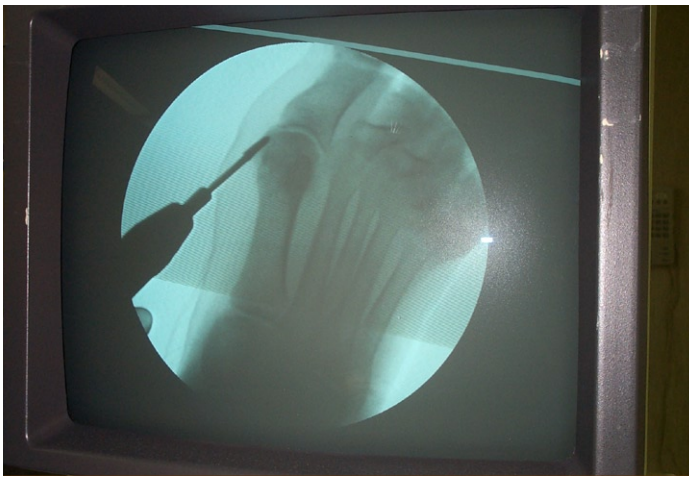
Introduction

Hallux valgus corrective orthopedic surgery was, a few years ago, surgery with potential risks and difficult postoperative pain control. With the introduction of percutaneous surgery (Photograph 1), it now can be performed on an ambulatory regime and with one anesthesia technique that provides an excellent postoperative analgesia. This technique does not require the performance of ischemia on the extremity, what has allowed us to perform a peripheral nerve block at the ankle level, thus avoiding the risks associated both with the making of ischemia and with the neuroaxial or troncular anesthesia techniques.



Photograph 1 Percutaneous surgery.

The objectives of this study were to assess the efficacy and the quality of both surgical anesthesia and postoperative analgesia after peripheral nerve block at the ankle for percutaneous surgery of hallux valgus and/or metatarsalgia in patients planned for ambulatory surgery without hospitalization.

Material and Methods

We conducted a study of 49 patients planned for ambulatory surgery having percutaneous surgery of hallux valgus and/or metatarsalgia for the period September 2005–December 2005. These patients underwent an anesthesia technique consisting of a peripheral nerve block at the ankle level. Due to the difference in postoperative pain, patients were divided in two groups, those who underwent simple halux valgus percutaneous surgery and those who underwent metatarsus correction associated or not to hallux valgus correction. Upon entrance to the preanesthesia area, patients had blood pressure, heart rate, pulse oximetry and electrocardiogram monitoring. We placed a nº18 intravenous catheter in the upper extremity with 500 ml of crystalloid solution and administered intravenous premedication with 1 mg of midazolam. To perform the anesthesia we injected 15-20 cc of a mixture of bupivacaine 0.5% and mepivacaine 2% with 1 ml of bicarbonate using 23G needles and a three-body syringe.

The anesthesia technique consists on the performance of three peripheral nerve blocks, with the patient in supine position. The first block is the tibial nerve block at the level of the internal malleolus of the ankle (Photograph 2). To do this, we had to localize the tibial artery, which is not always easy to palpate, and we performed the puncture in its external part, in the posterior inferior zone of the internal malleolus, in a spot at one third of the distance between the end of the tibial malleolus and the heel apex. At this point we performed an aspiration to dismiss accidental vascular puncture. Then we proceeded to inject 5 ml of anesthesia solution at a depth of 0.5–2cm, trying to avoid paresthesia. The second peripheral nerve we had to block was the deep peroneal nerve at the front of the ankle,

Photograph 2 Tibial nerve block.

on the depression located between the tendons of the anterior tibial muscle and the first finger extensor muscle (Photograph 3). We made a puncture perpendicular to the skin between both tendons until we contacted the bone. Then we pulled back the needle some millimetres to infiltrate 5 ml of anesthetic between bone and skin. The last block we had to perform was that of the saphenous nerve. We did an additional subcutaneous infiltration of 5 ml of anesthetic along the supramalleolar line from the tendon of the anterior tibial muscle to the anterior end of the internal malleolus. In the cases in which surgery went as far as the fifth finger, we reinforced the block with the subcutaneous infiltration of 3 ml of anesthetic between the Achilles tendon and the external malleolus. We did this to block the sural nerve. With this type of block we got a general anesthesia of the foot that allowed us to carry out the surgical technique.

