



# What Type of Peripheral Loco-Regional Anaesthesia for Thoracic Limb Surgery at the University Hospital La Renaissance - N'Djamena Chad

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## To cite this article:

Kader Ndiaye, Sory Traore, Adamou Abbassi, Mbang Dono Djerabe, Adjougoult Bonte, Kotyade Ngamai, Siniki Fandebnet. What Type of Peripheral Loco-Regional Anaesthesia for Thoracic Limb Surgery at the University Hospital La Renaissance - N'Djamena Chad.

*International Journal of Clinical and Experimental Medical Sciences*. Vol. 7, No. 2, 2021, pp. 50-54. doi: 10.11648/j.ijcems.20210702.13

Received: April 5, 2021; Accepted: April 16, 2021; Published: April 26, 2021

**Abstract:** Loco-regional anaesthesia has been revived in recent years, particularly with the advent of ultrasound guidance. We conducted a prospective study over a period of one year on the activity of peripheral loco-regional anaesthesia; 25 patients operated on the thoracic limb who had benefited from peripheral loco-regional anaesthesia were collated. Echo-guidance predominated in 76% of cases, axillary block predominated in our study, i.e. 72% of cases; 48% of our patients had had prior premedication with the combination of hypnovel and low dose fentanyl, which made the nerve block to be carried out more comfortably. The most used products were the combination of Bupivacaine 0.5% and Lidocaine 2% in 88%; the average volume injected per plexus block was 21.38 ml with a standard deviation of 6.1 ml. The postoperative analgesia was satisfactory with 28% of the patients having no pain, 64% having only moderate pain and only 4% having pain judged to be intense, i.e. 1 patient; the average duration of this postoperative analgesia was 252 minutes, going up to 420 minutes and it is in the same range as that found in the literature, which is 172.8 min on average, going up to 546.4 min for certain authors. No side effects or complications were observed in our series. In conclusion, we have noted the advantage of the practice of peripheral loco-regional anaesthesia for both the patient and the hospital; this should encourage practitioners to standardise it.

**Keywords:** Peripheral Loco-Regional Anaesthesia, Thoracic Limb Surgery, Clinical Impact

## 1. Introduction

In recent years, anaesthesia has undergone an enormous evolution, notably the techniques of peripheral loco-regional anaesthesia, which has had a revival, from neurostimulation to ultrasound guidance, and which constitutes a considerable comfort for the patient, especially in terms of reducing the risks associated with general anaesthesia and good management of intra- and post-operative pain.

At the University Hospital La Renaissance, we have made it a priority to use peripheral loco-regional anaesthesia for thoracic limb surgery whenever possible; we conducted a

one-year prospective study on the activity of peripheral loco-regional anaesthesia for thoracic limb surgery and postoperative follow-up; two techniques were used: ultrasound guidance and neurostimulation. Our objective was to evaluate our practice of peripheral loco-regional anaesthesia and its results in order to propose protocols for the further improvement of our patients' management.

## 2. Patients and Methods

We conducted a prospective study on all patients taken from the operating room for isolated thoracic limb surgery in our University Hospital during the study period, from 01

January 2020 to 31 December 2020. Only consenting patients who were operated on under peripheral loco-regional anaesthesia, without indication of prior general anaesthesia, were included.

Pre-medication with hypnovel (2mg) and Fentanyl (25µg) allows reduce pain at the injection site as well as intraoperative anxiety.

The technique used was ultrasound guidance and neurostimulation, sometimes with the coupling of two techniques using echoplex needles 25 mm to 50 mm, rarely in 100 mm.

The products used were Bupivacaine 0.5% combined with Lidocaine 2%; this results in concentrations of 0.25% for Bupivacaine and 1% for Lidocaine; Ropivacaine 0.375% was rarely used in isolation.

Pain was assessed by visual analogue scale (VAS) at the second, fourth and eighth postoperative hour.

The data were analysed with sphinx Plus 5 software and the graphs with Excel software.

### 3. Results

We collected 25 patients who had received peripheral loco-regional anaesthesia out of 31 patients operated on for thoracic limb surgery, i.e. 80.6% of thoracic limb operations; the average age was 33 years, 84% adults with extreme ages of 9 and 70 years and a sex ratio M/F=3.1

For the previous pathological conditions, there was only one case of coronary artery disease and one case of chronic kidney failure.

