Research Article on Ultrasound Guided Axillary Block for Upper Limb Surgery, Rural Experience

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Introduction: Ultrasound-guided axillary block is a standard anesthetic technical for surgery of the lower part of the upper limbs including the arm, elbow, forearm, wrist and fingers.

Methods and results: We carried out a prospective and descriptive study over 03 years on patients undergoing upper limb surgery under ultrasound-guided axillary block, out in the surgery department of the CHDII saint croix Isoanala south Madagascar, rural area. The purpose of this study is to evaluate the efficiency of ultrasound-guided axillary blocks for upper limb surgery. We included 67 patients with a mean age of 35.53±10.68 years with a predominantly male population. The majority of our patients were classified ASA I. The average installation time of the sensitivity block is 11.09 ± 3.86 minutes. The average block realization time is 8.62 ± 1.39 minutes. The average duration of the sensitivity block is 270.10 ± 57.32 minutes. The success rate is estimated at 88.05%. Complications were observed in 22.38% of cases (N=15), including 5 paresthesia, 3 vascular punctures, 4 infiltration pain and 3 tachycardia.

Conclusion: Axillary block is an anesthesia technique that can be performed even in a rural hospital center. This technique can replace general anesthesia for some upper limb surgeries. The use of ultrasonography makes it easy to carry out and reduces the doses of anesthetics.

Key Words: *Axillary Block; Ultrasonography; Trauma Emergency*

INTRODUCTION

Axillary block is a standard anesthetic technique for surgery of the lower part of the upper limbs, arms, elbow, forearm, wrist and fingers [1]. In recent years, in developed countries, loco regional anesthesia has continued to develop and is becoming the reference technique. Ultrasound-guided axillary block has recently been introduced in Madagascar. We carried out this study for several reasons, firstly, our center is located in an isolated place with very limited equipment to perform general anesthesia, therefore general anesthesia is reserved especially for major procedures such as peritonitis ; secondly, the cost of general anesthesia is largely high compared to that of loco regional anesthesia, yet the majority of our patients have a low standard of living, their financial means do not allow them to pay for the cost of surgery under general anesthesia; however, we have an ultrasound machine that allows us to perform echo-guided loco regional anesthesia. The purpose of this study is to determine the efficiency of ultrasound-guided axillary blocks for upper limb surgery in the surgery department of the CHDII Sainte Croix Isoanala South Madagascar, rural area.

MATERIALS AND METHODS

All patients undergoing upper extremity surgery (hand, forearm, arm) as a result of trauma were included in this 3-year prospective descriptive study, starting in January 2014 and ending in December 2016. The anesthesia consultation was systematic for all patients. The exclusion criteria were patient refusal, hemostasis disorder and puncture site infection. Vital parameters were monitored by an electrocardioscope. Patients were positioned supine with the upper limb in 90-degree abduction. A single anesthesiologist-resuscitator performed all the axillary blocks. We used an ultrasound machine with a 7.5 megahertz linear probe. The probe was protected by a condom. The anesthetic was injected using a 90 mm stimuplex needle in the plane. We performed a slow injection of 15 ml of 2% adrenaline xylocaine after an aspiration test by blocking all four nerves (musculocutaneous, radial, medial, ulnar) as well as the lateral cutaneous nerve either 3 ml per nerve. The cold test was carried out 2 to 3 times over an interval of 7 minutes to evaluate the installation of the sensory block on the territory to be operated on. the sensory block was considered satisfactory in the absence of sensory perception in the various territories, particularly the one concerned by the intervention. Sedation with 2 mg of hypnovel was used in patients with anxiety before injection. Sedation with 3 mg/kg/h propofol was required for some patients for intraoperative comfort. The surgery was authorized after the complete installation of the sensory block. All patients were followed up essentially clinically from the injection of local anesthetics up to 48 hours postoperatively. The parameters studied are the socio-demographic characteristics, the time taken to complete the block, the installation delay of the sensory block (delay between the end of the injection of the anesthetic and the installation of the sensory block), the duration of the sensory block (delay between the installation of the sensory block and the onset of pain), success rate and intraoperative comfort, incidents and complications related to the technique. Failure of the technique requires conversion to general anesthesia. Postoperative pain is assessed by the Numerical Rating Scale as soon as the patient arrives in the post-operative care room and then every 6 hours. All patients received paracetamol systematically every 6 hours, whether or not associated with profenid. The results were reported as an average value. The sample size was defined by the number of patients recruited and included during the study period. The data were collected using a questionnaire and then analyzed using XLSTAT 2020 software.

RESULTS

During the period of the study, we included 67 patients who were admitted for traumatic injuries. The average age of our patients was 35.53±10.68 years with extremes from 15 to 61 years and and male predominance (sex ratio 2.19 in favour of men). The average installation time of the sensitivity block was 11.09±3.86 minutes, the average block realization time is 8.62±1.39 minutes and the average duration of the sensitivity block is 270.10±57.32 minutes. Concerning postoperative pain, all patients had benefited systematically on paracetamol and only 38% (N=28) of the patients needed profenid-type adjuvant; none of our patients needed opioids. Details of our results are summarized in Table 1.

