ORIGINAL RESEARCH PAPER

Pharmacology

ULTRASOUND-GUIDED AXILLARY BLOCKAGE FOR ARTERIOVENOUS FISTULA OF THE UPPER LIMB: MALAGASY UNIVERSITY HOSPITAL EXPERIENCE

KEY WORDS: arteriovenous fistula, axillary block, ultrasound-guided, upper limb

HARIOLY NIRINA Marie Osé Judicaël — Department of Anesthesia Resuscitation, Morafeno-Toamasina Teaching Hospital, Madagascar

RASAMOELINA Ndrantoniaina* — Medical-Surgical Intensive Care Unit, Teaching Hospital Tambohobe – Fianarantsoa - Madagascar *Corresponding Author

ANDRIANIMARO Florelia Martinetti — Medical-Surgical Intensive Care Unit, Teaching Hospital Tambohobe – Fianarantsoa - Madagascar

RAHERINANTENAINA Fanomezantsoa — Department of Vascular Surgery, Morafeno-Toamasina Teaching Hospital, Madagascar

RAJAONANAHARY Toky Mamin'ny Aina — Department of Vascular Surgery, Morafeno-Toamasina Teaching Hospital, Madagascar

RIEL Andry Mampionona — Department of Intensive Care Unit, Teaching Hospital Toliara- Madagascar

ABSTRACT

Objective: Describe the practice of axillary blockade with ultrasound guidance for surgery to create an arteriovenous fistula of the upper limb in the Anesthesia Department of Morafeno Toamasina Teaching Hospital.

Material and methods: A prospective descriptive study was carried out over a 12-month period at Morafeno Toamasina Teaching Hospital. It deals with patients who have undergone surgery for the creation of an arteriovenous fistula under axillary ultrasound guidance. Sociodemographic characteristics, preoperative anxiety, duration of the block, the time of installation of the sensory block, the incidents, the success rate, the duration of the sensory block, the comfort of the patient and the complications related to the technique were evaluated.

Results: We collected 74 cases, all classified ASA III, whose mean age was 46.7 ± 18.6 years divided into 52 men and 22 women. The mean duration of axillary block development was 8.4 ± 4.8 minutes. Complications and adverse events were 24.3% (n = 18). The average time to install the sensory block was 15.4 ± 6.2 minutes. The mean sensory block duration was 300.4 ± 120.8 minutes. The success rate of the axillary ultrasound-guided block was 89.2%. The patients were in a very comfortable state in 46 cases (62.2%).

Conclusion: These results have shown the interest of axillary blocking ultrasound for the surgery of creation of arteriovenous fistula of the upper limb with a high success rate and a not insignificant comfort.

Introduction

The axillary block is the standard technical for surgery of the lower arm, elbow, forearm, wrist and fingers [1]. The axillary block is the most used anesthetic technique for the creation of the arteriovenous fistula [2]. The usual fragility of patients with renal insufficiency incites the anesthetist to propose this technique. In recent years, in developed countries, ultrasound-guided locoregional anesthesia has continued to develop and is becoming the reference technique. The axillary ultrasound-guided block is of recent introduction in Madagascar. The aim of this study is to describe the practice of Ultrasound-guided axillary blockage for surgery of arteriovenous fistula creation of the upper limb in the anesthesia department of Morafeno Toamasina Teaching Hospital.

Material and methods

All patients scheduled for surgery for the creation of an arteriovenous fistula at Morafeno Toamasina Teaching Hospital were included in this prospective descriptive study over a 12-month period from January 2016 to December 2017. The pre-anesthetic consultation was systematic to identify the contraindications of locoregional anesthesia. Non-inclusion criteria were informed patient refusal, abnormal hemostasis, and infection of the puncture site. Premedication was reserved for anxious patients. Continuous monitoring of blood pressure, heart rate, pulse oxygen saturation (SPO2) was provided by an electrocardioscope. All patients were supine with the upper limb in 90 degree abduction. A single resuscitating anesthetist physician performed all axillary ultrasound-guided blocks in this study. The axillary block was performed using a single doppler ultrasound machine with a 7.5 megahertz surface probe. The probe was protected by a sterile glove. The injection of the anesthetic product was performed using a lumbar puncture needle of 22 gauge. The approach was carried out in the plane (in plane). The anesthetist performed a slow injection of 7 ml of 2% xylocaine with adrenaline associated to 13 ml of 0.5% bupivacaine after aspiration test. The four nerves (musculocutaneous, radial, median, ulnar) were blocked as well as the cutaneo-medial sub-aponeurotic. The cold test was used to evaluate the installation of the sensory block in the territory to be operated. Surgery was allowed after complete installation of the sensory block. Additional sedation or local anesthesia was performed in case of pain during surgery. The data were collected at the time of the puncture on a form of compilation written beforehand. All patients underwent essentially clinical monitoring since the injection of local anesthetics up to 48 hours postoperatively. The parameters studied were the socio-demographic characters, the preoperative anxiety, the duration of the block, the delay in the installation of the sensory block (delay between the end of the injection of the anesthetic product and the installation of the sensory block). Incidents, the success rate, the duration of sensory block (delay between the installation of sensory block and the appearance of pain), the comfort of the patient intraoperatively and complications related to the technique. Failure of the block requires the practice of local anesthesia or sedation. The results were expressed in mean value. Data was analyzed using the XLSTAT 2008 software.

