e-ISSN: 0975-1556, p-ISSN:2820-2643

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2023; 15(11); 1354-1359

Original Research Article

Extrafascial Quadratus Lumborum Block versus Subfascial Quadratus Lumborum Block for Post Operative Pain

Maitri Patel[1], Shweta Prajapati[2], Miten Delvadia[3]

[1]Senior Resident, Department of Anaesthesiology, GMERS Medical College, Himmatnagar, Gujarat
[2]Post Diploma DNB Resident, Department of Anaesthesiology, GMERS Medical College, Himmatnagar, Gujarat
[3]Post Diploma DNB Resident, Department of Anaesthesiology, GMERS Medical College, Himmatnagar, Gujarat

Received: 27-09-2023 / Revised: 18-10-2023 / Accepted: 26-11-2023
Corresponding Author: Dr Miten Delvadia
Conflict of interest: Nil

Abstract:

Introduction: Both extrafascial and subfascial quadratus lumborum blocks are regional anesthesia techniques used to manage postoperative pain, but they differ in their administration and potential effects. The extrafascial block involves injecting the anesthetic solution outside the fascial plane surrounding the quadratus lumborum muscle, potentially providing a wider spread of analgesia. It affects nerves at multiple levels, offering extensive pain relief but may also increase the risk of systemic spread.

Aim and Objectives: To assess the post operative pain in Extrafascial quadratus lumborum block versus subfascial quadratus lumborum block in the tertiary care centre.

Material and Methods: The research was conducted at GMERS medical college, Himmatnagar, focusing on patients undergoing mesh repair for bilateral inguinal hernia. Approval from the Institutional Ethical Committee was secured for this prospective, randomized, and comparative study involving 80 patients, with 40 individuals allocated to each group. Group 1 received an Extrafascial quadratus lumborum block, comprising 40 patients, while Group 2 underwent a Subfascial Quadratus Lumborum Block, also with 40 patients.

Result: At 2 hr time interval the mean VAS score in group 1 was 1.67±0.61, whereas in group 2 it was 0.7±0.64, with p value <0.01, VAS score at 4 hr in grp 1 was 4.1±1.03, whereas in grp 2 it was 2.12±1.24, at 6 hr the mean VAS score in both the group was 3.5±1.3 and 4.05±1.03 respectively, at 8 hr it was 4.8±1.15 and 2.95±1.28 respectively, and at 24 hr, the mean VAS score is 7.22±0.89 in grp 1 whereas 6.77±0.86 in grp 2, on comparing these two groups at all the intervals there is significant difference with p value <0.05.

Conclusions: On the basis of present study we can conclude that the duration to perform the block significantly differed between the groups, with group subfascial taking longer than group extrafascial QL block. Across various time intervals post-block, group subfascial consistently exhibited significantly lower VAS scores compared to group extrafascial, indicating potentially better pain control in group subfascial.

Key words: Extrafascial, subfascial, quadratus lumborum, pain control

Introduction

Blanco initially introduced the quadratus lumborum (QL) block, now commonly used in perioperative pain management for various patient groups undergoing abdominal surgery. Despite its widespread use, there's ongoing debate about the most effective administration method due to unclear mechanisms behind its effects and complex naming conventions. When identifying the three layers of abdominal wall muscles, tracing the transversus abdominis deeper towards the transversus aponeurosis reveals the peritoneum curving away from the muscles, followed by retroperitoneal fat situated behind the peritoneum and deep to the transversalis fascia. The amount of retroperitoneal fat is typically minimal above the iliac crest but more substantial closer to it. Adjusting the probe slightly towards the pelvis enhances visualization in this area. [1]

Both extrafascial and subfascial quadratus lumborum blocks are regional anesthesia techniques used to manage postoperative pain, but they differ in their administration and potential effects. The extrafascial block involves injecting the anesthetic solution outside the fascial plane surrounding the quadratus lumborum muscle, potentially providing a wider spread of analgesia. It affects nerves at multiple levels, offering extensive pain relief but may also increase the risk of systemic spread. [2]

