Original Article

Amputation of Lower Extremity in Diabetic and High-Risk Patients under Peripheral Nerve Blocks (Combined Sciatic and 3-in-1 Femoral Blocks)

Raj Kumar A. Singh[1], Talib H. Al Juma[2], Mohd.B.S.Al Haifi[2], Ali Nour[3]
Departments of [1]Anaesthesia & I.C.U. and [3]Surgery, Al Jahra Hospital and [2]Department of Surgery, Al Amiri Hospital, Kuwait

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ABSTRACT

Objective: The above or below knee amputation of diabetic and high-risk patients (American Society of Anesthesiologists grade III-IV) can be carried out under peripheral nerve blocks (i.e. sciatic, femoral 3-in-1 block). The aim of this study is to determine whether this combined peripheral nerve block technique, which does not affect the treatment of diabetes mellitus and other associated diseases, can replace general anesthesia or central neuraxial blocks for amputation of a lower extremity in such high-risk patients.
Methods: After getting high risk consent from the relatives, 18 patients undergoing amputation of a lower extremity due to complication of diabetes were anaesthetized using the peripheral nerve block technique (sciatic, femoral 3-in-1 block). All patients were judged as very high-risk associated with multiple medical problems and ranked in ASA grade III-IV. Of the 18 patients, 10 were male. Their ages ranged from 54 to 84 years (mean 70.71; SD 8.38). Their weight ranged from 50 to 80 kg (mean 63.0; SD 8.60).
Results: Six patients did not require sedation. The remaining 12 patients were judged to be apprehensive and were sedated with intravenous injections of midazolam (dormicum) 1mg or intermittent injections of propofol 60-80 mg (total) with or without alfentanil 0.5-1mg (total). The combined sciatic and 3-in-1 femoral blocks were completely effective on 17/18 occasions (success rate 94.44%). One block was judged as partially effective. The duration of surgery was 90-145 min (mean 106.18; SD 24.34). The total amount of local anesthetic used was 40ml of 1% lignocaine and 20ml of 0.5%of bupivacaine with adrenaline 5μg/ml. Postoperatively only one patient was kept in I.C.U. for close observation and monitoring purpose while the remaining patients were sent directly to the wards from the recovery room. There were no complications intraoperatively or postoperatively. The postoperative follow-up of the patients continued for 24-36 hours and the follow-up period was uneventful.
Conclusion: A total of 17 of our 18 diabetic patients complicated with other multiple medical problems underwent lower limb amputation under combined peripheral nerve blocks without complications. These results indicate that peripheral nerve blocks can replace general anesthesia or central neuraxial analgesia for lower extremity amputation in high-risk patients. This technique does not hamper the treatment of diabetes mellitus and associated diseases and does not delay the healing of the postoperative wounds in these high-risk patients.

KEYWORDS: amputation, diabetes, peripheral nerve blocks and anxiolytics

INTRODUCTION

Even after repeated debridement of a diabetic foot ulcer, under ankle block or general anesthesia or only sedation, the ulcer often spreads towards the leg[1] leaving surgeons to carry out either a below knee or above knee amputation, depending upon the extent of the ulcers, in order to save the rest of the leg. As diabetic patients often suffer from ischaemic heart disease (IHD), hypertension (HTN), other major systemic diseases due to prolonged diabetes mellitus (e.g. diabetic nephropathy, retinopathy and polyneuropathy), they are at high risk for general anesthesia or central neuraxial analgesia[2-6].

A reversible blockade of nerve impulses can be made when local anaesthetic agents are injected into the regional nerves blocking the afferent pathways thus rendering the areas temporarily painless during the surgery. One such technique; the combination of the sciatic (L4,5,S1,2,3), femoral 3-in-1 block (blocking femoral nerves L2,3,4), lateral cutaneous nerve of thigh (L2,3) and obturator nerve (L2,3,4) is quite suitable for below knee or above knee amputation of diabetic foot ulcers. This technique does not hamper the treatment of the systemic diseases of these patients.