Photograph 3 Deep peroneal nerve block.

Once the operation was finished, we infiltrated the operated zone with 8 mg of dexamethasone and the patient was sent to the postanesthetic recovery unit. There we administered the patient intravenous analgesia consisting on 50 mg of dexketoprofen trometanol, as long as there was not a contraindication for it, such as gastric intolerance or allergy. In case of such contraindication we administered intravenous paracetamol 1g. Once the required time had passed, and provided that the discharge criteria of the postanesthetic recovery unit were met, the patients left the hospital unaided and with a rescue analgesia regime, consisting on dexketoprofen trometanol 25 mg/8 h by oral route, paracetamol 500 mg/8 h by oral route and gastric protection. The patients were also given a contact telephone number of the anesthesia service to solve any kind of incident that may arise during the immediate postoperative period.

A qualified nurse assessed the postoperative analgesic control through phone calls at the patient's home after 24 and 48 hours. They were asked in every case, how many hours he required to regain the normal sensibility of his foot; at what time he started the ingestion of analgesics; what amount of analgesia of the analgesia regime he had ingested and the VAS at the time of the phone call. Finally, they were asked about possible perioperative complications, like the presence of hematomas, paresthesia or other effects.

The data gathered in the study were the following: the demographic characteristics of the patients, the type of surgery performed and the block quality. The latter was assessed by the anesthetist present at the operating theatre as very good in case of lack of pain during the operation, good in the case that they required some type of sedation and medium if they required an analgesic reinforcement with local anesthetic due to pain in the surgical zone. The block was considered a failure if the patient required a change of the initial anesthesia technique. The quality of the postoperative analgesia was assessed, 24 hours and 48 hours after the operation using a visual analogical scale (VAS) from 0 to 10, where 0 means lack of pain and 10 means maximum possible pain. The duration of the sensitive block was defined as the time passed from the making of the nerve block to the time in which the patient had to ingest the first rescue drug. The amount of required analgesia was also collected after 24 and 48 hours. The motor block was assessed prior to the hospital discharge on the basis of whether the patient could or could not perform the plantar or dorsal flexion of the toes (lack of motor block), perform the flexion incompletely (partial block) or was able to perform toes movements (complete motor block). The hospital stay time was the period of time from the time of the patient's arrival to the surgery unit until the hospital discharge. We gathered possible complications of the anesthesia technique, like hematomas, paresthesia or other complications, and the medical, surgical, administrative or anesthetic causes for unplanned admission. Before leaving the hospital, the patients were asked to rate the comfort level during the operation as bad, medium, good, very good or excellent. They were also asked to rate the satisfaction level regarding the used anesthesia technique as rather unsatisfied, satisfied or very satisfied.

We carried out the statistical analysis through the description of the collected variables (univariant analysis), and we used the chi-square technique for the comparison among groups. All this was made with the SPSS statistical package version 9.0. The significance level used was 95%. The qualitative variables are expressed as number of cases and percentage.

Results

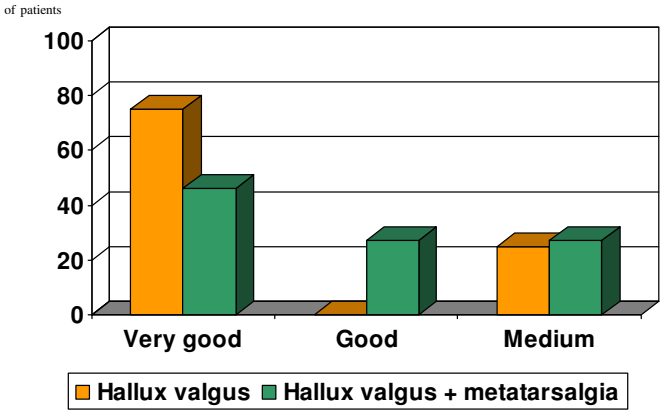
The study included 49 patients, 44 women and 5 men. 37 were operated on for hallux valgus + matatarsalgia (75.5%) and 12 for simple hallux valgus (24.5%). Table 1 shows the demographic characteristics of the patients included in the study.