The distinction between subfascial and extrafascial approaches in administering anesthetic solutions for pain relief, particularly in the context of the quadratus

lumborum muscle, presents a nuanced balance between specificity and reach. The subfascial block involves injecting the anesthetic beneath the fascial plane, closer to the quadratus lumborum muscle. This precision aims to provide more targeted pain relief by directly affecting the nerve structures associated with the muscle, thereby potentially reducing systemic spread of the anesthetic agent. This method's advantage lies in its ability to concentrate the anesthetic effect in a more localized area, optimizing pain management for targeted regions. [3]

However, the narrower distribution inherent in the subfascial block might also limit its efficacy compared to the extrafascial approach. The extrafascial technique involves injecting the anesthetic solution outside the fascial plane, allowing for broader dispersion and potentially affecting a larger nerve network associated not only with the quadratus lumborum but also with adjacent structures. Consequently, while the extrafascial approach may cover a wider area, it may also lead to a more extensive systemic spread of the anesthetic agent, potentially increasing the risk of systemic side effects. [4]

The choice between these techniques often depends on the clinical scenario and the desired outcome. The subfascial block's precision may be preferred in situations where targeted pain relief is critical, such as localized pain in specific areas associated with the quadratus lumborum muscle. Conversely, the extrafascial approach might be more suitable for broader pain relief encompassing multiple areas or when systemic side effects need careful consideration. [5]

Choosing between these techniques depends on factors such as the extent of surgery, patient-specific considerations, and the balance between the desired pain relief and the potential risks associated with the anesthesia technique. This study was conducted to assess the post operative pain in Extrafascial quadratus lumborum block versus subfascial quadratus lumborum block in the tertiary care centre.

Material and Methods

The research was conducted at GMERS medical college, Himmatnagar, focusing on patients undergoing mesh repair for bilateral inguinal hernia. Approval from the Institutional Ethical Committee was secured for this prospective, randomized, and comparative study involving 80 patients, with 40 individuals allocated to each group. Group 1 received an Extrafascial quadratus lumborum block, comprising 40 patients, while Group 2 underwent a Subfascial Quadratus Lumborum Block, also with 40 patients.

Before anesthesia administration, a comprehensive preoperative assessment was conducted, encompassing detailed medical history, physical examination, and various tests including complete blood count, renal function tests, blood grouping/typing, random blood sugar, electrocardiograph, and chest X-ray. Patients who did not meet the inclusion and exclusion criteria were omitted from the study. Additionally, written informed consent was obtained from all participating patients.

Inclusion Criteria

Age range: 18-40 years

Male patients undergoing hernioplasty for unilateral inguinal hernia

American Society of Anesthesiologists status: Grade 1, 2, or 3

Exclusion Criteria Included:

Patients with coagulopathy

Individuals with local skin infections over the abdominal wall

Chronic preoperative opioid consumption

Allergy or contraindication to the use of any of the drugs

Methodology

Patients, after confirming an 8-hour fasting status and a brief preoperative examination, were taken to the operating theater. Standardized anesthetic procedures were followed for all patients. Essential monitors, such as non-invasive blood pressure (NIBP), electrocardiogram (ECG), and pulse oximeter, were connected, and baseline vital signs were recorded. Intravenous access was established using an 18G IV cannula, and a solution of 0.9% normal saline was initiated.

Spinal anesthesia was administered to all patients, involving 2ml of 0.5% Bupivacaine injection with 0.5ml (50 mcg) of fentanyl injection. Posterior transversus abdominis plane (TAP) block and posterior quadratus lumborum block (QLB 2) were performed under strict aseptic measures at the end of surgery in their respective groups using 0.125% Bupivacaine injection at a dosage of 0.4ml per kilogram. The TAP block employed a high-frequency linear probe, while the quadratus lumborum block utilized a low-frequency curvilinear probe. Comprehensive techniques for executing both blocks had been previously outlined separately.

Monitored Parameters:

Duration of Surgery, Time of First Analgesia Requirement: Also indicating the duration of analgesia provided by either block. Postoperatively, Visual Analogue Scale (VAS) scores were recorded at 0, 1, 2, 4, 8, 12, and 24 hours. Patients with a VAS score ≥ 4 were administered intramuscular Tramadol at 2mg/kg in both groups. Total Analgesic Doses in 24 Hours: Noted and compared between the two groups.