For a below knee amputation (BKA), the nerve blockade of the sciatic and femoral nerves is quite adequate, while for an above knee amputation(AKA) the nerve blockade of the sciatic, femoral, lateral cutaneous and obturator nerves is necessary. In a

Address correspondence to:
Dr. Raj Kumar A.Singh, P.O.Box 2921, Salmiyah - 22030, Salmiyah, Kuwait. Tel. (965) 565-1884

Table 1
Number of patients associated with other systemic diseases:

Associated diseases	Patients
1. Ischaemic heart disease (IHD),hypertension (HTN) with Left Ventricular Failure(LVF) with pacemaker on Treatment.	1
2. IHD,HTN,atrial fibrillation(AF), broncheal asthma, peripheral vascular disease, cerebrovascular accident (CVA) with right sided hemiparesis and septicemia on dopamine infusion.	1
3. IHD,CVA-2 times, chronic obstructuve airway disease (COAD) with past history of myocardial infarction (MI) on treatment.	1
4. IHD, HTN, with occasional ventricular arrhythmia on treatment.	4
5. IHD, hypertrophy obstructive cardiomyopathy (HOCM), post-CVA (R. sided), chronic renal failure (CRF) with diabetic nephropathy on treatment.	3
6. IHD, HTN, end stage cirrhosis and ascites, Hepatitis C Virus +(ve), mild to moderate renal impairment, gastritis with methicillin resistant staphylococcus aeurious (MRSA) infection.	1
7. IHD, HTN, CRF, morbidly obese with history of pulmonary embolism (PE) on treatment.	1
8. IHD, HOCM, CRF and anemia on treatment.	1
9. IHD, HTN, chronic AF, CVA with multiple brain infarction and COAD on treatment.	1
10. IHD, congestive cardiac failure (CCF), LVF, right bundle branch block (RBBB) with pleural effusion on treatment.	1
11. IHD, HTN, AF, obese with hyperthyroidism on treatment.	1
12. HTN, CVA(R), aphagia and bed ridden .	1
13. IHD, HTN, CRF, anemia with past history of prolonged coma after general anesthesia for arterio-venous fistula operation but managed in I.C.U.	1

3-in-1 block of the femoral nerve, the nerve blockade of the femoral, lateral cutaneous nerve of thigh and obturator nerves is involved. Consequently, if the combination of the sciatic nerve block and femoral 3-in-1 block is effective for above knee amputation (AKA), the individual blockade of the latreal cutaneous nerve of thigh and the obturator nerve is not required for an above knee amputation.

To ensure a successful and effective peripheral nerve blockade, thorough knowledge of the surface anatomy of these peripheral nerves is essential[7-11]. This technique should be performed aseptically inside the operating theatre where all resuscitative measures are available and the patients should be fasting for at least 6 to 7 hours.

The purpose of this study was to determine whether this peripheral nerve block technique, which does not affect the treatment of diabetes mellitus and other associated diseases, could replace general anesthesia or central neuraxial block completely for lower extremity amputations in complicated high-risk diabetic patients.

METHODS

Eighteen patients scheduled for elective and emergency amputation of a lower extremity due to diabetic ulcers on the foot in which peripheral nerve blocks of the sciatic, and femoral (3-in-1 block) nerves were used were enrolled in this study. All surgeries took place between January 1992 and December 1999. All cases were assessed and examined by the anesthetist who graded the patients as very high-risk with associated with multiple medical problems as listed in the Table 1 and ranked in the American Society of Anesthesiologists grade III-IV.

The technique of peripheral nerve block was explained to the patients during the pre-anesthetic check up visit and an informed high-risk consent was obtained from the relatives. Patients with a history of adverse reaction to local anesthetics or a hypersensitivity reaction to any drug, including antibiotics, were excluded from the study.