As regards the efficacy of the nerve block, the anesthesia technique did not have to be changed because of its failure in any case. For every type of surgery, the results were as follows (Graph 1): the block was considered very good in 17 cases (45.9%) (IC 95% = 29.9–62) of hallux valgus + metatarsalgia and in 9 cases (75%) (IC 95% = 50.5–99.5) of simple hallux valgus; the block was good in 10 cases (27%) of hallux valgus + metatarsalgia; the block was considered medium in 10 cases (27%) (IC 95% = 12.7–41.3) of hallux valgus + metatarsalgia and in 3 cases (25%) (IC 95% = 0.5–49.5) of simple hallux, being necessary to reinforce the technique with local anesthetic during the operation.

Regarding the quality of the postoperative analgesia at the time of the hospital discharge, the VAS was 0 in 35 (94.6%) hallux valgus

Table I Demographic characteristics.

	Simple hallux (n=12) Num. (%) [CI 95%]	Hallux + metatarsalgia (n=37) Num. (%) [CI 95%]	Total (n=49) Num. (%) [CI95%]
ASA			
1-2	11 (91.7%) [76-100]	35 (94.6%) [87.3-100]	6 (93.9%) [87.2-100]
3	1 (8.3%) [0-24]	2 (5.4%) [0-12.7]	3 (6.1%) [0-12.8]
AGE			
<40	3 (25%) [0.5-49.5]	1 (2.7%) [0-7.9]	4 (8.2%) [0.5-15.8]
41-60	5 (41.7%) [13.8-69.6]	18 (48.6%) [32.5-64.8]	23 (46.9%) [33-60.9]
61-75	4 (33.3%) [6.7-60]	17 (45.9%) [29.9-62]	21 (42.9%) [29-56.7]
>75	0	1 (2.7%) [0-7.9]	1(2%) [0-6]
SEX			
Female	10 (83.3%) [62.2-100]	34 (91.9%) [83.1-100]	44 (89.8%) [81.3-98.3]
Male	2 (16.7%) [0-37.8]	3 (8.1%) [0-16.9]	5 (10.2%) [1.7-18.7]
BMI			
<25 (normal)	9 (75%) [50.5-99.5]	21 (56.8%) [40.8-72.7]	30 (61.2%) [47.6-74.9]
25-30 (overweight)	3 (25%) [0.5-49.5]	12 (32.4%) [17.30-47.5]	15 (30.6%) [17.7-43.5]
30-40 (obesity)	0	4 (10.8%) [0.8-20.8]	4 (8.2%) [0.5-15.8]



Graph I Block quality.

+ metatarsalgia cases and 1 in 2 of these cases (5.4%). In the case of simple hallux valgus, the VAS at the time of the discharge was 0 in 11 cases (91.7%), and 1 in one patient (8.3%). There were no significant differences as regards the postoperative analgesia between both groups at the time of the hospital discharge. After 24 hours, in the case of hallux valgus + metatarsalgia, the VAS were 0 in 26 cases (70.3%), 2 in 6 cases (16.2%), 4 in 4 cases (10.8%) and 9 in one case (2.7%). In the simple hallux valgus group, the VAS 24 hours after the surgery were 0 in 10 cases (83.3%), and 2 in 2 cases (16.7%). There were not, after 24 hours, significant differences as regards the analgesia between both groups.

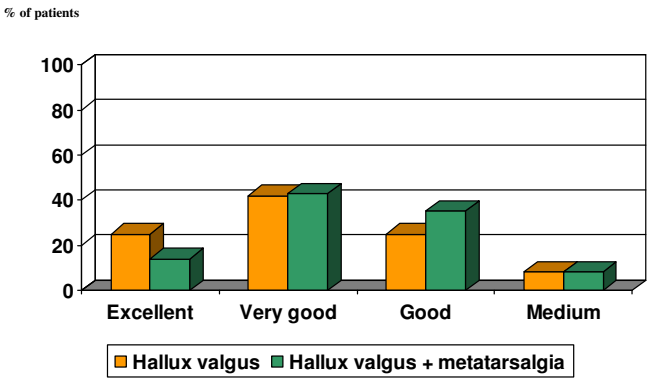
Finally, after 48 hours, the VAS results for the hallux valgus + metatarsalgia group were the following: VAS 0 in 17 cases (45.9%), VAS 2 in 7 cases (18.9%), VAS 3 in 3 cases (8.1%), VAS 4 in 4 cases (10.8%), VAS 5 in 5 cases (13.5%) and VAS 6 in one case (2.7%). As regards the simple hallux valgus group, the VAS after 48 hours were 0 in 7 cases (58.3%), 2 in 4 cases (33.3%), and 3 in one case (8.3%). The VAS in the hallux valgus + metatarsalgia group after 48 hours were significantly higher for the simple hallux valgus group (p=0.047).