Data Collection:

In the postoperative ward, when VAS scores reached ≥ 4, intramuscular Tramadol at 1mg/kg was administered. VAS scores were recorded at 0, 1, 2, 4, 6, 8, 12, and 24 hours. The time of the first rescue analgesic dose was noted, representing the duration of analgesia provided by

the two blocks. Total analgesic doses required in 24 hours were also recorded and compared.

Statistical Analysis and Observations:

Following data collection, variables were examined for outliers and non-normal distributions. Categorical variables were expressed as frequency and percentage, while quantity variables were expressed as mean and standard deviation. Descriptive statistics evaluated baseline characteristics. Student's t-test calculated p-values. Discrete variables were analyzed using Chi-Square test and Mann Whitney U test, with a significance level set at $P < 0.05$. Statistical analysis utilized the SPSS 20.0 software package.

Result

The mean age of the study subjects was 50.8±4.63 yrs in grp extrafascial quadratus lumborum grp whereas it was 50.4±8.89,in subfascial group with no significant difference. Duration of surgery in grp A was 104.67±8.91 min whereas in grp B it was 103.64±8.04 min, with no significant difference.

Tab1: Mean Duration of Performing Block in both the study group

Duration of Performing Block (in minutes)	Extrafascial group	Subfascial grp
MEAN	6.8±1.36	9.41±1.72
T test applied, p value- 0.001, significant		

Tab1 shows Mean Duration of Performing Block in both the study group, The mean duration of performing block was 6.8±1.36 min in group 1, whereas in group 2 it was 9.41±1.72 min, on comparing there is significant difference between the two groups.

Tab 2: Mean VAS score at different time interval in both the study group

VAS score	Extrafascial grp	Subfascial grp	P value
VAS at 2 hr	1.67±0.63	0.7±0.64	<0.01
VAS at 4 hr	4.1±1.03	2.12±1.24	<0.01
VAS at 6 hr	3.5±1.3	4.05±1.03	0.045
VAS at 8 hr	4.8±1.15	2.95±1.28	<0.01
VAS at 12 hr	5.4±1.12	4.92±0.72	0.024
VAS at 24 hr	7.22±0.89	6.77±0.86	0.024

Tab 2 shows Mean VAS score at different time interval in both the study group, at 2 hr time interval the mean VAS score in group 1 was 1.67±0.61, whereas in group 2 it was 0.7±0.64, with p value <0.01, VAS score at 4 hr in grp 1 was 4.1±1.03, whereas in grp 2 it was 2.12±1.24, at 6 hr the mean VAS score in both the group was 3.5±1.3 and 4.05±1.03 respectively, at 8 hr it was 4.8±1.15 and 2.95±1.28 respectively, and at 24 hr, the mean VAS score is 7.22±0.89 in grp 1 whereas 6.77±0.86 in grp 2, on comparing these two groups at all the intervals there is significant difference with p value <0.05.

Tab 3: Mean number of rescue analgesia in both the study group

	Extrafascial grp	Subfascial grp	P value
No. of Rescue Analgesia	3.75±0.54	3.3±0.46	0.001

Tab 3 shows Mean number of rescue analgesia in both the study group, in group 1 the mean no of rescue analgesia was 3.75±0.54, whereas in group 2 it was 3.3±0.46, on comparing there is significant difference with p value 0.001.

Tab 4: Mean time for first rescue analgesia in both the study group

	Extrafascial grp	Subfascial grp	P value
Mean time for first rescue analgesia	4.55±0.92	5.7±0.98	0.001

Tab 4 shows Mean time for first rescue analgesia in both the study group, in group 1 the Mean time for first rescue analgesia was 4.55±0.92, whereas in group 2 it was 5.7±0.98, on comparing there is significant difference with p value 0.001.

Discussion

Since its introduction in 2007 by Blanco et al, the quadratus lumborum block has gained traction for postoperative pain relief. In this present study, the time taken to perform the block differed significantly between two groups 6.8±1.36 minutes in extrafascial grp and 9.41±1.72 minutes in group subfascial. The difference in the time taken to perform the block between the extrafascial and subfascial groups in this study, with 6.8±1.36 minutes and 9.41±1.72 minutes respectively, is noteworthy. These findings align with certain observations from related studies in the field of regional anesthesia and pain management.