Among the 18 patients, 12 were scheduled for elective surgeries while the remaining six patients had emergency operations. The fasting blood sugar (FBS) of 11 patients was controlled by titration with soluble insulin (FBS, mean 7.5 ± 2.3 mmol/L). The FBS of the remaining 7 patients was not controlled before operation (FBS, mean 15.5 ± 3.5 mmol/L). All other biochemical investigation results were within normal values. The patients were not given premedication but the usual morning dose of medication for any associated systemic diseases (e.g. ischaemic heart disease and hypertension) was given.

Technique of peripheral nerve blockade:

With the patients supine on the operating table and monitoring systems (ECG, pulse oximeter, noninvasive blood pressure, Colins) in position, the groin and the anterior surface of the upper half of the thigh were prepared with antiseptic solution and the area was properly draped.

1. Sciatic Nerve Block:

Based upon the procedure described by Brown and Eriksson[9,10], the anterior approach of sciatic nerve was chosen. On the supine patient, a line was drawn from the anterior superior iliac spine to the pubic tubercle. This line was divided into three equal lengths. Another line was drawn parallel to the first from the prominent midpoint of the greater trochanter medially (Fig. 1). A perpendicular line was drawn caudo-laterally from the junction of the middle and medial section of the first line to the second line (Fig. 1). From this point of intersection on the second line, a skin-weal of local anaesthetic was raised with a fine needle. A 22-gauge spinal needle (12-15 cm) was inserted through the weal and directed slightly laterally until it made contact with the antero-medial aspect of the femur. The needle was withdrawn back as far as the subcutaneous tissue, then redirected and walked off the femur near the lesser trochanter where the sciatic nerve passes from above downwards.

The needle was then inserted about 5cm deeper than the depth required to contact the femur. The needle was then very close to the nerve. If the local anaesthetic could be injected without resistance, a successful block resulted. Actual paraesthesia was not sought but if it was obtained radiating to the foot following aspiration, the injection of 15-20 ml of 1% lignocaine and 5 - 10 ml of 0.5% bupivacaine with adrenaline 5 μg/ml solution was started. Sometimes the sciatic nerve lay more laterally behind the femur than was previously appreciated. In such cases, using the landmarks described above, it was impossible to bring the tip of the needle close to the nerve. The point of insertion of the needle should then be more medial with more lateral direction so as to bring the tip of the needle behind the femur where the sciatic nerve lay resulting in a higher success rate of the block. After a careful aspiration test, 5-10 ml of 1% lignocaine and 5 ml of 0.5% bupivacaine with adrenaline 5 μg/ml solution was injected.

