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Master thesis | Original study

Implementation of the fascia iliaca block in the emergency department for patients with hip fractures

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Abstract

Background: **Hip fractures are a common pathology with high morbidity and mortality. Proper pain management is a challenge in this elderly population. Evidence suggests benefit of the use of a fascia iliaca block (FIB) in the emergency setting.**
Objectives: **The aim is to develop, implement and evaluate a protocol for the application of FIB in the emergency department for patients with hip fractures at the University Hospital of Antwerp. Additionally, a survey was conducted on analgesia policies for hip fractures in hospitals in Flanders.**
Methods: **A protocol was created for the implementation of FIB in the emergency department. Training was provided for anesthesiologists and emergency nurses on ultrasound-guided supra-inguinal FIB. To evaluate the implementation of the protocol an observational cohort study was conducted. A survey was created on the use and protocols of pain management for hip fractures. It was emailed to all hospitals in Flanders.**
Results: **From 01/06/2022 to 31/01/2023, 46 patients were included. FIB was not applied in 36.9% of these patients. There were no significant differences in age, BMI, and gender between the groups with or without FIB ($p>0.05$). No toxicities were registered. There were no significant differences in pain scores upon admission or after intervention between the groups with and without FIB ($p=0.5$). The median number of points the pain score decreased was 1.5 points in both groups, with no significant difference ($p=0.4$). The survey revealed that locoregional techniques are used in about two-thirds of cases of hip fractures, with various techniques applied. They are usually performed by an anesthesiologist.**
Conclusions: **The protocol was usually correctly applied, an audit could identify areas for improvement of its application. The safety of the technique was confirmed. Further investigation is needed to provide evidence for the benefit of the application of an FIB in the emergency department in this population.**

Keywords: **Hip fractures, proximal femoral fractures, fascia iliaca block, nerve block.**

Introduction

Hip fractures are a common pathology in the emergency department, primarily in an older patient population. These patients typically have significant co-morbidities and existing cognitive limitations. Data from 30 centers in Flanders and the Netherlands from 2019 showed an average age at admission of 83 years, with 35.2% of patients having significant co-morbidities (ASA III or higher). Unfortunately, ASA status was unknown in 33% of patients[1]. Hip fractures are associated with high mortality and morbidity, with 20-25% of patients dying within one year[1-3]. Delirium occurs in a quarter of patients and is associated with increased one-year mortality. Risk factors for delirium include age, cognitive impairment, and morphine use[4]. One of the main complaints of patients with hip fractures is severe pain. Inadequate pain management is associated with atelectasis, increased risk of pneumonia, and delirium. Prompt and adequate treatment is therefore essential. However, pain management is challenging in this elderly population due to physiological changes and

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co-morbidities. Monotherapy with paracetamol is inadequate, NSAIDs are often contraindicated, and opioids are associated with side effects such as decreased consciousness, respiratory depression, and nausea. The most effective treatment for pain is surgical reduction, but this is not always possible within 48 hours, making the prompt provision of effective pain relief necessary[4,7-9].

Locoregional anesthesia with peripheral nerve blockade has now become a standard part of postoperative multimodal pain management for orthopedic procedures. However, a fascia iliaca block (FIB), also named fascia iliaca compartment block (FICB), is increasingly being used successfully in emergency departments for patients with hip fractures. This technique has already been included in various guidelines regarding pain management and/or hip fracture management[4,7-11]. Different peripheral nerve blocks (femoral block or FIB) are described in these guidelines, as are different techniques for the FIB (landmark infrainguinal technique, ultrasound-guided infrainguinal technique, ultrasound-guided suprainguinal technique, single shot vs. continuous block). No block or technique was found to be superior to another[4,11,15]. However, ultrasound-guided techniques are described to increase the chance of success and reliable analgesia while reducing the risk of complications such as intravascular injection[4,11,15]. It has already been shown that the FIB is at least equivalent to conventional analgesia (paracetamol/NSAIDs/opioids) and may even be superior in reducing pain scores. In addition, there is certainly an additive effect with conventional analgesia[4,6,11-14,16-18]. A positive effect is seen on the time to postoperative mobilization and the cost of analgesia. Furthermore, a reduction in the use of opioids is observed. A reduced risk of pneumonia has also been observed. However, the results regarding a reduced risk of delirium are not yet clear[4,6,10,12,16,18,19]. The fascia iliaca block is considered very safe, with very rare occurrence of side effects. A rare but very important side effect is the occurrence of local anesthetic systemic toxicity (LAST)[4,15,21]. Therefore it is a safe technique that can be learned with a steep learning curve by (young) doctors[5,7,13,15,20,22-24].