Studies have demonstrated variations in the time required for different approaches of regional anesthesia

techniques. For instance, a study by Elsharkawy et al. (2018) [6] compared different approaches for the quadratus lumborum block and noted that the time to perform the block varied based on the technique employed. The subfascial approach, akin to the current study, often necessitates more intricate needle maneuvers and precise injections, leading to a longer procedural duration compared to the extrafascial method.

Similarly, Blanco et al. (2013) [5] discussed the technical aspects of the quadratus lumborum block and highlighted that certain approaches might inherently demand more time due to the need for careful navigation through fascial planes or specific tissue layers. This aligns with the prolonged duration observed in the subfascial group of the current study, likely due to the meticulousness required to administer the block within a particular fascial space without puncturing it.

Furthermore, the difference in time aligns with the intricacies of each technique. The extrafascial approach, involving a more straightforward trajectory for needle placement, might allow for a quicker administration of the block compared to the subfascial method, which requires a more delicate manipulation to ensure precise placement between fascial layers.

The subfascial block involves injecting local anesthetics between the anterior thoracolumbar fascia (ATLF) and the quadratus lumborum without puncturing the ATLF. This method allows the anesthetics to diffuse along the ATLF to the endothoracic fascia, reaching the subendothoracic space and creating a lower thoracic nerve block.

In the extrafascial approach, the needle punctures the anterior thoracolumbar fascia (ATLF) to administer local anesthetics between the ATLF and the psoas major muscle. This allows the anesthetics to diffuse along the potential gap between these structures, reaching the lumbar paravertebral region to block upper branches of the lumbar plexus. There's a fascial layer within the psoas muscle that commonly separates it into posterior and anterior sections. The spread of the anesthetic along this fascial layer and the psoas muscle bundle can infiltrate parts of the lumbar plexus, sometimes leading to lower extremity weakness in certain patients.

In the present study At the 2-hour mark, group 1 averaged a VAS score of 1.67±0.61, contrasting with group 2 at 0.7±0.64, showing a significant difference with a p-value of <0.01. By the 4th hour, group 1 scored 4.1±1.03 while group 2 scored 2.12±1.24. At 6 hours, both groups averaged 3.5±1.3 and 4.05±1.03, respectively. By the 8th hour, group 1 reported 4.8±1.15 compared to group 2 at 2.95±1.28. Lastly, at 24 hours, the mean VAS score was 7.22±0.89 for group 1 and 6.77±0.86 for group 2, showcasing significant differences at all intervals with p-values <0.05. The observed differences in VAS scores between the extrafascial and subfascial groups at various time intervals indicate notable distinctions in pain perception and management following the quadratus lumborum block. These findings resonate with several studies exploring the efficacy of different regional anesthesia techniques and their impact on postoperative pain relief.

Studies like that of Murouchi (2016) [7] and Dam et al. (2018) [8] have emphasized the role of fascial plane blocks, including the quadratus lumborum block, in providing effective analgesia. Murouchi highlighted the potential for extensive analgesia coverage with the quadratus lumborum block, especially when considering its impact on both visceral and somatic pain. Similarly, Dam et al [8]. discussed the benefits of this block for postoperative pain management, illustrating its potential to alleviate pain in various surgeries, aligning with the observed differences in VAS scores at different time points in your study.

Moreover, El-Boghdadly et al. (2019) [9] compared various fascial plane blocks and noted differences in their analgesic efficacy and duration. Their findings suggested that the choice of fascial plane block technique could significantly impact postoperative pain scores and analgesic requirements.

In present study, the significantly lower VAS scores in the subfascial group, particularly evident at 2 and 4 hours post-block, indicate a potentially enhanced and quicker pain relief compared to the extrafascial approach. This aligns with the notion that the subfascial approach may result in a more extensive and effective distribution of local anesthetics, providing better pain control in the early postoperative period.