The injury mechanisms were dominated by assaults (28%), followed by traffic and road accidents in 32% of cases (see table 1). And the surgical indications were mainly hand tendinoplasties in 36% of cases (see table 2).

**Table 1.** Classification according to injury mechanism.

Mechanism of Trauma	Workforce	Percentage
No trauma mechanism	3	12,0
Traffic Accident / MVA	4	16,0
Domestic accident	4	16,0
Assault	7	28,0
Non-traumatic	6	24,0
Panaris / phlegmon	1	4,0
Total	25	100,0

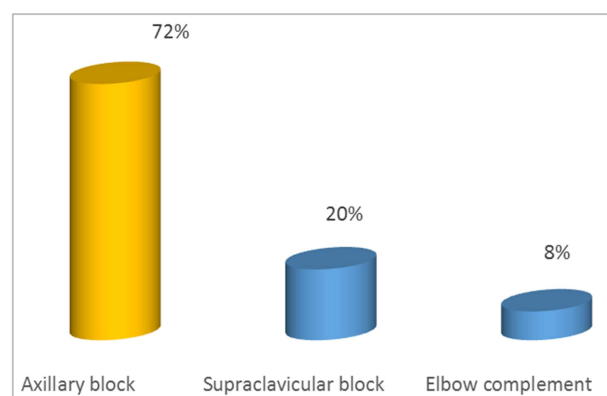
**Table 2.** Distribution by indication and surgical site.

Surgical indications	Workforce	Percentage
elbow	2	8,0
Debridement of abscesses	6	24,0
Forearm osteosynthesis	2	8,0
Osteosynthesis of the arm	2	8,0
Shoulder osteosynthesis	1	4,0
Hand osteosynthesis	3	12,0
Hand tendinoplasty	9	36,0
Total	25	100,0

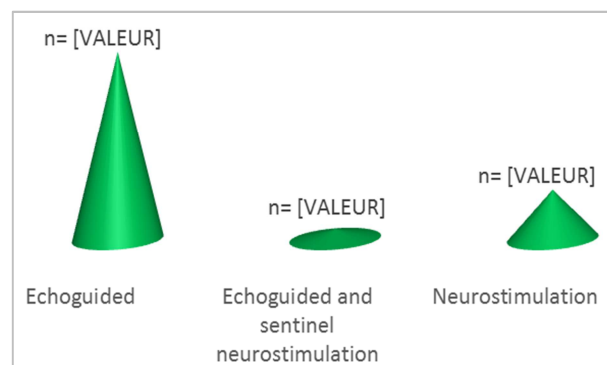
Depending on the surgical site and indication, the peripheral loco-regional anaesthesia techniques chosen were predominantly axillary in 72% of cases, followed by supra-

clavicular block in 20% of cases and 8% had an additional elbow block (figure 1). The predominant technique used was ultrasound guidance in 19 cases (76%), neurostimulation alone in 5 cases (20%), and ultrasound guidance coupled with neurostimulation in 1 case (figure 2). 48% of our patients had been premedicated with hypnovel 2 mg combined with 25 µg fentanyl before the nerve block was performed.

The combination of bupivacaine 0.5% and lidocaine 2% was used in 88% of cases and ropivacaine alone in 12% of cases. The average volume injected per plexus block was 21.38 ml with a standard deviation of 6.1 ml.



**Figure 1.** Type of nerve block performed.



**Figure 2.** Performing technique of nerve block.

We noted that the sensory and motor blocks were complete in 80% of cases and in 20% of cases, the installation of the sensory block was partial.

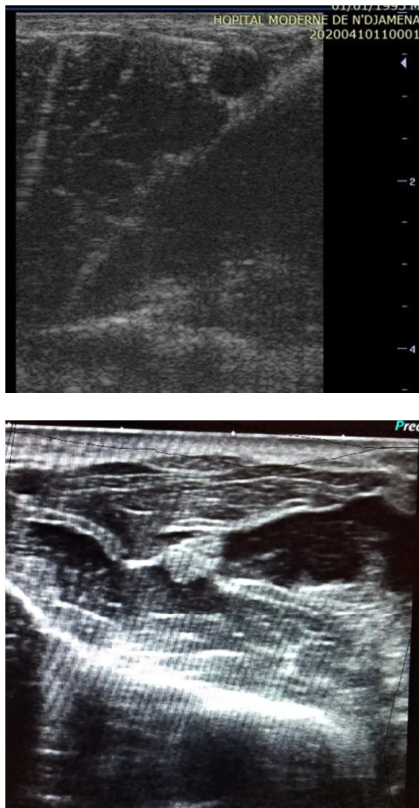
The average completion time was 7 minutes with a standard deviation of 3 and the average installation time was 8.76 minutes with a standard deviation of 4.