Despite increasing evidence of the benefits of the fascia iliaca block, its application in emergency patients with hip fractures is not yet standard of care. Retrospective data from 2019 showed that none of the included patients in our hospital received pre-operative locoregional anesthesia1. The main determining factor appears to be the lack of trained personnel[9,22-24]. Additionally, the Belgian Association for Regional Anesthesia (BARA) recently recommended that peripheral nerve blocks should only be performed by recognized anesthesiologists, who are not always available in the emergency department. The presence of a clear protocol and trained physicians can positively influence the implementation of this already proven useful technique[3].

Objectives

The objectives of this master's thesis are three-fold:

1. To develop a protocol for the application of a fascia iliaca block in emergency department patients

It is important to take all factors into account when developing this protocol. The protocol should contain objective criteria for the indication of the FIB. In addition, a uniform procedure should be described in detail. Lastly, the protocol should include a pathway for continuity of care with correct contact information for the responsible anesthesiologist to be easily reachable. The necessary safety measures and required equipment as per the BARA guidelines for the safe administration of peripheral nerve blocks should be described[21]. Additionally, it should be assessed which equipment is currently available and what changes or additions are needed to safely apply a fascia iliaca block in the emergency department of the UZA.

2. Evaluation of the implementation of the fascia iliaca block

After providing a protocol, the implementation of this protocol in the emergency department can begin. The success of the implementation should be evaluated, with any areas for improvement or adjustments to the protocol identified, in order to improve its application. Additionally, the effect of the fascia iliaca block on pain and other symptoms in this population can be examined.

3. Survey of hospitals in Flanders

To support our protocol and data, a survey was conducted to assess the practices and protocols regarding analgesia for hip fractures in other hospitals in Flanders.

Methodology

This will be divided into three parts:

1. Developing a protocol for the application of a fascia iliaca block in emergency department patients

To achieve this objective, a task-force was established, consisting of representatives from the relevant disciplines (anesthesia, emergency

medicine). They worked together to develop a practical protocol for providing a FIB in patients with hip fractures in the emergency department by an anesthesiologist or a resident under supervision of the former. The protocol clearly specifies the patient population, indications and contraindications. It also clearly specifies who will perform the procedure and the materials needed to perform the block and provides a standardized approach to how the procedure will be performed (including a time-out with checks, materials, technique, amount and nature of the local anesthetic, provision of monitoring and follow-up). Additionally, it specifies where Intralipid is available and provides guidance for its use. Finally, the protocol includes a flowchart for continuity of care with relevant phone numbers.
Before implementation of the protocol can begin, it was also determined which resources are already available in the emergency department and which resources still need to be provided for proper execution of this protocol. In the electronic patient record (EPR), an electronic request for the application of the block was made available. A standard template for reporting the procedure was also provided for uniform registration.

Additionally, the working group will focus on training fellow physicians and nurses on how to safely perform the procedure. Since the procedure would be performed by anesthesiologists or residents in anesthesiology under supervision of the former, it was decided to teach all anesthesiology staff (attending physicians and residents) an ultrasound-guided suprainguinal technique for the fascia iliaca block. Theoretical background was provided in the form of videos available on YouTube, which were sent via email to all relevant physicians. A group session with ultrasound training and training on phantoms was held, followed by hands-on 1-on-1 teaching during patient contact by experienced anesthesiology staff already familiar with the FIB technique. So they would be able to assist in the protocol and the procedure, a presentation was provided with theoretical background and practical information on the protocol for the nursing and emergency department staff. This presentation was provided with audio for clarification. It was sent via email and was also orally explained in four sessions on the department to answer any questions and address any uncertainties.

Finally, two flowcharts with a shortened version of the protocol were developed and distributed to the relevant departments (Figure 1 and 2), and the complete protocol was added to the hospital's central protocol database.

2. Evaluation of implementation of the fascia iliaca block

To evaluate the implementation of the protocol, a single-center observational cohort study was set up. This single-center study is reported according to the 'Strengthening The Reporting of Observational Studies in Epidemiology' (STROBE) statement.

Approval was obtained from the ethical committee of the UZA. Chairman Prof. dr. Peter Michielsen.