The amount of postoperative analgesic required 24 hours after the making of the block was assessed. 11 patients (22.4%) required the ingestion of dexketoprofen trometamol 25mg/8h by oral route and paracetamol 500mg/8h; 21 patients (42.9%) required dexketoprofen trometamol 25mg/8h by oral route only; 2 patients (4.1%) paracetamol 500mg/8h as the only analgesia and 15 patients (30.6%) did not ingest any analgesic drug. 48 hours after the operation, only 5 patients (10.2%) required analgesia with dexketoprofen trometamol 25mg/8h by oral route and paracetamol 500mg/8h; 16 patients (32.7%) ingested dexketoprofen trometamol 25mg/8h; 3 patients (6.1%) required paracetamol 500mg/8h, and 25 patients (51%) did not require any type of analgesia.

The average duration of the sensory block was 14 hours and 36 minutes. The motor block in the hallux valgus + metatarsalgia group at time of discharge was complete in 3 patients (8.1%), partial in 2 patients (5.4%) and there was no block in 32 cases (86.5%). In the case of simple hallux valgus there was not motor block in any case (100%). The average stay time in the hospital was 4.38 hours.

The only registered complication of the anesthesia technique was the deformity of the foot in the case of hallux valgus + metatarsalgia. There were no cases of unexpected hospitalization.

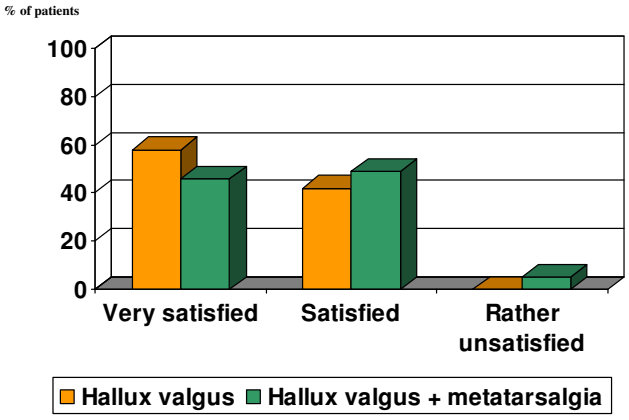
As regards the comfort level of the patient during surgery (Graph 2), it was medium in 3 cases of hallux valgus + metatarsaglia (8.1%) and 1 case of simple hallux (8.3%), good in 13 cases of hallux valgus + metatarsalgia (35.1%) and in 3 cases of simple hallux valgus (25%); the comfort level was very good in 16 cases of hallux valgus + metatarsalgia (43.2%) and in 5 cases of simple hallux (41.7%),



Graph 2 Comfort level during the operation.

and finally, the intraoperative comfort degree was rated excellent in 5 cases of hallux valgus + metatarsalgia (13.5%) and in 3 cases of simple hallux valgus (25%).

Satisfaction with the anesthesia technique used (Graph 3) was described as rather unsatisfactory in 2 cases of hallux + metatarsalgia (5.4 %), satisfactory in 18 cases of hallux valgus + metatarsalgia (48.6%) and in 5 cases of simple hallux valgus (41.7%), and very satisfactory in 17 cases of hallux + metatarsalgia (45.9%) and in 7 cases of simple hallux valgus (58.3%).



Graph 3 Satisfaction level regarding the used anesthesia technique.