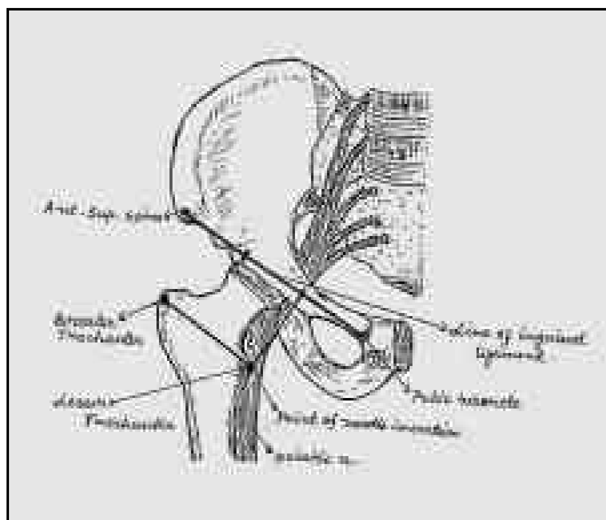

Fig. 1: Showing landmarks for the anterior approach to the sciatic nerve block

2. Femoral Nerve Block:

'3-in-1 block': The "three-in-1" block was first described by Winnie and his colleagues in 1973[11]. This type of femoral nerve block is also called a 3-in-1 paravascular block. The main aim of this technique is to block the femoral (L2,3,4), the lateral cutaneous nerve of thigh (L2,3) and the obturator nerve (L2,3,4) with a single injection of local anaesthetic into the musculofascial plane just below the inguinal ligament. The principle upon which this is based is that these three nerves are the branches of the lumbar plexus and lie in the groove between the psoas major and the ilacus muscles and fascia. Consequently, if a large volume of local anaesthetic is injected into this musculofascial plane, the local anaesthetic solution will spread towards cephalad via this fascial conduit containing these three branches of the lumbar plexus, affecting them simulteneously. In the 3-in–1 block, a modification of the femoral block could be blocked immediately below the inguinal ligament. The femoral artery was palpated and a fine short bevel, 3-5 cm, was inserted 0.5 to 1 cm lateral to the artery almost parallel with the course of the nerve, but inclined superiorly at an angle of 30-45° to a depth of 3-4 cm. A click was felt as the needle passed through the fascia lata. Paraesthesia was not sought but should it be obtained, the needle should be held firmly without moving upward or downward. Firm pressure was applied distal to the needle with the thumb and about 25-30 ml of anaesthetic solution (15-20 ml of 1% lignocaine and 10ml of 0.5% bupivacaine solution with adrenaline 5 μg/ml) was injected with the needle angled proximally.

As the exact position of the femoral nerve in relation to the femoral artery is not always constant, it may be close to the femoral sheath or few centimeters lateral to it or it may being more deeply placed. For accurate femoral nerve block, while injecting the local anaesthetic solution, it is always good to move the needle in and out in a fanwise manner from the stated depth (3-4 cm) and upto the subcutaneous tissue. In such a case, the amount of local anaesthetic solution to be injected should be about 10-15 ml[9-11].

Approximately 15 to 30 minutes after the peripheral nerve block, if the patient displays no signs/symptoms of reaction or hypersensitivity to the local anaesthetic solution, the surgery may proceed.

During the peripheral nerve blocks and surgery, the monitoring systems were continuously observed. O_2 6L/ min with simple oxygen mask, was given to all patients during sugery. We used 60ml of local anaesthetic solution (40 ml of 1% lignocaine +20 ml of 0.5% bupivacaine with adrenaline 5 μg/ml).

The data analysis was done by using statistical software SPSS Window Version 9. The descriptive statistics means and standard deviations were used to describe the findings. Since the response variables were repeated in three phases (pre, intra, and post operative periods), General Linear Model of Repeated Measures was carried out to test the factor variations by phase. The post hoc multiple comparison was done by LSD (Least Significant Difference). A value of p 0.05 was considered as significant.

RESULTS

The demographic data of the patients are given in Table 2. When the surgeons started incising the skin, most of the patients did not move their limb and did not complain of pain. Two emergency patients and three elective patients did not receive any sedation during surgery. The remaining 13 patients required sedation with intravenous injection of midazolam (dormicum) 1mg to alleviate their apprehensiveness just before starting the peripheral nerve block. Four patients posted for emergency and six elective patients needed mild sedation with intravenous injection propofol (diprivan) 20-30 mg as bolus followed by intermittent dosage of 20mg every 15 to 20 min during surgery.

Among the 18 patients, 17 patients underwent amputation of the lower extremity under combined sciatic and 3-in-1 femoral blocks quite effectively. Twelve patients were posted for below knee amputations (BKA) and five for above knee amputations (AKA). One female patient, 63 years old, who was posted for an emergency above-knee amputation, complained of pain during surgery under peripheral nerve block, sedation and analgesic. The blocks were supplemented with light general anesthesia (70% N_2O in O_2) and isoflurane 0.5 to 1% with Magill's circuit.

All patients had completely pain-free surgeries, except one female patient for whom the combined sciatic and 3-in-1 femoral nerve blocks was only partially effective. The analgesia lasted about 120-240 minutes.