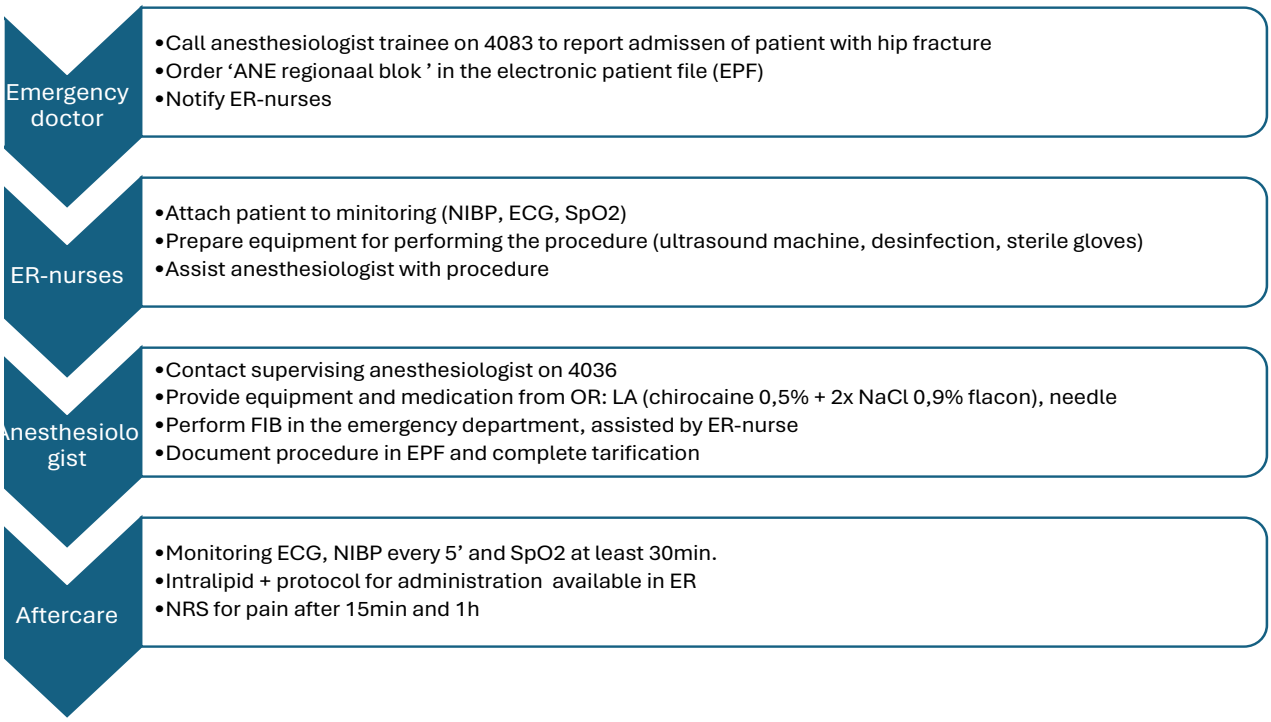

Fig. 1 — Flowchart - Patient with hip fracture; no immediate operation (< 2h after diagnosis).

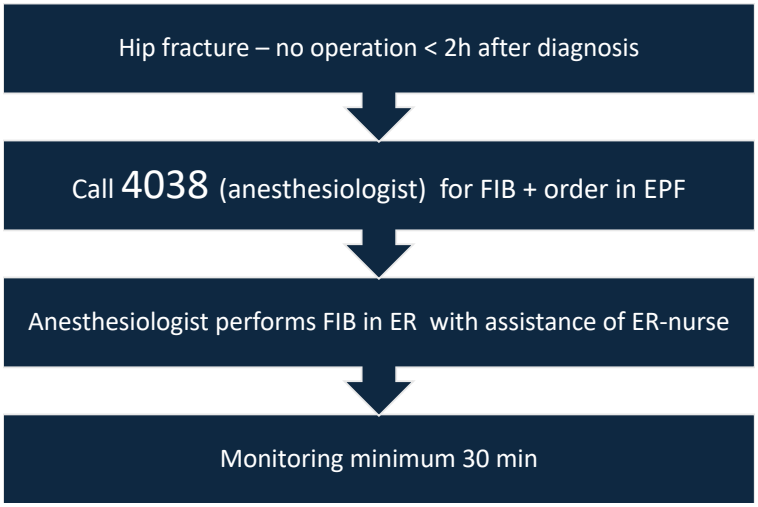

Fig. 2 — Flowchart - short.

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From the implementation of the protocol on 01/06/2022 until 31/01/2023, all patients with hip fractures at the University Hospital Antwerp(UZA) were registered in a database. The following data were collected: age, gender, BMI, administered pain medication, date of admission, date of surgery, date of application of the FIB, and pain scores at admission, after administration of systemic pain medication, and after application of the FIB. If no pain score was registered at admission, the time to the first registration was recorded. Pain scores were registered using the numeric rating scale (NRS) for pain.