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TABLE 1: Patient characteristics

Parameters	Number(N)	Percentage (%)
Patients enrolled	67	100
ASA Classification		
ASA I	52	77.61
ASA II	9	13.43
ASA III	6	8.95
Incidents and immediate complications	15	22.38
Paresthesia	5	7.46
Vascular puncture	3	4.47
Pain with anaesthetic infiltration	4	5.97
Tachycardia	3	4.47
Block realization time (minutes)		
Less than 10 minutes	49	73.13
More than 10 minutes	18	26.86
Sensitive block installation time (minutes)		
Less than 15 minutes	44	66.67
More than 15 minutes	23	34.32
Sensitive block duration (minutes)		
Less than 300 minutes	26	38.8
More than 300 minutes	41	61.19
Intraoperative patient comfort		
Very comfortable	51	76.11
Uncomfortable	8	11.94
Success rate		
Successful block	59	88.05
Failed block	8	7.46
Intraoperative sedation	8	7.46
Conversion to general anaesthesia	8	7.46

DISCUSSION

Our hospital center is located in an isolated area which is the preferred referral point for traumatic injuries. Many different types of injuries are observed, including abdominal, thoracic, cranioencephalic and especially limb injuries. As our centre is materially limited, we have chosen locoregional anaesthesia for all isolated lesions of the upper limbs. The average age of our patients was 35.53±10.68 years with a male predominance and the majority of our patients were classified as ASA I. This is explained by the fact that young and male subjects are solicited to confront the aggressors, notably the zebu thief. As for the anesthesia technique, we have chosen the axillary block because according to the literature, axillary block is one of the easiest and least risky techniques to perform. In fact, this approach is indicated for any surgical procedure involving the hand, forearm, elbow and lower third of the arm [2]. The ultrasound-guided approach in the plan was adopted in our study with a success rate of 88.05%. While the in-plane approach is the most widely used, no studies have demonstrated the superiority of either of these two approaches. In 2010, a study showed that the out-of-plane approach appears to be faster and easier than the in-plane approach [3]. For us, the approach in the plan was the easiest to perform and had no impact on the success rate. Other studies have shown that the use of ultrasonography facilitates the precise placement of the needle and injection, which increases the success rate of the axillary block, reduces the time it is installed, and reduces the dose of local anesthetic [4]. We used xylocaine with epinephrine which is the only product available in our company. We performed a slow injection of 15 ml of xylocaine 2% with adrenaline, either 3 ml per nerve, which was obviously sufficient. In the literature, it is difficult to know a standard product and volume for a brachial plexus block. The choice is based on age, approach and type of surgery [5]. According to some authors, for an ultrasound-guided axillary block, 1 ml of 20% lidocaine for each nerve is largely sufficient [4]. Other studies have confirmed that 4×5 ml (20ml) of anesthetics are sufficient for effective axillary block in tramatology [6]. In the developed countries such as France, the most used product currently is ropivacaine 5 to 7.5mg/ml. Adrenaline was the only adjuvant we used. In the literature, in the absence of any counter-indication, epinephrine is the most interesting adjuvant because it allows to reduce the total doses of anesthetics, to prolong the duration of the block by 50%, to improve the quality of anesthesia and to detect quickly an intravascular injection. The optimal dose is 5µg/ml [7]. Other adjuvants are also recommended in other studies to prolong and improve the quality of the block such as clonidine 100µg and dexamethasone 8mg [8-10]. For us epinephrine was our choice. Concerning the realization, in our study, the average realization time was 8.62±1.39 minutes, the average block installation time was 11.09±3.86 minutes and the average block duration was 270.10±57.32 minutes. We have found that the use of an ultrasonographic device makes it easier for us to perform. In some studies, the average block completion time was 445 s and the block duration was 190 min (extreme 120-310 min) [4]. A study carried out in Africa found a realization time of 13.74 minutes, an average duration of installation of the sensitivity block of 11.06 minutes and an average duration of the sensitivity block of 265 minutes [11]. In Tunisia, in 2016, a study reported that the heating of the anesthetic product caused a shortening of the installation time of the sensory and motor blocks and a lengthening of the duration of the sensory block [12]. Our anesthetics were stored in a warm place with a tropical climate, which could explain the longer duration of the sensory block in our study. Regarding efficacy, 88.05% success was observed in our study. A randomized study of 188 patients who underwent hand surgery under axillary block showed that the use of ultrasonography with or without stimulation significantly improved the success rate of axillary block. with 82.8% success of echo-guided block, 80.7% success of echo-guided block with neurostimulation versus 62.9% success of block under neurostimulation alone [13]. Another study in Dakar showed a success rate of 85.25% [11]. As regards complications, in our study they were observed in 22.38% of cases (N=15), including 5 paresthesia, 3 vascular punctures, 4 infiltration pain and 3 tachycardia. . In the literature, since the advent of ultrasonography, complications are rare. However, some studies have reported some complications. An African study reported 3.27% cases of vascular punctures [11]. In a study of 405 patients who had an axillary block with catheter placement, only one developed a hematoma, and this patient was receiving heparin [14]. Some authors have reported that the incidence of neurological injury was higher after interscalenic block (4%) compared to axillary block (1%) [15]. Other studies have described that echoguiding has improved success rates and reduced complications [16,17].

