Original Research Article

Comparative Analysis of Unilateral Subarachnoid block with Ankle block for elective foot surgery

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ABSTRACT

Background: *There are many accepted anesthesia techniques for elective foot surgery ranging from general anesthesia to regional anesthesia, regional anesthesia being the preferred method. Regional anesthesia techniques employed for foot surgery includes subarachnoid block, epidural anesthesia and ankle block.*

Objective: *The present study is aimed at providing comparative analysis of ankle block with unilateral subarachnoid block for elective foot surgeries in terms of hemodynamic safety profile and post operative analgesia.*

Material and Methods: *Study includes prospective analysis of 80 ASA II and III patients who underwent elective foot surgery. Patients were randomly divided into two groups of 40 each, Ankle block group (AB) and Unilateral subarachnoid group (US). The parameters recorded for study includes systolic blood pressure, diastolic blood pressure, heart rate, visual analogue scale for pain severity, time of first analgesic need and the complications.*

Results: *There were minimal blood pressure changes and heart rate variability in AB group as compared to US group when compared with basal values ($p<0.05$). The time for first analgesic requirement is prolonged in AB group as compared to US group. The visual analogue scale score was assessed at 2^{nd} ,4^{th} and 6^{th} hours for group AB were lowered as compared to group US ($p <0.05$).*

Conclusion: *Ankle block is associated with lesser hemodynamic variations and better postoperative analgesia as compared to unilateral subarachnoid block.*

Keywords: *Elective foot surgery, unilateral subarachnoid block, ankle block, hemodynamic stability, post operative analgesia*

Introduction

With the improvement in treatment modalities and diagnostic skills, more and more aged and debilitated patients with compromised respiratory and cardiac reserve are presenting for elective foot surgery. These patients can be anesthetized safely by administering regional anesthesia and the regional techniques frequently used in such cases include subarachnoid block (preferably unilateral), epidural block (graded), and ankle block. [1,2,3] Regional anesthesia offers distinct advantage of better postoperative recovery profile and cost effectiveness. [3,4] Unilateral subarachnoid block and ankle block are propagated as the safest techniques for administering anesthesia in these patients because of minimal hemodynamic variation associated with these techniques and lower incidence of complications as compared to general anesthesia. [1] The regional block technique like ankle block is area specific anesthesia and studies demonstrated that peak serum concentration of local anesthetic remains at level lower than toxic

level resulting in lower complication rate as compared with other techniques. [5,6,7,8] As there is paucity of studies comparing ankle block with subarachnoid block , only few studies compare these two techniques. [9,10,11,12,13] The present study is designed to compare the hemodynamic stability and recovery profile of unilateral subarachnoid block with ankle block.

Material and methods

After getting approval from institutional ethic committee, the present study was conducted on 80 ASA II and III patients of either sex planned for elective foot surgery after excluding patients who received total intravenous anesthesia or general anesthesia due to inadequate anesthetic response. The patients were randomly divided into two groups: Unilateral subarachnoid group, US group (n=40) and Ankle block group, AB (n=40). The demographic data of patient (age, sex and weight), ASA group, hemodynamic parameter (systolic blood pressure, diastolic blood pressure and heart rate), visual analogue scale, postoperative analgesic requirement and any potential complications were recorded. Systolic blood pressure, diastolic blood pressure and heart rate were recorded before and after anesthesia technique at 5, 15, 30 and 60 mins duration. Visual analogue scale (VAS) and time for first analgesic requirement was noted in the postoperative period. VAS is a numerical scale ranging from 0 to 10, 0 being no pain and 10 labeled as extreme pain.

All patients received 1 mg midazolam IV sedation before anesthesia administration. The unilateral subarachnoid block was administered by placing the patient in lateral decubitus position depending upon the site of surgery and under all aseptic precaution, subarachnoid block was performed using 25 G quincke needle in L_3-L_4 intervertebral space and 7.5 mg of 0.5 % bupivacaine (hyperbaric) was administered after obtaining free CSF flow. The patient was kept in this position for 10 minutes and then patient is placed supine.