Postoperative analgesia was assessed at the second hour (H2), fourth hour (H2) and eighth hour postoperative (H8); the VAS (Visual Analogue Scale) was used for pain assessment as described in the following charts:

**Table 3.** VAS/EVA at H2.

H2	Workforce	Percentage
≤ 3	24	96,0
4 à 5	1	4,0
Total	25	100,0

So in table 2 we observe that 96% of our patients had a  $VAS \leq 3$



**Figure 3.** Echo-guided axillary block: Echo-guided median nerve block.

**Table 4.** VAS/EVA at H4.

H4	Workforce	Percentage
$\leq 3$	18	72,0
4 à 5	4	16,0
Not assessed	3	12,0
Total	25	100,0

At the 4th postoperative hour, the  $VAS \leq 3$  was the majority in 72% of cases and only 3 patients had not benefited from pain assessment, i.e. 12% of patients.

**Table 5.** VAS/EVA at H8.

H8	Workforce	Percentage
$\leq 3$	7	28,0
4 à 5	16	64,0
6 à 7	1	4,0
Not assessed	1	4,0
Total	25	100,0

At the 8th hour, only 1 patient had a VAS between 6 and 7.

The average duration of the sensory block was 252 minutes and ranged from 120 minutes to 420 minutes, with a standard deviation of 92. There were no incidents or accidents related to loco-regional anaesthesia.

## 4. Discussion

Fundamental to modern neural blockage is the concept that pain is a sensory warning transmitted by nerve fibres and is

subject to modulation or interruption anywhere in the nerve pathway [1, 2]. Peripheral nerve block as an anaesthetic technique plays an important role in loco-regional anaesthesia compared to general anaesthesia and confers excellent pain control and reduction of postoperative stay [2].

In our study, the average age was 33 years with extreme ages of 9 and 70 years and a sex ratio M/F=3.1 with only 8% ASA II; our age range is almost similar to other authors age ranging from 19 to 97 years with a sex ratio of 0.6. Unlike our sample, their population was predominantly female [3] and an adult age above 18 years [4].

The mechanisms were dominated by assaults (28%), followed by traumatic causes such as traffic and road accidents in 32% of cases (see Table 1); the surgical indications (Table 2) were mainly located in the hand in 48% of cases.

Several factors and determinants for the choice of the block to be performed - which depend on the lesion location, the history and morphology of the patient - among others, can also influence the choice of the technique. For example, for a morbidly obese patient, an axillary block may be preferred to an infraclavicular block as it is more superficial. Patients with severe lung disease should be carefully evaluated, for phrenic nerve block, a side effect of interscalene and supraclavicular blocks, may precipitate respiratory failure in these patients [5]. The factors determining the nerve territories anaesthetised are a major consideration when choosing a neural block technique [5]; as well as the technical difficulty and/or experience of the practitioner, and finally the benefit/risks ratio of the procedure under consideration [6].

Axillary block predominated in our study, i.e. 72% of cases, followed by supra-clavicular block in 20% of cases and 8% had a complement of elbow block (figure 1) so the initial sensory block was partially installed. The echo-guidance technique in 76%, neurostimulation in 20% and echo-guidance coupled with neurostimulation for 1 case (i.e. 4%) (figure 2); in other series echo-guided supraclavicular block and neurostimulation [4] and the failure rate of the block was similar, 8% in our series vs. 5.1%, up to 12.5% [4] and a success rate of 94.9% in their series vs. 76% in our series. Neurostimulation is still used in our hospital, due to the non-permanent availability of ultrasound in the operating room. Nevertheless, both techniques still exist with a clear trend towards ultrasound guidance; in 2012, in a panel of 247 anaesthetists in France, 16% of peripheral LRAs were performed using neurostimulation guidance alone. For the remaining peripheral LRAs (84%), 40% benefited from ultrasound guidance alone, and 60% from a combination of both guidance methods neurostimulation and ultrasound guidance [7].

