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ORIGINAL RESEARCH

Retrospective Comparison of Quadratus Lumborum and Pericapsular Nerve Group Blocks for Postoperative Pain Management of Patients Undergoing Outpatient Hip Arthroscopy

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Introduction: Hip arthroscopy is commonly performed as an outpatient procedure and effective postoperative pain management is important to provide quality patient care and enable timely discharge. Multiple regional nerve blocks have been described for pain relief after hip arthroscopy, but there is no consensus on the optimal technique. This retrospective investigation aimed to compare quadratus lumborum (QL) and pericapsular nerve group (PENG) blocks to determine if there are differences in analgesic outcomes after outpatient hip arthroscopy.

Methods: A total of 50 consecutive patients that received QL block and 50 that received PENG block for outpatient hip arthroscopy were identified and compared to determine if there were any differences in the primary outcome of total perioperative opioid consumption prior to discharge from the surgery center. Important secondary analgesic outcomes include postoperative opioid consumption, verbal rating scale (VRS) pain scores or total time in the recovery area. Summary statistics of relevant variables are compared and reported between study groups (QL versus PENG).

Results: For QL and PENG groups, no significant differences were observed in total perioperative oral morphine equivalents (OME) (69.5 vs 60mg; p=0.40), postoperative OME (15 vs 15.3mg; p=0.96) or maximum pain scores in the recovery area (7.0 vs 6.0; p=0.41). Postoperatively, QL block patients were in PACU for a greater length of time after surgery than PENG block patients (89.5 vs 72 minutes; p<0.001). No patients had uncontrolled pain requiring emergency room visits or hospital admission within 24 hours. No neurologic complications or instances of motor weakness were reported after QL or PENG blocks.

Conclusion: This retrospective study observed similar opioid requirements and pain scores for patients receiving QL versus PENG block for hip arthroscopy, though PENG block patients had shorter times in the recovery area. Prospective, controlled trials are required to further explore and confirm these findings.

Keywords: quadratus lumborum, QL, pericapsular nerve group, PENG, Hip arthroscopy

Introduction

Hip arthroscopy is a common surgery used to treat a variety of painful hip pathologies including femoroacetabular impingement and labral tears.[1,2] Because of the largely ambulatory nature of this procedure, successful management of early postoperative pain is important. Postoperative pain after hip arthroscopy may range from mild to severe, making consistent timely discharge from the outpatient center potentially difficult.[2] Postoperative pain may result from the surgical procedure itself, traction on the hip joint during surgery and potentially due to arthroscopic irrigation fluid extravasation into the surrounding tissue.[3,4]

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While opioids are an important modality in treating postoperative pain, dependence on their use in treating moderate to severe pain may limit timely outpatient discharge due to the side effects of over sedation, respiratory depression, nausea and urinary retention.[5] Multimodal analgesic strategies that limit opioid use and include regional anesthesia blocks have been a recent area of interest for hip arthroscopy. There is evidence that patients receive analgesic benefit from utilization of a variety of regional blocks, but currently there is no consensus on optimal technique for patients undergoing hip arthroscopy. Sensory innervation of the hip involves input from several major branches of the lumbosacral plexus, including the femoral nerve, obturator nerve, accessory obturator nerve, sciatic nerve, superior gluteal nerves, and nerve-to-quadratus femoris.[6] The complex innervation of the hip makes complete analgesia difficult to obtain with a single perineural injection. Regional techniques that have shown to be beneficial for analgesia after hip arthroscopy include lumbar plexus,[7,8] femoral nerve,[9,10] fascia iliaca,[11,12] quadratus lumborum (QL),[13–16] and pericapsular nerve group (PENG) blocks.[17–20] There is a risk of quadriceps weakness and the potential for postoperative falls after regional techniques such as lumbar plexus, femoral, and fascia iliaca blocks.[7,10,15] Concern for postoperative fall risk has led to a focus on regional nerve blocks that target the sensory innervation of the hip capsule while preserving motor function. Both the QL and PENG blocks have been described in multiple studies to be effective for pain control after hip arthroscopy and have low risk of causing motor weakness based on available evidence.[13–20]

The QL block, introduced in 2007, is a posterior abdominal wall fascial plane block developed for use in abdominal surgery. The QL block offers extended coverage of the hip and has been found to be effective for postsurgical analgesia after hip arthroplasty,[21] femoral neck fracture,[22] and hip arthroscopy.[13–16] Injection of local anesthetic within the thoracolumbar fascia around the QL muscle is thought to provide hip analgesia through blockade of radicular roots as they exit the intervertebral foramina or potentially more laterally as the lumbar plexus exits the psoas muscle.[13] QL blocks appear to be motor-sparing based on available evidence, but sufficient local anesthetic spread to the L3-L4 nerve roots or lumbar plexus could conceivably lead to motor weakness.[13,15]