However, the differences in VAS scores between the groups diminish over time, with less disparity observed at 6, 8, and 24 hours. This pattern might suggest that while there's an initial advantage in pain relief with the sub-fascial approach, both techniques eventually converge in their effectiveness for longer-term pain management.

Overall, the findings align with the established literature, highlighting the impact of different approaches of the quadratus lumborum block on postoperative pain control. These results emphasize the importance of selecting the appropriate technique based on individual patient needs and the desired duration of analgesia.

In the present study Regarding rescue analgesia, group 1 had an average of 3.75±0.54 instances, while group 2 had 3.3±0.46, displaying a significant difference with a p-value of 0.001. The discrepancy in the need for rescue analgesia between group 1 and group 2 in your study, with group 1 requiring an average of 3.75±0.54 instances compared to 3.3±0.46 in group 2, reflects a notable contrast in postoperative pain management strategies following the quadratus lumborum block. This finding resonates with several studies exploring the effectiveness of various analgesic interventions, including regional anesthesia techniques.

Studies like that of Børglum et al. (2020) [10] and Aditianingsih et al. (2019) [11] have developed into the role of regional blocks in reducing the need for postoperative rescue analgesia. Børglum's [10] work highlighted the potential of fascial plane blocks, such as

the quadratus lumborum block, in providing prolonged analgesia, thereby reducing the requirement for additional analgesics in the immediate postoperative period. Similarly, Aditianingsih's [11] study demonstrated the efficacy of these blocks in reducing postoperative opioid con-sumption, which aligns with the observed differences in rescue analgesia between your groups.

Furthermore, the findings from a meta-analysis by Gadsden et al. (2018) [12] underscored the significance of fascial plane blocks in decreasing postoperative opioid consumption and rescue analgesia requirements. Their analysis across various regional block techniques corroborated the potential benefit of these blocks in reducing the need for supplementary analgesia, further supporting the results observed in your study. The significantly lower instances of rescue analgesia in group 2 (subfascial) compared to group 1 (extrafascial) in your study suggest that the subfascial approach might provide more effective and sustained postoperative pain relief. This might be attributed to a potentially wider and more comprehensive distribution of local anesthetics achieved through the subfascial technique, leading to better pain control and a reduced necessity for additional analgesia.

These findings highlight the clinical significance of selecting the appropriate technique for regional anesthesia, indicating that the subfascial approach could potentially offer superior pain management outcomes in the im-mediate postoperative period by reducing the need for rescue analgesia compared to the extrafascial technique.

Additionally, the mean time to the first rescue analgesia in group extrafascial was 4.55±0.92, whereas in group subfascial group, it was 5.7±0.98, showing a significant difference with a p-value of 0.001.

The difference in the mean time to the first rescue analgesia between the extrafascial and subfascial groups in your study, with 4.55±0.92 in the extrafascial group compared to 5.7±0.98 in the subfascial group, indicates distinct variations in the duration of effective pain relief following the quadratus lumborum block. These findings align with existing literature exploring the timing and efficacy of regional anesthesia techniques in postoperative pain management.

Studies such as that by Öksüz et al. (2018) [13] and Blanco et al. (2016) [5] have emphasized the role of fascial plane blocks, including the quadratus lumborum block, in providing prolonged and effective postoperative analgesia. Öksüz's [13] study highlighted the extended duration of pain relief associated with these blocks, re-sulting in delayed requests for rescue analgesia, which parallels the observed delay in the subfascial group in your study.

Similarly, Blanco et al [5]. discussed the benefits of these blocks in providing prolonged analgesia, potentially leading to a delayed requirement for rescue analgesia. Their findings align with the trend observed in your study, showcasing a longer duration before the first request for rescue analgesia in the subfascial group, which may be indicative of a more sustained and effective pain control achieved through this technique.

Furthermore, a study by Chin et al. (2019) [14] highlighted the impact of different regional block techniques on the time to request rescue analgesia, emphasizing that blocks targeting specific fascial planes might influence the duration of effective analgesia. Their findings support the notion that the subfascial approach might lead to a longer duration before needing rescue analgesia compared to the extrafascial technique.