Standard pain management in the hospital consists of paracetamol, tramadol and morphine. Paracetamol 1 g is administered four times daily (or with a maximum dose of 60mg/kg/day), if pain score remains > 3 after this, tramadol 100mg can be administered, if there is not enough pain relief with this combination morphine 5mg subcutaneous can be added.

As a supraregional trauma-centre, UZA has a specific procedure regarding major trauma cases. All cases that were admitted through the major trauma procedure were excluded.

When no FIB was applied, the reason for this was also recorded if it could be determined.

Lastly, cases of local anesthetic systemic toxicity (LAST) were recorded.

These data were first analyzed descriptively. Given that we observed that a significant proportion of patients did not receive the block, it was decided to compare the patient groups with (group 1) and without (group 0) the block. Statistical analysis was performed using IBM SPSS (SPSS, Chicago, Illinois, USA). Continuous variables will be reported as means ± SD; non-continuous variables as n (%) or median with quartiles. For variables assumed to be normally distributed in the population (age, BMI), an independent samples T-test was used. For non-normally distributed or non-parametric values, a Mann-Whitney U test was used. A p-value less than 0.05 was considered statistically significant. Categorical variables were compared using the chi-square test.

Finally, the type of systemic pain medication and whether or not a block was applied depending on it was analyzed. The systemic pain medication was divided into four groups: no pain medication, only paracetamol, paracetamol with NSAID or tramadol or strong opioids or ketamine. This data was compared using a chi-square test.

3. Survey of hospitals in Flanders

The same working group developed a survey that examines the practices and protocols regarding pain management in hip fractures. This survey was sent via email to all heads of anesthesia and emergency medicine departments of all hospitals in Flanders. For hospital networks (such as GZA, ZNA), all campuses with emergency departments were contacted. The survey was first sent out in July 2022. To obtain a higher response rate, a reminder was sent in January 2023 and one in February 2023.

Results

1. Developing a protocol for the application of a fascia iliaca block in emergency department patients

From January 2022, the training of physicians in the anesthesiology department (staff members and resident physicians) was initiated as described in the methodology of this study.

In May 2022, a practical protocol was established. The full protocol can be found on the last page of this article. Three physicians worked together in

developing the final protocol, which included a staff member from the anesthesiology department, a resident physician in anesthesiology, and a staff member from the emergency medicine department. To clarify and provide visual support, a flowchart was created and distributed via email to all physicians and nurses in the relevant departments (emergency and anesthesiology).

Also in May 2022, an extensive presentation was sent to all involved physicians and nurses for further explanation, followed by four oral sessions for clarification. The protocol was implemented in the University Hospital Antwerp starting from 01/06/2022.

2. Evaluation of implementation of the fascia iliaca block

In the period from 01/06/2022 to 31/01/2023, 53 patients with a hip fracture were registered. Seven patients were excluded because they were admitted through major trauma service. Thus, 46 patients met the inclusion criteria.

Patient characteristics

In 17 out of 46 patients (36.9%), no FIB was applied in the emergency department. In the majority of cases, 13 patients, this was because the attending anesthesiologist was not contacted by the treating physician in the emergency department or the patient was transferred directly to the nursing unit. In 2 cases, the decision was made not to apply FIB due to low pain scores in combination with therapeutic anticoagulants. In the remaining 2 cases, no note was found explaining why the decision was made not to apply FIB. The demographic data are shown in Table I.

Table I. — Demographic data.

	Group 0	Group 1	P
Age (years)	80(13)	80(10)	0,4
BMI	24(4)	24(5)	0,6
men/women	5/12	10/19	46
Group 0 = no fascia iliaca block, Group 1 = fascia iliaca block. Data are presented as mean (SD). P<0.05 = significant.			

No cases of local anesthetic systemic toxicity (LAST) were registered in this cohort.

Pain scores

NRS for pain upon admission is shown in Figure 3. NRS for pain after FIB or systemic pain medication is shown in Figure 4. Reduction in the NRS for pain is shown in Figure 5.

The median NRS upon admission was 6 in both groups (P=0.5), with higher maximum scores for the fascia iliaca block group. In 17 patients (36.9%) no NRS for pain upon admission was recorded. The first NRS was noted several hours after admission in these cases, after administration of systemic pain management and/or application of FIB. The first notation of a pain score varies greatly here: from more than 4 hours after admission to more than 24 hours after admission or postoperatively.

In 14 (30.4%) patients, the pain score was not checked after administration of systemic pain management. In 3 (6.5%) patients, no control NRS was recorded after application of an FIB. Only in 8 (17.4%) cases was a pain score correctly recorded upon admission, after administration of systemic pain management, and after application of FIB. Also, in 6 (13.0%) patients who did not receive FIB, a pain score was recorded upon admission and after administration of systemic pain management.