The PENG block, first described in 2018, is a fascial plane block that aims to anesthetize the sensory articular nerves of the hip joint capsule.[23] The PENG block targets the terminal articular branches of the femoral and obturator nerve as they course just outside of the hip capsule between the psoas muscle fascia and superior pubic rami.[24] Although newly described, the block has been quickly adopted in clinical practice due to the perceived benefit, minimal risk, and replicability of the involved anatomical landmarks. While thought to be motor sparing, there is a potential risk of motor weakness when greater doses of local anesthetic are used and spread to the femoral nerve.[25]

At our institution, QL blocks were regularly performed for patients undergoing outpatient hip arthroscopic surgery, prior to a practice shift to primarily performing PENG blocks for these surgical procedures due to perceived benefit and relative ease of performance of PENG blocks. There have been no previous studies directly comparing the analgesic effectiveness of QL versus PENG blocks for patients undergoing arthroscopic hip surgery. The objective of this retrospective study is to examine and compare existing patient data for QL and PENG blocks to determine if there are differences in analgesic outcomes such as total perioperative opioid consumption, postoperative opioid consumption, pain scores or time spent in the recovery room after outpatient hip arthroscopy with femoroplasty and labral repair.

Materials and Methods

This was a single-center retrospective investigation of patients that underwent outpatient hip arthroscopy and received either a QL or PENG block for postoperative analgesia at an ambulatory surgery center of The Ohio State University between January 1, 2017 and May 1, 2022. Institutional review board (IRB) approval was obtained prior to conducting retrospective chart reviews for this study (IRB#: 2022H0203). No patient consent forms were required by the Ohio State University IRB given that this was a retrospective investigation based on electronic chart reviews. After IRB approval was obtained, approved personnel reviewed patient medical records over the study time period in order to identify patients that underwent hip arthroscopy surgery performed by a single surgeon and received either a QL or PENG block for postoperative analgesia. A total of 50 consecutive patients that received QL block and 50 consecutive patients that received PENG block were identified. All patient data obtained from their electronic medical record was stored in a password-protected electronic research database and patient confidentiality was maintained throughout the retrospective study. This investigation was conducted in accordance with the Declaration of Helsinki.

Patients were included in this investigation if they were ≥18 years old, underwent outpatient hip arthroscopy with femoroplasty and labral repair, and received either a preoperative QL or PENG block. Patients were excluded from this study if the QL or PENG block was performed after surgery, if it was an open surgical procedure or if there was incomplete documentation of data in the electronic medical record. Femoroacetabular impingement and labral tear were the indications for the surgical procedures. Approved study personnel reviewed the perioperative records of subjects identified that met inclusion criteria and had no excluding factors, and their data was recorded in an electronic database. The primary objective of this study was to evaluate the effectiveness of QL versus PENG block for post-operative analgesia after ambulatory hip arthroscopy. The primary outcome measure assessed was total perioperative opioid consumption, reported as total oral morphine equivalents (OME) received intraoperatively and postoperatively. Intraoperative opioid administration was at the discretion of the anesthesia providers caring for each patient. Many providers are similar in their intraoperative management, but there is not a standardized institutional protocol for intraoperative analgesic medication administration. Postoperative opioid medications is only given on request by the patient, with medications given incrementally until satisfactory analgesia is achieved. In the recovery area, IV fentanyl 25mcg increments are administered on patient request (up to 4 doses), and oral oxycodone 5mg initial dose is also available on patient request. If a patient's pain is not adequately controlled after these initial measures, IV hydromorphone 0.5mg increments (up to 4 doses) may be administered, and sometimes an additional oral oxycodone 5mg dose is given on patient request. Important secondary outcome measures collected include verbal rating scale (VRS) pain scores (0–10), total time in the recovery area (minutes), adverse events in the recovery area, unanticipated hospital admission or return to hospital within 24 hours due to uncontrolled pain, and neurologic complications.