Results

During the 12-month study period, we collected 74 end-stage renal patients undergoing surgery for the creation of an arteriovenous fistula under axillary ultrasound-guided block. The average age was 46.7 ± 18.6 years, divided into 52 men and 22 women. All patients were classified as ASA III. All axillary blocks were realised by the same doctor anesthetists. Premedication was necessary in 6 patients (8.1%). The performance of the axillary ultrasound-guided block is summarized in Table 1. The average duration of the axillary block was 8.4 ± 4.8 minutes. Complications and adverse events were 24.3% (n = 18). Paresthesia was the most common adverse event in 6 cases (8.1%). The average time of installation of the sensory block was 15.4 ± 6.2 minutes. The mean sensory block duration was 300.4 ± 120.8 minutes. Sedation was performed in 4 patients (5.4%). Complementary local anesthesia was performed in 4 patients (5.4%). The success rate of the axillary ultrasound-guided block was 89.2%. The patients were in a very comfortable state in 46 cases (62.2%).

Table 1: Performance of the axillary ultrasound-guided block (n = 74)

Parameters	Number (n)	Percent (%)
Incidents and immediate complications		
Paresthesia	6	5.4
Vascular puncture	4	2.7
Pain with anesthetic infiltration	2	8.1
Tachycardia	4	5.4
Faintness	2	2.7
Duration of realization of the block (minute)		
Less than 10 minutes	48	64.9
More than 10 minutes	26	35.1
Sensory block delay (minute)		
Less than 15 minutes	21	56.8
More than 15 minutes	16	43.2
Duration of sensory block (minute)		
Less than 300 minutes	18	24.3
More than 300 minutes	56	75.7
Intraoperative patient comfort		
Very comfortable	46	62.2
Comfortable	20	27.0
Uncomfortable	8	10.8
Intraoperative sedation	4	5.4
Additional local anesthesia	4	5.4

Discussion

This prospective study, describing the realization of ultrasound-guided nerve blocks in the creation of an arteriovenous fistula, included 74 patients with renal insufficiency. This study showed the advantage of axillary block ultrasound in patients with renal failure with a success rate of 89.2%. The axillary echogrammed block can be realized either by the approach in the plane or by the approach out of the plane. In our study, nerve blocks were approached by an approach in the plane in 74 cases or 100% of cases. In Senegal, in 2015, one study reported the predominance of the approach in the plan but no impact on the success rate [3]. In our study, the mixture of 7 ml of 2% xylocaine adrenaline and 13 ml of 0.5% bupivacaine was used in all cases. Leye PA and al [3] used an average volume of 28 ± 5 ml with a mixture of lidocaine 2% and Bupivacaine 0.5%. Studies have reported that reducing the dose of the volume of local anesthetics does not decrease the block success rate [4, 5, 6]. One study showed that 1 ml of local anesthetic placed correctly in contact with the nerves, without intraneural injection allows a constant success of the technique [7].

In our study, the average completion time of the axillary block was 8.4 ± 4.8 minutes. The completion time of the axillary ultrasound-guided block varies according to the experience of the team. One team performed an axillary block in a shorter time of 3.3 ± 1.5 minutes [8]. In our study, the mean time to onset of sensory block and mean sensory block duration were 15.4 ± 6.2 minutes and 300.4 ± 120.8 minutes, respectively. Leye PA and al found an average onset delay and mean sensory block duration of 11.06 ± 4.3 min and 265 ± 63 minutes [3]. The longer average duration of sensory blocking observed in our study can be explained by the use of Xylocaine Adrenaline associated with the warming of the product. Our anesthetic products have been stored in a warm place with a tropical climate. Trabelsi W and al [13], observed that the warming of bupivacaine 0.5% at 37 ° C allowed an increase in the duration of the sensory block.