Discussion

Traditional surgery for hallux valgus correction [18] has been until recently a relatively complex surgery as regards surgical and anesthetical technique. An ischemia tourniquet on the affected extremity was necessary to get an adequate surgical field. This has been until now a very important limiting factor to choose an adequate anesthesia technique. But above all, patients undergoing this type of surgery suffered intense postoperative pain. [9, 22, 25] This required patients to stay confined in hospital to recover from anesthesia and to need postoperative pain control with intravenous analgesia. With the growing development of ambualatory surgery units, without confinement [24], and especially, the recent evolution of surgical techniques there is a change of direction in the anesthetic care of these patients. Hallux valgus percutaneous surgery permits a faster and less painful postoperative recovery because bone injuries and, especially, soft tissue injuries are reduced. The fact that ischemia is not required to perform the surgery has allowed us to go from conventional neuroaxial anesthesia techniques to using less expensive peripheral nerve block techniques with less complications. [23] Also, there is the additional advantage of offering the patient a lasting postoperative analgesia. [2] The results of our study confirm these assertions. The difference with other techniques described elsewhere [11, 7, 5, 6, 8] is that in our case the blocked nerve zone is smaller due to a more peripheral performance of the block. This has allowed our patients to walk unaided once the surgery is finished (Photograph 4). Also, another remarkable difference between our study and others [3, 4, 10, 14, 19, 20] is that there is no need to place a perineural catheter to get good postoperative anesthesia.

Photograph 4 Final result at the time of the hospital discharge.

In agreement with what the literature usually describes, hallux valgus pathology in our sample is more common in females, with a greater incidence in ages between 40 and 75. At these ages, an association with metatarsalgia is more common. Although we have not identified the connection between overweight and incidence of hallux valgus, there may be a greater incidence of metatarsalgia among those patients with a higher BMI. Despite the performance of the peripheral nerve blocks without a neurostimulator, the results obtained as regards its efficacy have been very satisfactory. Thus, we can assert that it is a valid technique for this kind of surgery. In more aggressive surgeries the results have been less satisfactory. Such is the case of like hallux valgus + metatarsalgia, in which the nerve zone that has to be blocked is bigger. Despite this, it was not necessary a change of anesthesia in any case of our study. The associated anesthesia complications have been minimal and there were no unplanned hospitalizations. However, the most important and remarkable advantage is the quality of the postoperative analgesia. This and the few incidences of anesthesia complications have allowed these patients to be included in a surgery circuit without hospitalization and with a short stay time before discharge. In the existing bibliography, most of the authors have required the use of analgesia techniques in addition to the anesthesia technique. [5] In our work, the obtained nerve block has been innocuous and prolonged enough to allow the patients to leave the hospital unaided, with VAS results significantly lower than in most cases, always <1 at the time of discharge, even in the case of more complex surgery. There were no differences between the groups as regards postoperative pain at the time of the hospital discharge and after 24 postoperative hours. However, we have identified that, after 48 hours, there are significant differences. This may be because at that time, the sensory block has already dissipated (14h36min average time) and hallux valgus + metatarsalgia surgery is still slightly painful. This is unlike simple hallux valgus surgery, where 48 hours after the operation the pain diminishes independently of the used anesthesia technique. During the first 24 hours the consumption of non-steroidal anti-inflammatory drugs was higher, in relation to the block ending and the manifestation of pain; whereas after 48 hours of surgery, the consumption of analgesics decreases. A possible explanation would be that the only patients that required analgesia at that time were those with higher VAS, such as the case of hallux valgus + metatarsalgia.

We conclude that in hallux valgus corrective surgery, the peripheral nerve block at the ankle level is considered an effective, easy and innocuous anesthesia technique. It provides a good and prolonged postoperative analgesia, thus allowing surgery without confinement and providing an excellent degree of comfort and satisfaction for the patients.

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References

1 Capdevila X, Dadure C, Bringuier S, Bernard N, Biboulet P, Gaertner E, Macaire P. Effect of Patient-controlled Perineural Analgesia on Rehabilitation and Pain after Ambulatory Orthopedic Surgery: A Multicenter Randomized Trial. ***Anesthesiology***. 2006 Sep;**105(3)**:566–573.

2 Ferrer Gomez C, Puig Bitria R, Boada Pie S, Recasens Urbez J, Rull Bartomeu M. Oral analgesia versus posterior tibial nerve block for postoperative pain in ambulatory open hallux valgus surgery: a randomized clinical trial. ***Rev Esp Anestesiol Reanim***. 2006 Apr;**53(4)**:220–5.