Patient demographic items collected and compared between QL and PENG study groups included gender, age, body mass index (BMI), American Society of Anesthesiologists (ASA) score, and preoperative VRS pain score (0–10). Preoperative and intraoperative management and outcome parameters collected were dose of preoperative oral medications (acetaminophen and gabapentin), ropivacaine dose (mg) for either QL or PENG block, intraoperative opioid and non-opioid analgesic medication doses (IV fentanyl, IV hydromorphone, IV ketamine, IV ketorolac), intraoperative OME given and surgery duration. Since this was a retrospective investigation, the intraoperative management of analgesic medications and procedures was at the discretion of the anesthesia providers. All peripheral nerve blocks were performed by experienced anesthesiologists that routinely perform nerve block procedures as part of their daily practice. Type 1 QL blocks are performed at our institution, with local anesthetic being deposited at the anterolateral border of the QL muscle, and 0.35% ropivacaine 30mL is the most common QL block dose administered. For PENG blocks the local anesthetic is injected when needle contact is made with the superior pubic ramus just lateral to the iliopsoas tendon, and 0.35–0.5% ropivacaine 20mL is the dosing range commonly administered at our institution. No adjuvant medications were administered for either QL or PENG blocks. Local anesthetic infiltration with 0.2–0.5% ropivacaine 20–30mL was administered by the surgeon during the operative course to aid with post-operative analgesia. Postoperative analgesic management and outcome measures assessed were total time in the post-anesthesia care unit (PACU), maximum VRS pain score (0–10), VRS pain score at the time of discharge (0–10), IV fentanyl or hydromorphone doses, oral oxycodone dose (mg), OME in PACU, and total perioperative OME. All oral and intravenous opioid medications administered intraoperatively and postoperatively to each patient were converted to OME and added to report total OME.[26] Postoperative provider notes, nursing notes, vital sign flowsheets were reviewed for documentation of any adverse events occurring in the recovery area. All providers notes available in the electronic medical record within 24 hours postoperatively were reviewed to determine if any patient phone calls, unplanned emergency room visits or unplanned hospital admissions occurred due to uncontrolled pain. Postoperative recovery room nurses ensure that patients can safely ambulate on crutches prior to discharge from the ambulatory center, and thus all nursing notes were reviewed for each patient for documentation of any motor weakness or other neurologic deficits. All orthopedic provider follow-up clinic notes after surgery were also reviewed for documentation of any neurologic complications. Among all patients included in this study, regardless of whether they received QL or PENG block, we sought to examine if any patient factors correlated with opioid consumption or total time in PACU. To accomplish this, univariable model statistical analysis was performed to determine if any patient characteristics or selected non-opioid pain medications were predictive of longer PACU times, PACU OME or total perioperative OME.

Statistical Methods

Continuous variables were summarized as median [IQR: interquartile range] and compared between study groups using Kruskal–Wallis tests. Categorical variables are reported as frequency (percentage) and compared between study groups using chi-squared tests or Fisher's exact tests where relevant. No beforehand sample size calculation was performed for this retrospective exploratory investigation. From a previous study it was known that approximately 50 patients had received a QL block for hip arthroscopy at our outpatient surgery center,[15] and thus we located 50 consecutive patients that received PENG block for outpatient hip arthroscopy to have a similar number of subjects in each study group. Univariable linear regression models were fit to assess the association of relevant patient characteristics and selected medications with each of the time in PACU, PACU OME, and total OME outcomes respectively. Model diagnostics were conducted by visual inspection of residual quantile-quantile plots and histograms. No violations of the normal distribution assumption were observed for the models. Hypothesis testing was conducted at a 5% type I error rate (alpha = 0.05). SAS version 9.4 (SAS Institute, Cary, NC) was used to conduct all statistical analyses.

Results

A total of 50 consecutive patients that received QL block and 50 consecutive patients that received PENG block for analgesia after outpatient hip arthroscopy surgery were identified during the study period. None of the subjects identified had excluding factors and all were included in the statistical analysis.

Patient demographic and baseline characteristics compared between study groups were similar (Table 1), and no statistically significant differences were observed. Table 2 summarizes preoperative and intraoperative analgesic management and outcomes, and a few differences were observed between study groups. QL block patients received a greater dose of ropivacaine (mg) for the nerve block procedure compared to patients that received PENG blocks (median 105 [interquartile range (IQR) 70, 105] vs 87.5mg [70, 100]; p=0.0146). Greater preoperative oral gabapentin doses were

Table 1 Demographic Summary by QL or PENG Group

Variable	QL (n=50)	PENG (n=50)	p-value
Gender (male % / female %)	26% / 74%	44% / 56%	0.0592[a]
Age	33 [27, 39]	36 [28, 42]	0.2834[b]
Body Mass index (kg/m^2)	28.7 [23.7, 33]	28.5 [25.2, 37]	0.5304[b]
ASA score	2 [1, 2]	2 [1, 2]	1.0000[b]
Initial verbal rating scale (VRS) pain score prior to surgery (0–10)	4 [2, 7]	4 [2, 6]	0.9143[b]

Notes: Data shown are % for binary outcomes, and median [25th to 75th percentile range] otherwise. [a] Chi-Square p-value; [b] Kruskal–Wallis p-value.