48% of our patients had been premedicated with hypnovel 2 mg combined with 25  $\mu$ g fentanyl, compared with 94% in another study [8]. However, their population was mainly children, unlike our study population, concerning adult; our premedication protocol is similar to the study [9] in terms of the molecules used; other authors had used the same products

plus adrenaline 1: 200,000 [4].

Adjuvants such as tramadol, dexmedetomidine, magnesium, opioids, adrenaline and naloxone have not been shown to be effective and the benefit-risk balance is unfavourable; the use of adrenaline can be considered for the test dose [10]. The analgesic properties of clonidine as an adjuvant, administered intrathecally or epidurally, have been demonstrated; but the benefit of its addition to local anaesthetics for peripheral nerve blocks is less clear, although it is widely accepted that clonidine improves the quality and duration of a block [11].

Our patients who received premedication did not feel any pain during needle punctures when the block was performed; this low rate of premedication in our sample explains the absence of a standardised protocol in our centre for performing LRA. For premedication, the most used combination is hypnovel between 1 to 2 mg and sufenta 5 µg which gives good analgesia during the block [12]. The non-use of sufenta in our series, whose advantage in loco-regional anaesthesia no longer needs to be demonstrated, is due to the non-permanent availability in our hospital.

The average completion time was 7 min with a standard deviation of 3.68 min and 20 min and the average installation time was 8.76 min with a standard deviation of 4.45 min; in other studies, the average installation time was 13 and 17.5 min [9] and it was 11.57 min and 21.73 min respectively by ultrasound and neurostimulation [4] for the same products used separately. Our shorter installation time would be related to the synergy of action of the products.

The use of ultrasound is currently undeniable in the performance of nerve blocks; its advantage is no longer in doubt. In our series, the ultrasound-guided technique was predominant in 76% of cases; its advantage is irrefutable nowadays as demonstrated in other series. Thus, it also reduces the risk of intravascular injection and damage to the surrounding tissues [3]; the use of ultrasound would have made it possible to have a target zone sparing intra-neuronal injection and other complications such as pneumothorax [13]; but also numerous advantages, in particular the reduction in the time taken to carry out the procedure compared to neurostimulation [4].

The duration of effective analgesia depends on the type of product, the volume and concentration of the local anaesthetic injected, and other patient factors such as diabetic neuropathy, and rarely lasts longer than 16 hours [14]. In our series, postoperative analgesia was satisfactory: 28% of patients had no pain, 64% had only moderate pain and only 4% had pain considered severe, i.e. 1 patient (see chart 5); the average duration of the sensory block was 252 minutes and ranged from 120 minutes to 420 minutes, with a standard deviation of 92 and was 172.8 minutes, going up to 546.4 minutes for some authors [9].

The complications of peripheral loco-regional anaesthesia are numerous: the most frequently cited in the studied literatures are: haematoma, arterial dissection, peripheral neuropathy, pneumothorax, paraesthesia of the hemidiaphragm; accidental intravascular administration leading to

a risk of convulsion or ventricular rhythm disorder and risk of cardiac arrest. In relation to the number of procedures, serious complications are rare; identifying the anatomical structures to be avoided theoretically reduces the risk of occurring complications [15]. In our study, we did not note any side effects linked to the technique; other studies have not noted any side effects in their series [4, 8, 9], which reassures and encourages this practice.

## 5. Conclusion

Through this observational study, despite the small size of our sample, the practice of loco-regional anaesthesia has many advantages for both the patients and the practitioners and we were in accordance with several authors. Loco-regional anaesthesia provides long-lasting postoperative analgesia. This remains a real comfort for the patients and the technique under ultrasound guidance should be encouraged because its advantages are undeniable and it could avoid many side effects related to the injection. A prospective study with a more exhaustive population in the future will reinforce this study and this could lead to the establishment of a protocol for loco-regional anaesthesia in our hospital and could encourage other practitioners to use this technique frequently for thoracic limb surgery.

## Acknowledgements

To all the staff of the operating room, the intensive care unit and the surgical department of the University Hospital La Renaissance. My thanks also to Ndiaye Diabe.

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