3 Rodriguez J, Taboada M, Carceller J, Lagunilla J, Barcena M, Alvarez J. Stimulating popliteal catheters for postoperative analgesia after hallux valgus repair. ***Anesth Analg***. 2006 Jan;**102(1)**:258-62.

4 Casati A, Fanelli G, Koscielniak-Nielsen Z, Cappelleri G, Aldegheri G, Danelli G, Fuzier R, Singelyn F. Using stimulating catheters for continuous sciatic nerve block shortens onset time of surgical block and minimizes postoperative consumption of pain medication after halux valgus repair as compared with conventional nonstimulating catheters. ***Anesth Analg***. 2005 Oct;**101(4)**:1192–7.

5 G Valladares, A martinez Navas, T Vazquez Gutierrez, S Merino, M Reina, M Echevarria. Analgesia postoperatoria en la cirugía del pie y tobillo mediante bloqueo ciático popliteo lateral con ropivacaína. ***Rev. Soc. Esp. Dolor***. 2004;**11(2)**.

6 Casati A, Vinciguerra F, Santorsola R, Aldegheri G, Putzu M, Fanelli G. Sciatic nerve block with 0.5% levobupivacaine, 0.75% levobupivacaine or 0.75% ropivacaine: a double-blind, randomized comparison. ***Eur J Anaesthesiol***. 2005 Jun;**22(6)**:452–6.

7 Suarez Ruiz P, Lopez Alvarez S, Sarmiento Penide A, Barbeito Vilarino MJ, Bonome Gonzalez C, Cobian Llamas JM. Popliteal fossa sciatic nerve block for ambulatory hallux valgus surgery: comparison of lateral and posterior approaches. ***Rev Esp Anestesiol Reanim***. 2005 Jan;**52(1)**:4–8.

8 Sinardi D, Marino A, Chillemi S, Siliotti R, Mondello E. Sciatic nerve block with lateral popliteal approach for hallux vagus correction. Comparison between 0.5% bupivacaine and 0.75% ropivacaine. ***Minerva Anestesiol***. 2004 Sep;**70(9)**:625–9.

9 Desjardins PJ, Black PM, Daniels S, Bird SR, Fitzgerald BJ, Petruschke RA, Tershakovec A, Chang DJ. A randomized controlled study comparing rofecoxib, diclofenac sodium, and placebo in post-bunionectomy pain. ***Curr Med Res Opin***. 2004 Oct;20(10):1523–37.

10 Casati A, Vinciguerra F, Cappelleri G, Aldegheri G, Grispigni C, Putzu M, Rivoltini P. Levobupivacaine 0.2% or 0.125% for continuous sciatic nerve block: a prospective, randomized, double-blind comparison with 0.2% ropivacaine. ***Anesth Analg***. 2004 Sep;**99(3)**:919–23.

11 Taboada Muniz M, Alvarez Escudero J, Carceller J, Rodriguez J, Rodriguez, Forja MJ, Cortes J, Atanassoff PG. Sciatic nerve block by the lateral route at the level of the popliteal fossa with 0.75% ropivacine: advantages of a more proximal approach. ***Rev Esp Anestesiol Reanim***. 2003 Aug–Sep;**50(7)**:340–5.

12 Reinhart DJ, Stagg KS, Walker KG, Wang WP, Parker CM, Jackson HH, Walker EB. Postoperative analgesia after peripheral nerve block for podiatric surgery: clinical efficacy and chemical stability of lidocaine alone versus lidocaine plus ketorolac. ***Reg Anesth Pain Med***. 2000 Sep–Oct;**25(5)**:506–13.

13 Magistris L, Casati A, Albertin A, Deni F, Danelli G, Borghi B, Fanelli G. Combined sciatic-femoral nerve block with 0.75% ropivacaine: effects of adding a systemically inactive dose of fentanyl. Eur J Anaesthesiol. 2000 Jun;17(6):348-53.

14 Levecque JP, Borne M, Saissy JM. Analgesia with continuous lateral posterior tibial nerve block. ***Reg Anesth Pain Med***. 1999 Mar–Apr;**24(2)**:191–2.