Ankle block was performed by placing the patient in supine position and keeping the pillow underneath the lower leg in order to improve the access to all the five nerves namely Deep Peroneal nerve, Superficial Peroneal nerve, Saphenous nerve, Posterior Tibial nerve and Sural nerve. Under all aseptic precautions, anterior tibial artery found between Extensor digitorum longus and extensor hallucis longus muscle palpated, advance the needle lateral to artery between these structures in perpendicular direction to deposit 3-5 ml of local anesthetic agent deep to extensor retinaculum to block deep peroneal nerve. Withdraw the needle, direct it superficially toward lateral and medial malleolus and deposit 3-5 ml of local anesthetic agent separately at two sites to block superficial peroneal nerve and saphenous nerve respectively. Palpate posterior tibial artery, insert the needle postero-lateral to artery and inject 3-5 ml of local anesthetic agent in order to block posterior tibial nerve. Insert the needle lateral to Achilles tendon in the direction of lateral malleolus, inject 5 ml of local anesthetic agent subcutaneously as the needle is withdrawn to block the sural nerve.

Statistical analysis was performed using statistical package for social sciences version 21. Quantitative parameters are compared using student t-test whereas qualitative parameters are compared using chi square test and fisher exact test. p value

of less than 0.05 is considered statistically significant.

Results

No significant difference was observed in demographic parameters and duration of surgery in both the groups. Hemodynamic parameters on data observation showed that systolic blood pressure, diastolic blood pressure and heart rate values decreased in both the groups but the variation in AB group are less pronounced as compared to US group and these are statistically significant (p<0.05). As shown in table 1 and table 2, Systolic and diastolic blood pressure before block are comparable In two groups with p value more than 0.05[0.99 and .946 respectively] but after administration of anesthetic block technique, the drop in blood pressure recorded at 5 min, 15 min, 30min and 60 min was more in US group as compared to AB group and this drop is statistically significant [p value <0.05]at all intervals except the diastolic blood pressure recorded at 60 min where p value of more than 0.05 was recorded [p value=0.07].

Table 1: Systolic blood pressure values of the patients (mmHg)

	Before Block	5 minutes after block	15 minutes after block	30 minutes after block	60 minutes after block
US Group	132.4±10.7	116.6±13	118.6±12	120.4±10.1	121.5±9.6
AB Group	132.5±10.7	129.2±11.1	128.6±10.5	129.3±9.7	129.6±10.6
P value	0.99	<0.05	<0.05	<0.05	<0.05

Table 2: Diastolic blood pressure values of the patients (mmHg)

	Before Block	5 minutes after block	15 minutes after block	30 minutes after block	60 minutes after block
US Group	81.4±6.6	71.6±8.2	72.2±7.1	75±4.8	74.4±4.8
AB Group	81.3±6.5	75.7±9.6	76.7±6.6	78.3±4.5	76.8±7
P value	0.946	<0.05	<0.05	<0.05	0.07

Table 3: Heart rate values of the patients (bpm)

	Before Block	5 minutes after block	15 minutes after block	30 minutes after block	60 minutes after block
US Group	79.8±7.9	68.5±8.2	69.8±8	71±7.2	71.5±7
AB Group	79.6±7.7	76.6±8.5	76.8±7.5	78±7.7	78±7.9
P value	0.92	<0.05	<0.05	<0.05	<0.05

Similarly, table 3 shows that the heart rate of patients recorded before block were comparable in two groups with p vaue more than 0.05[0.92] but the decrease in heart values recorded at 5min, 15min, 30min and 60 mins after block were more in US group as compared to AB group and these changes are stastistically significant with p value <0.05. It was also observed that 11 patients in group US group required 10 mg of mephentermine and 5 pateints required 5 mg of mephentermine whereas no

patient in group AB required mephentermine. As depicted in line graph, the postoperative pain VAS scores observed at 2nd,4th and 6th hour showed significantly lower values in AB group as compared to US group and this difference is statistically significant($p<0.05$). It was observed that time for first analgesic requirement was prolonged in AB group as compared to US group.