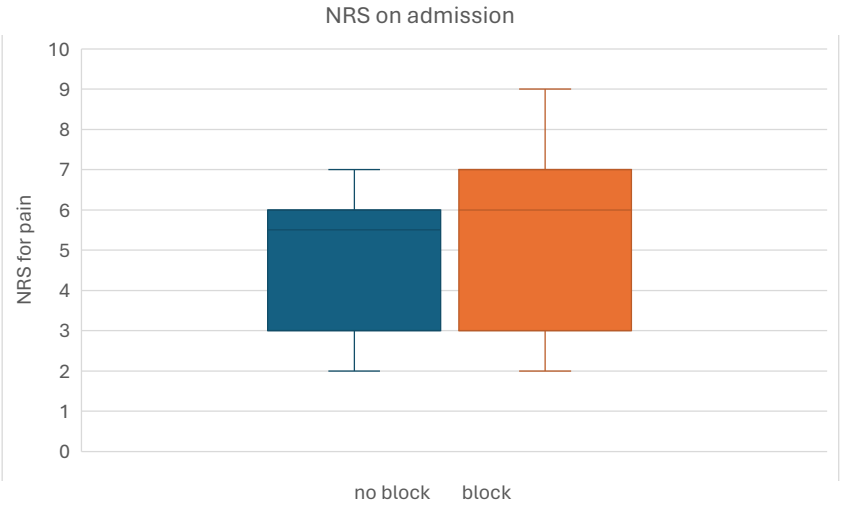

Fig. 3 — NRS score for pain upon admission.
Box plots of NRS scores on admission in the emergency department.
Box shows median with quartiles. Whiskers show minimum and maximum. Dots show outliers.
No block = patients didn't receive fascia iliaca block.
Block = patients received fascia iliaca block.

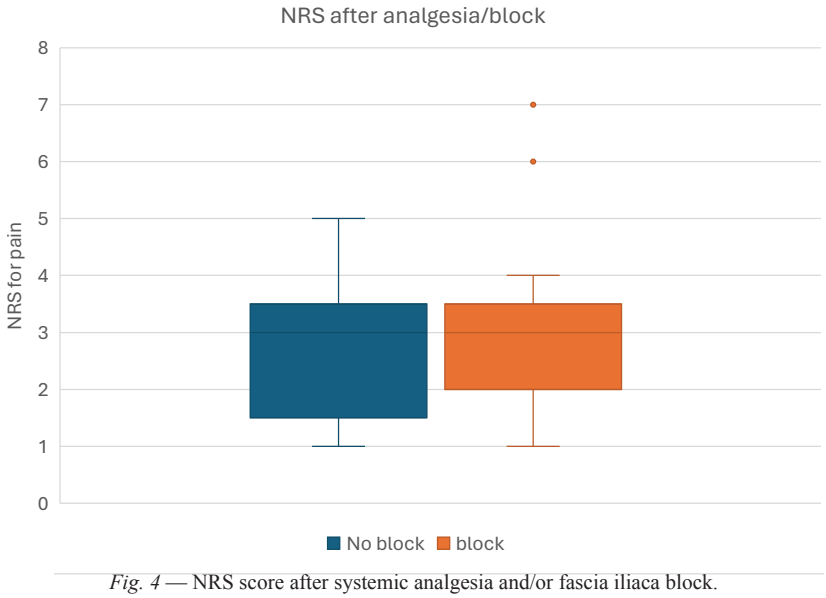

Fig. 4 — NRS score after systemic analgesia and/or fascia iliaca block.
Box plots of NRS scores after systemic analgesia and/or fascia iliaca block
Box shows median with quartiles. Whiskers show minimum and maximum. Dots show outliers.
No block = patients didn't receive fascia iliaca block, only systemic analgesia.
Block = patients received fascia iliaca block.