The heart rate and systolic blood pressure of the patients did not change significantly during preoperative, intraoperative and postoperative periods. The diastolic blood pressure of the patients in the postoperative period was slightly lowered in comparison with those in pre and intraoperative periods ($p < 0.006$) as shown in Table 3, however, after infusing plasma-expanding fluids, the diastolic blood pressure came up within no time. None of the patients experienced any arrhythmia during the surgery. The oxygen saturation of the patients was within the range of 96-100% during both the peripheral nerve blocks and surgery (Table 3). None of the patients developed symptoms of hypersensitivity reaction or adverse effects of local anesthetics. Postoperatively, the patients were free from cellulitis, neuritis or skin infection around the site of injection. As the patients could lie supine, the patients did not have any discomfort during the nerve block and surgery. Postoperatively, all patients remained pain free for 3-4 hours. The postoperative follow-up of the patients continued for 24-36 hours. Those patients who complained of pain six hours after operation were given injections of pethedine (1.0-1.5mg/kg) intramuscularly 6-8 hourly. The vital signs of the patients remained stable and the postoperative period was uneventful.

Table 2
Demographic data of the patients [values are given as mean, SD and ranges].

1. Sex ratio: Male:Female 10:8
2. Age (Years): [54-84], Mean, 70.71 ± 8.73
3. Weight (Kg): [50-80], Mean,63.0 ± 8.6
4. ASAstatus: (iii): (iv) 7:11
5. Operation status: Elective: Emergency 12:6
6. Latency period (in min): [15-28], Mean, 19.33 ± 10.42
7. Duration of surgery (in min): [90-145], Mean,106.18 ± 24.34

Table 3
Hemodynamic parameters of the patients during pre, intra and postoperative periods (values are given as ranges mean and SEM of three phases).

Parameters	Preoperative 1) Range; 2) Mean(SEM)	Intraoperative 1) Range; 2) Mean(SEM)	Postoperative (Recovery) 1) Range; 2) Mean(SEM)	Statistical Significant ("p" value)
Pulse (per min)	1) 70—100 ; 2) 84.35(±8.87)	1) 74—99 ; 2) 84.71(±10.17)	1) 74—96 ; 2) 83.06(±7.28)	0.25
Systolic BP (mmHg)	1) 126—178 ; 2) 146.59(±18.80)	1) 120—180 ; 2) 145.59(±21.22)	1) 122—178 ; 2) 144.59(±17.84)	0.26
Diastolic BP (mmHg)	1) 70—88; 2) 80.41(±7.24)	1) 72—100 ; 2) 79.12(±7.46)	1) 70—90; 2) 76.29(±5.19)	0.006**
Arterial SaO_2	1) 97—100; 2) 98.12(±1.14)	1) 96—100; 2) 98.12(±1.00)	1) 97—100; 2) 98.41(±0.93)	0.09

Based on estimated marginal mean and standard error of mean (SEM), where *p < 0.05, **p < 0.01, ***p < 0.001 [General Linear Model of Repeated Measures (GLMRM) and Least Signifiant Difference (LSD)].

DISCUSSION

Peripheral nerve block is an extremely useful and effective technique for lower limb amputation in older patients with poor general condition and who are graded as very high-risk[11-14]. The 18 diabetic patients listed in Table 1 underwent leg amputations surgery under effective peripheral nerve blocks with the least metabolic and cardiopulmonary disturbances during intraoperative and postoperative periods. The regional analgesia accelerates the speed of postoperative recovery in such patients as opposed to those patients operated under general anesthesia. These patients are quite satisfied with this regional nerve block technique with rapid functional recovery following their lower limb amputation surgery.

When high-risk patients with hemodynamically unstable status need lower extremity amputation, general anesthesia or central neuraxial blockade, which can lead to bilateral blockade with extensive sympathectomy, should be avoided. As the peripheral nerve block can be confined to the regional area without affecting the hemodynamic condition of the patients, it is a suitable technique for such patients. The regional anesthesia provides stress-free anesthesia, which is important because many perioperative complications are the consequences of stress responses to surgery, especially in patients with chronic diseases. This technique does not hamper the treatment of the associated systemic diseases. It does not block the sympathetic nervous system so that the hemodynamic status of the patient remains unaffected. The use of local anesthesia for amputation due to diabetic foot ulcers does not have any deleterious effect on wound healing[15,16].

