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Practice of Unilateral Spinal Anesthesia During Varicose Lower Limb Surgery in Morafeno University Hospital Toamasina

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Abstract

Introduction: To our knowledge, unilateral spinal anesthesia in the Atsinanana region of Madagascar has not been studied to date. Our study aims were mainly to describe our current practice in performing unilateral spinal anesthesia during varicose surgery of the lower limb and secondarily to assess the factors influencing success of the technique.

Methods and Patients: This is a prospective, observational, descriptive and analytic non-randomized, single-center study over a period of 18 months, including all patients requiring lower limb surgery.

Result: Forty-two (42) patients were selected for our study. The mean age of our study population was 47.5 ± 19.82 years with extremes of 16 to 86 years. The average installation time of the blocks was 14.5 ± 2.87 minutes with the extremes of 13 to 30 minutes. The average regression time of the blocks was 125.26 ± 32.24 minutes with the extremes of 15 to 180 minutes. The types of intervention were crossectomy with stripping, phlebectomy and stripping. The failures concerned bilateralisation, early regression and absence of sensory block. The success rate of anesthesia was 85.6%. The dose of hyperbaric bupivacaine and patient positioning had a significant impact on the success rate of anesthesia.

Conclusion: Although it is a simple technique, an effort in drafting a protocol to standardize the practitioner attitude still needs to be provided in order to improve the effectiveness rate.

Keywords - Unilateral Spinal Anesthesia, Varicose Vein Surgery, Hyperbaric Bupivacaine.

I. INTRODUCTION

Spinal anesthesia is perimedullary locoregional anesthesia. Patient remains conscious and local anesthetics block the transmission of nerve impulses in a reversible manner. The resulting blocking combines a sympathetic block (neurovegetative conduction), a sensory block (painful and tactile sensitivity) and an engine block (motor conduction) [1, 2]. The unilateral spinal anesthesia, described for the first time by Harder in 1959 [3], is a variant of conventional spinal anesthesia which consists of fixing spinal anesthesia on the side to be operated [4]. Widely practiced in Western countries, in Madagascar it is not common practice [5] and has not been studied to date in the Atsinanana region although it is a technique simple requiring no more material than conventional spinal anesthesia [6]. Unilateral spinal anesthesia is very suitable for elderly patients with cardiovascular risk and remains

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very practical in the intervention of the lower limbs, especially varicose surgery [7]. Our objective is mainly to describe our current practice in performing unilateral spinal anesthesia for varicose surgery of the lower limb and secondarily to assess the factors influencing the success of the technique.

II. MATERIALS AND METHODS

This was a prospective, single-centric, non-randomized, descriptive prospective study that lasted for 3 years from February 2016 to February 2019. We targeted all patients who needed varicose surgery during our period of study. We included both sexes (male and female) over 15 years of age for co-operation, to benefit from varicose surgery of the lower limb and no contraindications to spinal anesthesia (refusal, crushing disorder). blood pressure, infection at the site of the puncture The exclusion criteria involved patients operated on both limbs, patients operated at more than two different sites, the duration of intervention greater than two hours. All patients had benefited systematically a pre-anesthetic consultation to ask the indication of unilateral spinal anesthesia and to have the consent of the patient premedication with 100 mg of hydroxizin one to two hours before the intervention was reserved for people anxious. bladder, standard monitoring, peripheral venous approach and vein-vein perfusion isotonic saline 9 per thousand, antibiotic prophylaxis, oxygenation with a nasal telescope at an inspired oxygen fraction of 1 and a flow rate of 3 liters per minute; we had positioned the patient in the lateral decubitus position on the side to be operated in the fetal position. After locating the space between L5-L4 and L4-L3, a strict asepsis, we inserted the spinal needle whose bevel was oriented parallel to the sagittal plane and progressively advanced to perceive a resistance that corresponded to the crossing of the ligamentum and dura. After the reflux of a clear cerebrospinal fluid, we directed the bevel of the needle on the side to operate and injected the anesthetic solution slowly with a speed of 1 ml / min. The anesthetic solution was obtained after mixing 0.5% Hyperbaric Bupivacaine and Fentanyl. The dose and volume of Hyperbaric Bupivacaine 0.5% used was variable depending on the expected duration of the procedure and Fentanyl was fixed at 25 gammas (0.5ml) for all patients. Our patients were divided into 6 groups according to the dose of bupivacaine (A: 8 mg, B: 9 mg, C: 10 mg, D: 11 mg, E: 12 mg, F: 13 mg) and placed in horizontal level for at least 15 minutes before the incision The electrocardioscope was monitored during the installation of the blocks, during the per and postoperative period. The sensory block was evaluated by the cold test. The variables studied were demographic characteristics (age, gender, height, antecedents, ASA class), surgery (type of intervention, time to incision), anesthesia (type Needle, dose and volume, puncture site, patient position during block set-up, block set-up delay, cephalic extension level of blocks, block regression delay , success rate, the and hemodynamic and perioperative incidents.) A survey card had been developed. The data were collected during the pre-anesthetic consultation, during the intervention and during the first 24h post-operative direct interview for the collection of subjective parameters. The statistical analyzes were done using the SPSS software version 22. The results were expressed in number, percentage (%) and on average with the standard deviation. For the correlation analysis, we used Pearson's chi-square test and we retained as significant a p value ≤ 0.05.