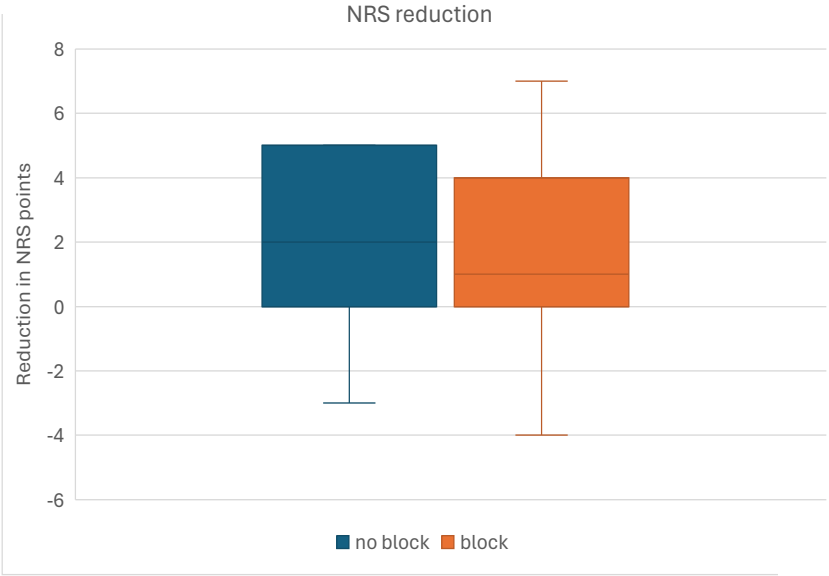

Fig. 5 — NRS score reduction.
Box plots of NRS score reduction after systemic analgesia and/or fascia iliaca block.
Box shows median with quartiles. Whiskers show minimum and maximum. Dots show outliers.
No block = patients didn't receive fascia iliaca block, only systemic analgesia.
Block = patients received fascia iliaca block.

Therefore, we can conclude that pain score registration was adequate in 14 (30.4%) patients.
The median NRS for pain after FIB or systemic pain management is 3 in both groups (P=0.5). The pain score after FIB was always recorded within 12 hours after its application and before surgery (Figure 4).

When we look at the number of points that the NRS for pain drops after systemic pain management or after application of FIB (Figure 5), we see a median difference of 1.5 points with no significant difference between both groups (P=0.4). There is, however, greater variability in the number of dropped points in patients with FIB.

Application of FIB and systemic pain relief

The administration of analgesics is presented in Table II. It appears that the FIB group had proportionally more patients who received a combination of painkillers or strong opioids. However, these differences were not statistically significant (p=0.3).

3. Survey of hospitals in Flanders

Responses to the survey were received from 46 out of 56 hospitals or hospital campuses in Flanders, resulting in a response rate of 82%. In the majority of cases, the survey was completed by an anesthesiologist (87%), and most of these

physicians had more than 10 years of experience (72%). Only about a quarter of respondents worked in a recognized trauma center.

Just under half of the centers have a specific protocol for pain management (47.8%) in hip fractures, and in about one-third of cases, there is a general pain protocol (30%). Twenty percent of hospitals do not have a general pain protocol.

In two-thirds of cases, locoregional techniques are used for pain management in hip fractures (pre-, peri-, or postoperatively). These techniques involve various methods, the most commonly used being the supra-inguinal fascia iliaca block (Figure 6). Almost all cases are performed under ultrasound guidance (97%). In the vast majority of cases, the technique is carried out by an anesthesiologist (81.8%). There is great variety in the choice of type of local anesthetic, its concentration and the volume used to perform the procedure (Figure 7 and 8). These locoregional anesthesia techniques are used in various locations throughout the hospital (Figure 9).

Table II. — Administered analgesics.

		0	1	2	3	Totaal
Block	None	2	8	6	1	17
	FIB	3	7	13	6	29
Totaal		5	15	19	7	46

0 = no pain relief; group 1 = paracetamol; group 2 = paracetamol+NSAID and/or tramadol; group 3 = strong opioids and/or ketamine. FIB = fascia iliaca block.
Both groups were comparable in terms of administered analgesics.

Surgical intervention is intended in 80% of cases within 12-48 hours after admission. The preferred technique for intraoperative anesthesia during surgical intervention is a spinal anesthesia in slightly more than half of the cases (58.1%).

Discussion and Limitations

After the implementation of our protocol, FIB was not applied in approximately one third (34.1%) of the patients who presented to the emergency department with a hip fracture. In the majority of these cases,