As the diabetic patients with atherosclerotic disease already have compromised blood supply in the extremities, the intravenous Bier's block technique should not be used for such procedures. Tourniquets will hamper the blood flow in the ischaemic leg and may cause extensive gangene or ulcers of the foot. Single shot (unilateral spinal) or single epidural analgesia can be utilized for such operative procedures. These techniques, however, have their disadvantages such as hypotension, retention of urine, persistent postdural puncture headache (PDPH), cardiac arrest, neurological deficits (e.g. paraplegia, total spinal, permanent cauda equina syndrome, meningitis and meningism), transient Horner's syndrome, acute radicular pain, bacterial infection, epidural haematoma and abscess (serious but rare), venous air embolism, pneumoencephalus, extensive upward block leading to high sympathetic block and acute toxic reaction related to the anaesthetic solution[17-23].

General anesthesia obviates the concerns regarding central neuraxial block associated with untoward sequelae. While general anesthesia is an acceptable alternative to other techniques for lower extremity amputation surgery, it has its own adverse effects for patients with hemodynamically unstable status[4,6,24]. Postoperative complications of general anesthesia are mainly cardiopulmonary. Such high-risk patients may need postoperative ventilatory support and some of them cannot be weaned off the ventilator resulting in prolonged stays in I.C.U.

Lower extremity amputation for diabetes mellitus with vascular diseases, especially in high-risk patients, has a high morbidity and mortality rate. The probable causes of postoperative death in these patients are cerebral infarction, infection and myocardial infarction[6,24-26]. Considering all these factors, the peripheral nerve blocks (combined sciatic and 3-in-1 femoral blocks) are suitable for lower extremity amputation (AKA or BKA).

For 12 patients, below knee amputations were effectively carried out under sciatic and 3-in-1 blocks with or without sedation. Of the remaining six patients, five underwent above knee amputations under this combined sciatic and 3-in-1 block with mild sedation or analgesic. The sixth patient who was the 63-year-old female, was more apprehensive before starting the peripheral nerve blocks. She was sedated with intravenous injection of midazolam (dormicum) 1-2 mg. After starting the incision of the skin, she complained of pain and her pulse went up to 110/min and blood pressure to 179/100mmHg. She was sedated with an injection of diprivan (propofol) 60-80mg and alfentanil 0.5mg, then supplemented by N_2O 70% in O_2 and Isoflurane 0.5-1% with Magill's circuit and mask holding. The patient settled down; her pulse came down to 70-75/min and blood pressure to 145/80mmHg. The light general anesthesia lasted for about 30 min. Isoflurane and N_2O were turned off before suturing the skin of the amputation stump. The skin incision was started within 15min of the peripheral nerve blocks. As the latent period of the peripheral nerve blocks, especially sciatic nerve is about 20-30 min (max 40 min), the skin incision of this woman started before the effect of the complete peripheral nerve block was attained[10] leading to the necessity to sedate the patient and offer supplemental light general anesthesia in the initial stage of the surgery. When the full effect of the peripheral nerve block was attained, the light general anesthesia could be turned off before the completion of the above knee amputation.

As we did not carry out the blockade of lateral cutaneous nerve of the thigh and obturator nerves individually, it seems that the 3-in-1 block of

paravascular injection at the inguinal region with an adequate amount of local anaesthetic can effectively block the femoral, lateral cutaneous nerve of thigh and obturator nerve. The data from the literature suggest that the posterior approach for lumbar plexus block could be more effective than the technique of 3-in-1 block but further clinical studies are necessary to confirm it as a more reliable and safer method for the blockade for above knee amputation[27]. The original description of Winnie et al showed that the spread of the local anaesthetic solution to all these nerves could be demonstrated radiographically after paravascular inguinal injection with thumb pressure below the site of injection[11]. The confirmation of this sheath concept came from Sharrock who reported an inadvertent 3-in-1 block while injecting the local anaesthetic solution to block the lateral cutaneous nerve of thigh[28].