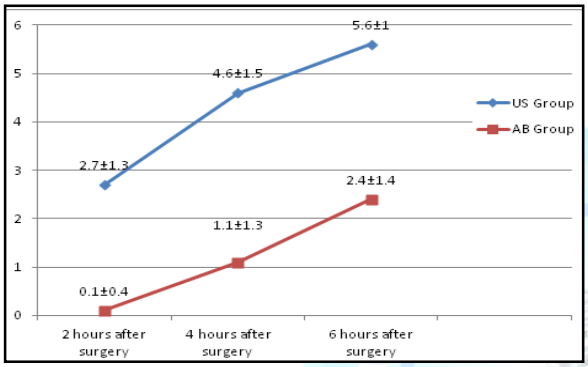

Fig. 1 Post operative VAS score of the patients

The following complications were observed in US group: one patient developed hypotension in recovery room, one patient developed postdural puncture headache for 3 days, three patients had postoperative nausea and vomiting and two patients developed urinary retention requiring catheterization whereas only one patient in AB group had one episode of nausea and vomiting requiring antiemetic and that too intra operatively and no patient in AB group developed any postoperative complication.

Discussion

Many aged debilitated patients with limited pulmonary and cardiac reserve presents in operation theatre for elective foot surgery poses stress on anesthetist how to administer safe anesthesia. Various studies demonstrated that regional anesthesia is safe in these patients as compared to general anesthesia.[14] Regional anesthesia technique frequently employed for foot surgery in increased risk patients are unilateral subarachnoid block or peripheral nerve block for example ankle block. Ankle block offers better intraoperative hemodynamic profile and quicker recovery as compared to unilateral subarachnoid block because ankle block is area specific anesthesia and does not affect the sympathetic system of patient. [5,7,8] In spite of clear advantage of ankle block over other anesthetic techniques, it is generally used less as compared to other methods because its success depends on anesthetists skill and the desired effect may consume longer duration. [15]

In this present study, we compared these two anesthesia techniques in the patients planned for elective foot surgery. In our study, we observed that hemodynamic parameter (blood pressure and heart rate) shows decreasing trend but the effect was more pronounced in US group and these observation were similar to the study conducted by A Urfalioglu et al. [13] When the two groups were compared for basal hemodynamic value and intraoperative hemodynamic values, statistically significant decrease was observed in US group as compared to AB group and these observation were consistent with study conducted by A Urfalioglu on 60 patients. In our study, 16 out of 40 patients in US group needed intraoperative vasoconstrictor which was more as compared to study conducted by A Urfalioglu where only 7 out of 30 patients needed vasoconstrictor. This may be attributed to difference in hydration status and cardiac reserve of patients as their study also includes ASA I patients. However, results in AB group were consistent with

study conducted by A Urfalioglu as no patient in both studies required vasoconstrictor. The above observation point towards the lesser risk associated with ankle block as compared to unilateral subarachnoid block which is associated with greater hemodynamic variation, suggesting ankle block as preferable anesthesia technique in ASA II and III patients. [7,16,17]

In our study, we observed favorable postoperative VAS score in AB group as compared to US group and these finding were consistent with A Urfalioglu but in our study we recorded VAS score for only first 6 postoperative hours whereas they observed VAS score for 24 hours and found that VAS score were better in AB group even at 24 hours postoperatively. As the VAS score in first 6 hours was favorable in AB group so the need for first analgesic was prolonged in AB group as compared to US group and these observation were also consistent with study conducted by A Urfalioglu. The above observation clearly suggests better postoperative pain relief with ankle block as compared to unilateral spinal anesthesia [9] and these observations may be attributed to prolonged residual anesthetic and analgesic effect of ankle block in postoperative period.

In our study, we observed that postoperative complications were more in US group as compared to AB group and these finding were consistent with study conducted by A Urfalioglu however the number of patients developing complications in US were more in our study and this may be attributed to patient dependent factors. [18] The AB group patients had not experienced any complication in postoperative period and these finding were similar to the study by Urfalioglu.

To conclude, we advocate ankle block as preferable method of anesthesia in aged, debilitated and frail patients over unilateral subarachnoid block because it offers similar degree of surgical anesthesia with minimal hemodynamic variation, better postoperative pain relief and no postoperative complication favoring better patient recovery profile.

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