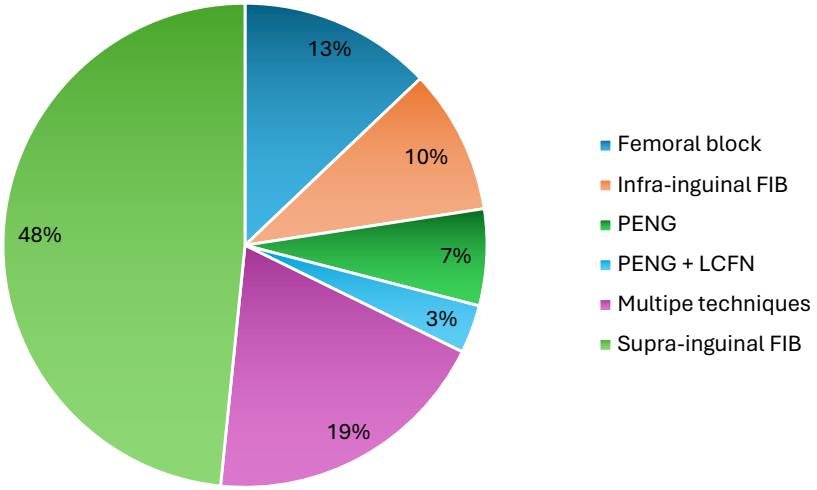

Fig. 6 — Locoregional techniques.
Which locoregional techniques are used in your hospital?

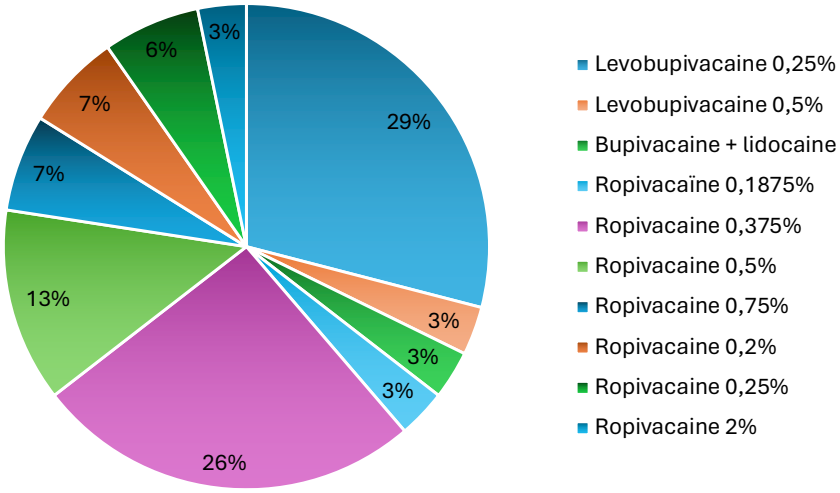

Fig. 7 — Type of local anesthetic.
Which type of local anesthetic and concentration is used for the locoregional technique?

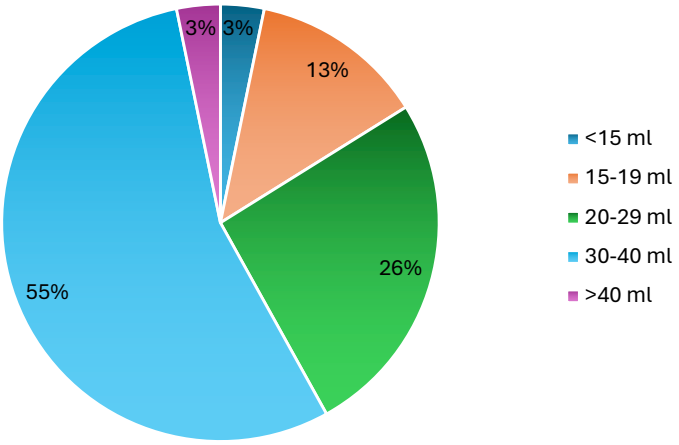

Fig. 8 — Amount of local anesthetic.

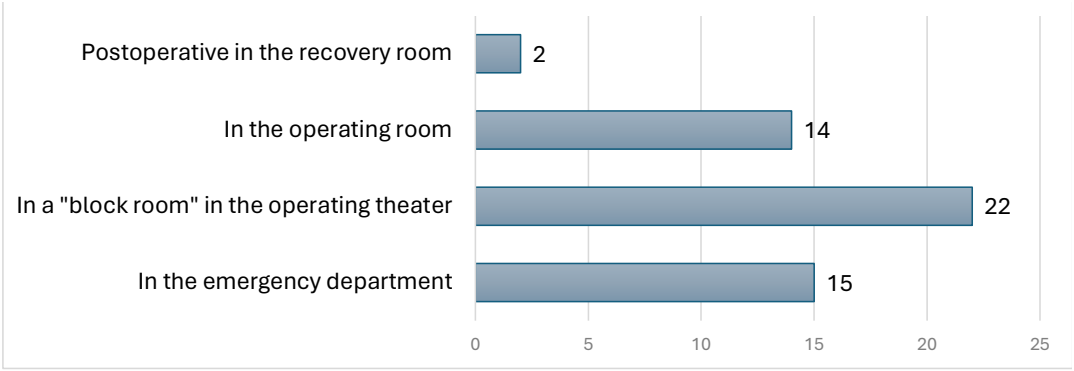

Fig. 9 — Location.

the protocol was not followed correctly, and the attending anesthesiologist was not called by the treating emergency physician. The reason for this was only documented in one case, which was the use of oral anticoagulants. In all other cases, no reason was documented.