III. RESULTS

Over three years, 42 patients were selected for our study. The mean age of our study population was 47.05 ± 19.82 years with an average size of 160.43 ± 8.44 cm and an average weight of 58.048 ± 7.81 kg. The majority of our patients were male (81%), most with no specific history (61.9%) and ASA class I (64.3%). Interventions consisted of crossectomy with streaking (76.1%), phlebectomy or stripping (23.9%). The mean time to incision was 35.52 ± 15.81 minutes with extremes of 20 to 105 minutes and the average duration of surgery was 54.43 ± 26.003 minutes with extremes of 25 to 120 minutes. For the puncture the Quincke 22 gauge needle was used in 61.9% of cases and 25 gauge in 38.1% of cases. A significant proportion (42.9%) was in group C that is to say having received 10mg of Bupivacaine and 25µg of Fentanyl. All patients were punctured in a lateral decubitus position at the L3-L4 (81%) and a single puncture (76.2%) in the majority of cases. The injection speed of the anesthetic solution was 1 ml / min and the bevel was oriented on the side to operate for all patients. (Table I)

Table I: Distribution according to the embodiments of the technique

	Effective (n)	Percentage (%)
Position in DCL during the puncture	42	100
Puncture level		
L3-L4	34	81

L4-L5	8	19
Puncture number		
Once	34	76,2
Multiple	8	23,2

The majority (95.2%) of the patients were in lateral decubitus at horizontal level for at least 15 minutes after infiltration of the anesthetic solution and 4.8% remaining in proclive at 5 °. Cephalic extension levels of the blocks were at T10 (57.1%) and at T6 (42.9%). We had 2 cases (4.8%) of bilateralisation, 2 cases (4.8%) of intraoperative sensory block and 2 cases (4.8%) of absence of sensory block, a success rate of 85 , 7%. The average time to install the blocks was 14.5 ± 2.87 minutes with the extremes of 13 to 30 minutes. The average regression time of the blocks was 125.26 ± 32.24 minutes with the extremes of 15 to 180 minutes. (Table II)

Table II: Distribution according to the characteristics of the block obtained

	Effective (n)	Percentage (%)
Cephalic extension level of blocks		
T6	18	42,9
T10	24	57,1
Failed blocks		
Bilateralization	2	4,8
Early inefficiency	2	4,8
No block	2	4,8
No failure	36	87,5

The dose significantly affected the quality of the block obtained and the success of the technique with respective p values at 0.04 and 0.008 (Table III).

Table III: Correlation between dose of bupivacaine and type of failure

Bupivacaine	Bilateralization	Early lifting	No bloc	No failure	Total
Group A (8 mg)	1	1	0	0	2
Group B (9mg)	1	1	1	4	7
Group C (10mg)	0	0	0	18	18
Group D (11mg)	0	0	1	3	4
Group E (12mg)	0	0	0	6	6
Group F (13mg)	0	0	0	5	5
Effective	2	2	2	36	42
r	0,3	0,3	-0,2	0,4	
p	0,04	0,04	0,3	0,008	

The dose also had an impact on the regression period of the sensory block (Table IV).

Table IV: Correlation between bupivacaine dose and regression delay of the block

Bupivacaine	≤ 45 min	45 à 90 min	90 à 150 min	> 150 min	Total	p
Group A (8 mg)	0	2	0	0	2	
Group B (9mg)	0	0	7	0	7	
Group C (10mg)	0	0	17	1	18	0,002
Group D (11mg)	1	0	3	0	4	
Group E (12mg)	0	0	4	2	6	

Group F (13mg)	0	0	1	4	5
Total	2	2	2	36	42

Horizontal supine position was more effective during block installation (Table V).

Table V: Correlation between position during block installation and type of failure

Type of failure	DL in proclive at 5 to 10°	DL in horizontal level 180°	Total	r	P
Bilateralization	0	2	2	0,06	0,7
Early inefficiency	0	2	2	0,06	0,7
No block	0	2	2	0,06	0,7
No failure	0	36	36	0,6	0,0001
Total	2	40	42		

No cases of hypotension and bradycardia had been reported. Hemodynamic stability was maintained by intraoperative crystalloid infusion at 6-7ml / kg over 90min. No patients had pre-filled ephedrine or atropine. Perioperatively, no cases of respiratory distress, acute urinary retention, nausea and vomiting, or post-lumbar puncture headache were observed.