CONCLUSION

Axillary block is an easy anesthesia technique that can be performed even in a rural hospital. Although we do not have enough cases to be conclusive, we have observed that axillary block is of great interest; it can replace general anesthesia for some upper limb surgeries, it avoids the use of opioids in postoperative care and reduces the cost of the operation. The use of ultrasonography makes it easier to perform technical procedures, increases the success rate, greatly reduces the doses injected and reduces complications.

REFERENCES

1. Ranganath A, Srinivasan KK, Iohom G. Ultrasound guided axillary brachial plexus block. Med Ultrason. 2014; 16(3):246 - 51.

2. Schroeder L E , Horlocker T T, Schroeder D R. The efficacy of axillary block for surgical procedures about the elbow. Anesth Analg. 1996 ; 83(4):747-51.
3. Bloc S, Mercadal L, Dessieux T, et al. The learning process of the hydrolocalization technique performed during ultrasound- guided regional anesthesia. Acta Anesthesiol Scand. 2010;54(4):421-25.
4. Brian D O'Donnell, Gabrielle Iohom. An estimation of the minimum effective anesthetic volume of 2% lidocaine in ultrasound-guided axillary brachial plexus block. Anesthesiology. 2009 ;111: 25-9.
5. Xavier Paqueron, Gilles Boccara, Mouhssine Bendahou et al. Brachial plexus nerve block exhibits prolonged duration in the elderly. Anesthesiology. 2002; 97(5):1245-9.
6. Brian D O'Donnell, Helen Ryan, Owen O'Sullivan et al. Ultrasound-guided axillary brachial plexus block with 20 milliliters local anesthetic mixture versus general anesthesia for upper limb trauma surgery: an observer-blinded, prospective, randomized, controlled trial. Anesth Analg. 2009; 109(1) : 279-83.
7. W F Kennedy Jr, J J Bonica, R J Ward et al. Cardiorespiratory effects of epinephrine when used in regional anesthesia. Acta Anaesthesiol Scand Suppl. 1966; 23: 320-33.
8. Zekiye Bigat , Neval Boztug, Necmiye Hadimioglu et al. Does dexamethasone improve the quality of intravenous regional anesthesia and analgesia, a randomized, controlled clinical study. Anesth Analg. 2006 ;102(2):605-9.
9. Gabriella Iohom, Adnane Machmachi, Désiré-Pascal Diarra et al. The effects of clonidine added to mepivacaine for paronychia surgery under axillary brachial plexus block. Anesth Analg. 2005; 100(4): 1179-83.
10. Simon J Parrington, Dermot O'Donnell, Vincent W S Chan et al. Dexamethasone added to mepivacaine prolongs the duration of analgesia after supraclavicular brachial plexus blockade. Reg Anesth Pain Med. 2010; 35(5):422-26.
11. Leye PA , Traoré MM , Bah MD et al. Evaluation of the practice of ultrasound-guided axillary brachial plexus block at a teaching Hospital in Dakar. 2017;22(1):55-57.
12. Trabelsi W, Ben Gabsia A, Lebbi A, et al. Effect of warming bupivacaine 0.5% on ultrasound-guided axillary plexus block. Randomized prospective double-blind study. Orthop Traumatol Surg Res. 2017; 103(1):71-75.
13. Vincent W S Chan, Anahi Perlas, Colin J L McCartney et al. Ultrasound guidance improves success rate of axillary brachial plexus block. Can J Anaesth. 2007; 3:176-82.
14. BergmanBD, Hebl JR, Kent J, et al. Neurologic complications of 405 consecutive continuous axillary catheters. Anesth Analg. 2003; 96(1): 247-52.
15. Fanelli G, Casati A, Garancini P et al. Nerve stimulator and multiple injection technique for upper and lower limb blockade: failure rate, patient acceptance, and neurologic complications Study Group on Regional Anesthesia. Anesth Analg. 1999; 88(4): 847–52.
16. Kapral S, Greher M, Huber G, et al. Ultrasonographic guidance improves the success rate of interscalene brachial plexus blockade. Reg Anesth Pain Med. 2008;33(3): 253–58.
17. Orebaugh SL, Williams BA, Vallejo M et al. Adverse outcomes associated with stimulator-based peripheral nerve blocks with versus without ultrasound visualization. Reg Anesth Pain Med. 2009; 34(3): 251–55.