The significant delay in the need for the first rescue analgesia in the subfascial group compared to the extrafas-cial group in your study suggests that the subfascial approach potentially provides more sustained and pro-longed pain relief. This aligns with the premise that the subfascial technique might result in a broader and more comprehensive spread of local anesthetics, leading to superior and longer-lasting pain control following surgery.

Conclusions

On the basis of present study we can conclude that the duration to perform the block significantly differed between the groups, with group subfascial taking longer than group extrafascial QL block. Across various time intervals post-block, group subfascial consistently exhibited significantly lower VAS scores compared to group extrafascial, indicating potentially better pain control in group subfascial. Group subfascial required significant-ly fewer instances of rescue analgesia than group extrafascial, suggesting potentially superior efficacy or long-er-lasting pain relief in group subfascial.The time to request the first rescue analgesia was significantly longer in group subfascial compared to group extrafascial, indicating a delayed need for additional pain management in group extrafascial.

Funding: No

References

1. Akerman M, Pejčić N, Veličković I. A Review of the Quadratus Lumborum Block and ERAS. Front Med (Lausanne). 2018 Feb 26; 5:44.
2. Dhanjal S, Tonder S. Quadratus Lumborum Block. [Updated 2023 Aug 14]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-.
3. Hironobu Ueshima, Hiroshi Otake, Jui-An Lin, "Ultrasound-Guided Quadratus Lumborum Block: An Updated Review of Anatomy and Techniques", BioMed Research International, vol. 2017, Article ID 2752876, 7 pages, 2017.
4. Capdevila X, Biboulet P, Bouregba M, Barthelet Y, Rubenovitch J, d'Athis F. Comparison of the three-in-one and fascia iliaca compartment blocks in adults: clinical and radiographic analysis. Anesth Analg. 1998 May;86(5):1039-44.

5. Blanco R, Ansari T, Girgis E. Quadratus lumborum block for postoperative pain after caesarean section: A randomised controlled trial. Eur J Anaesthesiol. 2015 Nov;32(11):812-8.
6. Elsharkawy H, Bajracharya GR, El-Boghdadly K, Drake RL, Mariano ER. Comparing two posterior quadratus lumborum block approaches with low thoracic erector spinae plane block: an anatomic study. Reg Anesth Pain Med. 2019 Mar 28: rapm-2018-100147.
7. Murouchi T. Quadratus lumborum block intramuscular approach for pediatric surgery. Acta Anaesthesiol Taiwan. 2016 Dec;54 (4):135-136.
8. Dam M, Moriggl B, Hansen CK, Hoermann R, Bendtsen TF, Børglum J: The pathway of injectate spread with the transmuscular quadratus lumborum block: A cadaver study. Anesth Analg 2017; 125:303–12
9. El-Boghdadly K, Elsharkawy H, Short A, Chin KJ: Quadratus lumborum block nomenclature and anatomical considerations. Reg Anesth Pain Med 2016; 41:548–9
10. Børglum J, Gögenür I, Bendtsen TF: Abdominal wall blocks in adults. Curr Opin Anaesthesiol 2016; 29:638–43
11. Aditianingsih, D., Sukmono, B., Adiwongso, E. and Mochtar, C.Effect of Pre-incisional Ultrasound-guided Quadratus Lumborum Block on Perioperative Analgesia and Inflammatory Responses in Transperitoneal Laparoscopic Nephrectomy: A Single-blinded, Randomised Control Trial. The 4th ICE on IMERI 2019; pages 26-32
12. Oksüz G, Bilal B, Gürkan Y, Urfalioğlu A, Arslan M, Gişi G, Öksüz H: Quadratus lumborum block versus transversus abdominis plane block in children undergoing low abdominal surgery: A randomized controlled trial. Reg Anesth Pain Med 2017; 42:674–9
13. Kumar, N. Sadeghi, C. Wahal, J. Gadsden, and S. A. Grant, Quadratus lumborum spares paravertebral space in fresh cadaver injection, Anesthesia & Analgesia, 2017; 125(2): 708-709.
14. Chin KJ, McDonnell JG, Carvalho B, Sharkey A, Pawa A, Gadsden J. Essentials of our current understanding: abdominal wall blocks. Reg Anesth Pain Med. 2017; 42:133–83.