IV. Discussion

Regarding demographic characteristics, extreme ages were 16 to 86 years old. The patients were ASA class I, II and III with a sex ratio of 34 men and 8 women. The average size was 160.43 ± 8.44 cm and the average weight was 58.048 ± 7.81. Previous studies are comparable to our study. (Table IV)

Table VI: Comparison of demographic characteristics

Studies	Effective	Demographic characteristics
Magar JS et al, 2017 [8]	30	Age: 18 to 65 years Gender: 21 men and 9women ASA class: I, II, III Size: 163.47 ± 4.49 cm Weight: 60.43 ± 4.92 kg
Leyla TK et al, 2013[9]	15	Age ≥65 years Gender: 7 men and 8 women ASA class: I and II Size: 168.21 ± 4.18 cm Weight: 69.57 ± 7.96 kg
Errando CL et al, 2014 [10]	61	Age ≥65 years Gender: 14 men and 47 women ASA class: I, II, III Size: 159.8 ± 13.8 cm Weight: 68.6 ± 13.8 kg

In our study, the average duration of surgery for unilateral lower extremity varicose veins was 54.43 ± 26.003 minutes with extremes of 25 to 120 minutes. In 2017 according to Magar JS et al, in a series of 30 cases, unilateral spinal anesthesia can cover surgery with an average duration of 131.5 ± 14.57 minutes. Concerning the modality of the realization of the technique, the needles said to "pencil point" with small lateral eyelet (25G), making it possible to control the direction and the diffusion of the flow of local anesthetic are recommended by certain authors [11]

. We used the Quincke 25 and 22G bevel needle, which revealed a 95.2% block closure rate (n = 40) approaching that described in the literature. (Table VII).

Table VII: Variation in Success Rate by Needle Type

Studies	Needle type	Success rate
Li Zhu, Chun Tian et al, 2014[12]	Quincke 25 et 22G	93,3%(n=30)
Mohammad Alipour, 2014[13]	Quincke 25	94,45%(n=36)
Apaydin et al, 2014[14]	Quincke 25	96%(n=40)
Bergman et al, 2015[15]	Atraucan 26G	94%(n=30)
Leyla T. K et al, 2013[9]	Quincke 25	95%(n=20)
Chevaleraud É et al, 2008[11]	Pencil tip 25 ou 27G	98,2%(n=226)

According to the authors, the lateralization of the blocks does not depend on the type of needle used. Gauge and needle type are more specifically related to the incidence of side effects [16]. All our patients had benefited from Bupivacaine 0.5% (5 mg / ml) in hyperbaric form as anesthetic products which remains the reference in terms of unilateral spinal anesthesia [17]. The dose of bupivacaine received by our patients ranged from 8 to 13 mg. The usual dose of Bupivacaine for eveinage is 8 mg [18]. Higher doses (10 to 15mg) greatly increase the regression of the blocks and the level of extension of the blocks [19]. The dose of Fentanyl used as adjuvant was set at 25µg in all patients. Fentanyl at a dose of 25µg prolongs the duration of the sensory block by approximately 31 min without influencing the motor block [18]. The average time to install the blocks was 14.5 ± 2.87 minutes and the average regression time of the blocks was 125.26 ± 32.24 minutes. Etchebarne [20] and Magar [8] found in their work a respective installation delay at 5 minutes and 15.93 ± 1.98 minutes with a respective regression delay at 235 ± 53 minutes and 155.33 ± 17, 27 minutes. Apart from the dose, the injection rate that was constant at 1 ml / min for all our patients can also have an impact on the success rate [21]. The injection speed varies between 0.33ml / min [15] to 1ml / min [14] depending on the teams. Based on our results, the dose had an impact on lateralization, sensory block (p = 0.04) and block regression (p = 0.002). In addition to the dose and the speed of injection, the position is also involved in the success of unilateral spinal anesthesia. According to the authors, the vertebral column must be rectilinear with respect to the plane of the bed. It is not necessary to be sloping or proclive, given the very low volumes used [11]. Theory justified in our series because the patients put in proclive of 5 ° during the installation of the blocks (two cases are 4,8%) had had a bilateralisation. On the other hand, the 40 patients (95.2%) who were horizontally leveled during the installation of the blocks had strictly lateralized blocks. The position had a significant influence on the bilateralisation of the block obtained (r = 0.8, p = 0.0001). As in many articles on unilateral spinal anesthesia, none of the most common incidents during conventional spinal anesthesia such as arterial hypotension, bradycardia [19], respiratory disorders [1], urination disorders [22]], headaches after lumbar puncture [23] were not included in our study.

V. Conclusion

Our study, despite the small size of the sample and its monocentricity, made it possible to highlight the interest of practicing unilateral spinal anesthesia. Indeed, it suffices to respect some conditions to succeed the strictly lateralized blocks including the dose, the position and the speed of puncture. Given the absence of incidents related to conventional spinal anesthesia, our study had shown that the practice of unilateral spinal anesthesia could contribute to improving the quality of anesthetic management during surgery of varicose veins of the lower limb in Madagascar.

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