15 Fanelli G, Casati A, Beccaria P, Aldegheri G, Berti M, Tarantino F, Torri G. A double-blind comparison of ropivacaine, bupivacaine, and mepivacaine during sciatic and femoral nerve blockade. ***Anesth Analg***. 1998 Sep;**87(3)**:597–600.

16 Garcia-Enguita MA, Ortega-Lahuerta JP, Arauzo-Perez P, Laglera-Trebol S, Giron-Mombiela JA, Lopez-Sicilia S, Urieta-Solanas A. The utility of digital infiltration of mepivacaine and ketorolac in postoperative analgesia of the unilateral hallux valgus. ***Rev Esp Anestesiol Reanim***. 1997 Nov;**44(9)**:345–8.

17 Porter KM, Davies J. The control of pain after Keller's procedure--a controlled double blind prospective trial with local anaesthetic and placebo. ***Ann R Coll Surg Engl***. 1985 Sep;**67(5)**:293–4.

18 Wrighton JD. A ten-year review of Keller's operation. Review of Keller's operation at the Princess Elizabeth Orthopaedic Hospital, Exeter. ***Clin Orthop Relat*** Res. 1972;**89**:207–14.

19 Martinez Navas A, Vazquez Gutierrez T, Echevarria Moreno M. Continuous popliteal block with ropivacaine via a stimulant catheter for postoperative analgesia after foot surgery. ***Rev Esp Anestesiol Reanim***. 2003 Apr;**50(4)**:188–91.

20 Taboada M, Rodriguez J, Valino C, Vazquez M, Laya A, Garea M, Carceller J, Alvarez J, Atanassoff V, Atanassoff PG. A prospective, randomized comparison between the popliteal and subgluteal approaches for continuous sciatic nerve block with stimulating catheters. ***Anesth Analg***. 2006 Jul;**103(1)**:244–7.

21 Taboada M, Lorenzo D, Oliveira J, Bascuas B, Perez J, Rodriguez J, Cortes J, Alvarez J. Comparison of 4 techniques for internal saphenous nerve block. ***Rev Esp Anestesiol Reanim***. 2004 Nov;**51(9)**:509–14.

22 Desjardins PJ, Shu VS, Recker DP, Verburg KM, Woolf CJ. A single preoperative oral dose of valdecoxib, a new cyclooxygenase-2 specific inhibitor, relieves post-oral surgery or bunionectomy pain. ***Anesthesiology***. 2002 Sep;**97(3)**:565–73.

23 Agostinelli JR, Carter A, O'Neal J, Hadaway S, Tarleton D, Reilly MD, Pham HT. Postoperative transient bradycardia and asystole after bilateral bunionectomies performed using spinal anesthesia. ***J Foot Ankle Surg***. 1995 Sep–Oct;**34(5)**:498–500; discussion 511–2.

24 Dawson J, Coffey J, Doll H, Lavis G, Cooke P, Herron M, Jenkinson C. A patientbased questionnaire to assess outcomes of foot surgery: Validation in the context of surgery for hallux valgus. ***Qual Life Res***. 2006 Sep 25.

25 Thipphawong JB, Babul N, Morishige RJ, Findlay HK, Reber KR, Millward GJ, Otulana BA. Analgesic efficacy of inhaled morphine in patients after bunionectomy surgery. ***Anesthesiology***. 2003 Sep;**99(3)**:693–700.

26 Casati A, Chelly JE, Cerchierini E, Santorsola R, Nobili F, Grispigni C, Di Benedetto P, Torri G. Clinical properties of levobupivacaine or racemic bupivacaine for sciatic nerve block. ***J Clin Anesth***. 2002 Mar;**14(2)**:111–4.

27 Casati A, Borghi B, Fanelli G, Cerchierini E, Santorsola R, Sassoli V, Grispigni C, Torri G. A double-blinded, randomized comparison of either 0.5% levobupivacaine or 0.5% ropivacaine for sciatic nerve block. ***Anesth Analg***. 2002 Apr;***94(4)***:987–90.

28 Casati A, Magistris L, Fanelli G, Beccaria P, Cappelleri G, Aldegheri G, Torri G. Small-dose clonidine prolongs postoperative analgesia after sciatic-femoral nerve block with 0.75% ropivacaine for foot surgery. ***Anesth Analg***. 2000 Aug;**91(2)**:388–92.