In our study, we noted 4 cases of vascular punctures (5.4%). In Australia in 2009, one study reported a vascular puncture rate of 5.1% [8]. However, one study reported a low involuntary vascular puncture rate of 1.6% (20 cases out of 1214 axillary blocks) [9]. Barrington MJ and al [8] reported that ultrasound-guided nerve block reduces the incidence of vascular punctures compared with the neurostimulator block [8]. The success rate (89.2%) observed in our study was close to the literature. Studies have reported success rates of 90%, 95.1% and 96.1% respectively [10, 11 and 12]. In our structure the echogenic neurostimulation needle was not available. The use of a 22-gauge lumbar puncture needle had been shown to be effective. The limitation of the study was the existence of an information bias due to an individual variation in perception because we relied on the data and information provided by the patients and by the person who completed the questionnaire without be able to check them in specific ways. The limitation of the study was the existence of an information bias due to an individual variation in perception because we relied on the data and information provided by the patients and by the person who completed the survey without be able to check them in specific ways. This series of cases is a great first in Madagascar although it is a preliminary. The norms in the achievement of an axillary block were respected despite the deficiencies in technical platform.

Conclusion

This study showed the advantage of the axillary block ultrasound for the surgery of creation of arteriovenous fistula of the upper limb in the renal insufficiency with a high rate of success and a not insignificant comfort. Large-scale study could yield more eloquent results.

References

1- Ranganath A, Srinivasan KK, Iohom G. Ultrasound guided axillary brachial plexus block. Med Ultrason. 2014; 16(3): 246 - 51.
2- Matsuda H, Oka Y, takatsu S, Katsube R, Yoshida R, Oyama T, Takeda Y, Miyazaki M. Ultrasound-guided block of selective branches of the brachial plexus for vascular access surgery in the forearm: a preliminary report. J Vasc Access. 2016; 17(3) : 284-90.
3- Leye PA, Traoré MM, Bah MD and al. Evaluation de la pratique du bloc axillaire échoguidé au CHU Aristide Le Dantec de Dakar. Rev. Afr. Anesthésiol. Med. Urgence. 2017; 22(1): 53-57.
4- Van Geffen GJ and al. A prospective randomised controlled trial of ultrasound guided versus nerve stimulation guided distal sciatic nerve block at the popliteal fossa. Anaesth Intensive Care. 2009; 37:32-7.
5- Casati A, Baciarello M, Di Cianni S and al. Effects of ultrasound guidance on the minimum effective anaesthetic volume required to block the femoral nerve. Br J Anaesth. 2007;98:823-7.
6- Riazi S, Carmichael N, Awad I and al. Effect of local anaesthetic volume (20 vs 5 ml) on the efficacy and respiratory consequences of ultrasound-guided interscalene brachial plexus block. Br J Anaesth. 2008; 101 (4):549-56.
7- O'Donnell BD, Lohom G. an estimation of the minimum effective anesthestic volume of 2% lidocaine in ultrasound-guided axillary brachial plexus block. Anesthesiology. 2009; 111: 25-9.
8- 8- Barrington MJ, Watts SA, Gledhill SR and al. Preliminary result of the Australian regional anaesthesia colaboration. A prospective audit of more than 7000 peripheral nerve and plexus blocks for neurologic and other complications. Reg Anesth Pain Med 2009; 34: 534-41.
9- Rannou JJ, Marchal P, Le bret F, Kayembe F, Merniz N, Heriche CH. Effractions vasculaires lors de la réalisation du bloc axillaire échoguidé en dehors du plan : ŕ propos de 1214 blocs. J. anrea. 2015; 1 (1): A377- A378. DOI: 10.1016/j.anrea. 2015.07.576.
10- Liu FC, Liou JT, Tsai YF, and al. Efficacy of ultrasound-guided axillary brachial plexus block: a comparative study with nerve stimulator-guided method. Chang Gung Med J. 2005; 28: 396-402.
11- 11- Chan V, Perlas A, McCartney C, Brull R, Xu D, Abbas S. Ultrasound guidance improves success rate of axillary brachial plexus block. Canadian Journal of Anesthesia 2007; 54 (3):176–82.
12- Kefalianakis F1, Spohner F. Ultrasound-guided blockade of axillary plexus brachialis for hand surgery. Handchir Mikrochir Plast Chir. 2005 Oct; 37 (5):344-8.
13- Trabelsi W, Ben Gabsia A, Lebbi A, and al. Effect of warming bupivacaine 0.5% on ultrasound-guided axillary plexus block. Randomized prospective double-blind study. Orthopaedics & Traumatology: Surgery & Research. 2017; 103(1): 71-75.