The combined sciatic and 3-in-I femoral blocks are adequate for above knee amputations provided the paravascular inguinal injection is effective with an adequate amount of local anaesthetic (25-30ml)[11-13,15,16,29]. As the peripheral nerve block of sciatic and 3-in-1 has to carry out in succession, the anterior approach of the sciatic nerve block has been chosen while keeping the patient in the supine position. The patients were also satisfied with supine position. As the motor blockade to some extent is necessary for amputation, we used 1% lignocaine and 0.5% bupivacaine with adrenaline 1:200,000 solution. With these local anesthetics, no adverse effects were reported during the intraoperative or postoperative periods[30,31].

According to Gligorijevic and Brown, in emergency and high-risk patients, especially diabetic and peripheral vascular disease patients, combined sciatic and 3-in-1 blocks can be extremely useful and effective for any surgery on the lower extremity[9,27]. In our case, 6 out of 18 patients were operated on with peripheral nerve blocks for emergency lower extremity amputation and the results were quite satisfactory without any side effect (three patients were for above knee and another three for below knee amputation).

Though the operative procedure is performed under local anesthesia, continuous monitoring of the patient's heart rate, blood pressure and arterial oxygen saturation is essential during preoperative, intraoperative and postoperative periods. The intravenous infusion line must be in place preoperatively by inserting a 18-guage cannula on the dorsum of the hand and O_2 (35-45%) with ventimask should be administered to the patients. If necessary, apprehensive patients can be mildly sedated with injections of dormicum 1-2mg with or without alfentanil or propofol 20-30mg. The heart rate and blood pressure and arterial oxygen saturation did not change significantly during intraoperative or postoperative periods as shown inTable 3.

Postoperatively, the patients were pain-free for about 3-4 hours. All but one patient were sent to the respective wards from the recovery room.

Combined sciatic and 3-in-1 blocks can be suitable not only for diabetic foot amputation and any other surgery of the lower extremity but also for postoperative pain relief[32-34]. The peripheral nerve stimulator/locator should be recommended as the standard technique for such peripheral nerve block. For more than 15 years, the use of the peripheral nerve stimulator/locator has made the localization of the nerve more popular and easier and superior to paraesthesia techniques[35-38]. With this instrument, the effectiveness of the nerve block, with a high predictive value in terms of success with minimum local anesthetics injection, is quite evident and over-dosage of the local anesthetics can be minimized.

We used the peripheral nerve stimulator/locator (Ezstim (ES300), Life-Tech, Inc.Stafford, Texas, USA) in two patients for below knee amputation and one for above knee amputation. With this instrument, a minimum output of 0.5mAor less and a pulse width of 200 ms with a stimulating frequency of 1Hz (twitch), the sciatic nerve (anterior approach) and femoral nerve were localized easily showing peripheral muscular response to the nerve stimulation. We could inject the local anesthetics in each nerve block with 100% percent effectiveness of peripheral nerve blocks.

Though the total number of patients who underwent amputation (AKA/BKA) under peripheral nerve blocks in this study is small, the sample patient surveys confirmed that 94.44% of patients were satisfied with use of such technique for their operative procedures. For further confirmation, we need to carry out this technique on a larger number of patients.

Only by educating the diabetic patients on how to control their diabetes and to take care of their feet to prevent the formation of foot ulcers can amputations for diabetic foot ulcers be reduced. Patients need to be warned to be fully compliant with their diabetic regimes to avoid these potentially serious complications[39-41].

In conclusion, considering the data from other literature in combination with our own results, we conclude that combined sciatic nerve (anterior approach) and 3-in-1 femoral nerve blocks, preferably with nerve stimulator/locator, is a simple, safe and effective anesthetic technique for many

surgical procedures on lower extremity (especially for high–risk diabetic patients complicated with multiple medical problems). Surgeons and anesthetists should encourage this peripheral nerve block technique in high-risk patients for their elective or emergency surgeries on their lower extremities whenever it is deemed suitable.

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