As research has shown, implementing a protocol is not always easy, and guidelines are often not followed in daily clinical practice[25]. A possible improvement strategy is to conduct an audit in the form of a survey among colleagues in the relevant departments to investigate possible barriers and identify factors that can be addressed. In this regard personal (related to the knowledge and attitude of the physician), guideline-related, and external factors have been described in the literature[25]. From those, strategies can be developed to improve implementation. It appears to be of great importance to have good dissemination and visibility of the protocol in the relevant departments, with regular refreshing or repetition of it[25,26]. This can be done, for example, through educational meetings or e-learnings or posters in the department[25,26]. In addition, attention can be paid to informing and educating the staff (physicians and nurses) about the usefulness of such a protocol and its application, and space can be provided for teaching an revising the necessary skills[25]. Based on such audit, the protocol can be adjusted to make it more practical[25].

The median pain scores upon admission do not differ between both groups. However, we do see some patients with clearly higher scores upon admission in the group that received a FIB.

A caveat here is that the pain score upon admission was not recorded for 41.5% of the patients. The first NRS for pain was often noted hours after the first patient contact, with a very large variation in this time. Often after the administration of systemic pain relief, after the application of the FIB, and in some cases even postoperatively.

We can only state that pain scores were adequately recorded in about one-third of the patients (34.1%). This means both upon admission and after the administration of systemic pain relief and/or application of the FIB. Here again, we can note that the timing of pain score recordings after an intervention is highly variable, ranging from shortly after an intervention (<1 hour after administration of pain relief or application of the FIB) to several hours after.

Furthermore, we observe no difference in the NRS for pain in patients after the application of the FIB compared to those after only the administration of systemic pain relief. However, this result is also not statistically significant.

We see no difference in the decrease in these NRS scores after the administration of systemic pain relief compared to the decrease in NRS scores after the application of the FIB.

There may be multiple explanations for not finding differences between these groups. Primarily, our study design was not intended for comparing these two groups. Therefore, we have a small cohort, and no statistically significant results were obtained. Additionally, in this small cohort, there were many missing data points where pain scores were not registered or were recorded in a highly variable manner. Secondly, there may be selection bias, as it was not recorded why some patients did not receive FIB even though the protocol prescribed it for all patients, which could affect correct analysis. Thirdly, the FIB was applied by a variety of anesthesiologists and residents in anesthesiology. This might contribute to a different experience level with the technique and since there is a learning curve for its application, this makes it possible that not every block is equally effective in providing analgesia.

The survey shows that there is little uniformity in the treatment of pain in hip fractures in our Flemish hospitals. It also appears that in a fairly large number, namely one-fifth, of our hospitals, there are no protocols for pain management. The literature shows that the presence of a protocol is essential for the systematic application of good pain relief. Despite its proven usefulness, as mentioned in the introduction of this thesis, no locoregional anesthesia or analgesia technique is applied in a significant proportion of cases. Furthermore, when these techniques are used, there is little uniformity in the choice of technique, dose, and type of local anesthetic used. It is also noteworthy that despite guidelines regarding safety and efficacy, some cases are still performed without ultrasound guidance.

Conclusion

Despite the protocol being correctly applied in the majority of cases, it appears that there is still room for better implementation in the University Hospital of Antwerp. A survey of the physicians in the relevant departments could reveal strategies for optimization. Currently, there is no benefit of applying FIB on pain scores in this center. This can be explained by the study design not being appropriate for conducting this comparison, resulting in a small cohort with many factors confounding the data, including non-uniform registration of pain scores.

Setting up a prospective study with consistent and correct registration of pain scores before and after interventions (systemic pain relief and application of FIB) could provide a solution for this.

As no cases of local anesthetic systemic toxicity were recorded, we can confirm that the safety of this technique is also confirmed in our center.

Looking at all hospitals in Flanders, there is little uniformity in the application of pain relief for hip fractures. We see that many colleagues apply the literature of proven benefit of locoregional techniques in hip fractures in their daily practice. However, these techniques are often applied only periprocedurally and not at the time of presentation in the emergency department. Additionally, it is striking that despite evidence in the literature for the usefulness of standardized protocols, in a large proportion of hospitals, there are no protocols available, and often even a general pain protocol is lacking. Here we can conclude that in this regard, the University Hospital Antwerp is doing relatively well compared to other Flemish hospitals.

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