Table 2 Preoperative and Intraoperative Management and Outcomes by QL or PENG Group

Variable	QL (n=50)	PENG (n=50)	p-value
Ropivacaine for nerve block (mg)	105 [70, 105]	87.5 [70, 100]	0.0146[a]
Preoperative oral medications:			
Acetaminophen (mg)	975 [650, 975]	975 [975, 975]	0.0686[a]
Gabapentin (mg)	300 [300, 600]	0 [0, 0]	<0.0001[a]
Intraoperative IV medications:			
IV Fentanyl (mcg)	100 [100, 100]	100 [100, 100]	0.8982[a]
IV Hydromorphone (mg)	0.5 [0, 1.5]	0 [0, 1]	0.5290[a]
IV Ketamine (mg)	0 [0, 40]	30 [25, 30]	0.0272[a]
IV ketorolac (mg)	15 [15, 15]	15 [15, 15]	0.6224[a]
Intraoperative oral morphine equivalents (OME)	40 [30, 60]	40 [30, 60]	0.6408[a]
Surgery duration (minutes)	115.5 [104, 135]	122.5 [113, 134]	0.1997[a]

Notes: Data shown are median [25th to 75th percentile range]. [a] Kruskal–Wallis p-value.

given to patients that received QL blocks compared to the PENG block study group (median 300 [300, 600] vs 0mg [0, 0]; p<0.0001). QL block subjects had lower doses of IV ketamine given intraoperatively compared to those receiving PENG blocks (median 0 [0, 40] vs 30mg [25, 30]; p=0.0272).

Postoperative analgesic management and outcomes by QL or PENG group are summarized in Table 3. The only statistically significant difference observed postoperatively was that QL block patients were in PACU for a greater length of time after surgery than PENG block patients (median 89.5 [77, 113] vs 72 minutes [56, 94]; p=0.0008). One patient in each study group was documented to have moderate postoperative hypoxemia (SPO2 range of 87–90%), and each required additional time in PACU for this to resolve prior to discharge. Importantly, no significant differences were observed in VRS pain scores after surgery, doses of opioid medications, postoperative OME or total OME between study groups (Table 3, Figure 1). No patients in either study group had documentation of uncontrolled pain requiring emergency room visits, hospital admission or phone calls to providers within the first 24 hours postoperatively. No neurologic complications or motor weakness were documented for any of the patients in this retrospective study.

Among all patients included in this study, univariable models were fit to identify any potential patient characteristics or selected non-opioid medications that may be associated with total patient time in PACU, OME received in PACU or total OME received perioperatively. Oral gabapentin dose was the only factor noted to be associated with longer time in PACU (Estimate 0.06 ± 0.01; p<0.0001) (Table 4). Higher preoperative VRS pain score was associated with greater PACU OME (Estimate 1.32 ± 0.56; p=0.0207) and total OME given perioperatively (Estimate 2.55 ± 0.90; p=0.0053) (Tables 5 and 6).

Discussion

Hip arthroscopy is increasingly being performed in ambulatory surgical centers,[27] placing a greater emphasis on pain relief and the ability to safely ambulate in the recovery room. The complex sensory innervation of the hip joint has led to a number of regional anesthesia techniques being effectively utilized for analgesia after hip arthroscopy,[6–20] however in the ambulatory setting consideration should be given to the greater potential for motor weakness after lumbar plexus, femoral and fascia iliaca blocks.[7,10,15] In comparison, QL and PENG blocks both offer an attractive option in facilitating opioid-sparing analgesia while also minimizing risk of motor weakness.[13–20] Our practice has mirrored the sequential adoption of the QL followed by the PENG block for hip arthroscopy as the supporting literature on these two blocks has emerged. We previously reported the analgesic benefit of QL blocks in hip arthroscopy as compared to femoral and fascia iliaca blocks in patients that received a multimodal analgesic regimen.[15] PENG blocks are currently favored over QL blocks in our practice given the relative ease of performance, lower total dose of local anesthetic and our initial experience was that PENG blocks seemingly resulted in less pain and required less time in the recovery area compared to QL blocks.

Table 3 Postoperative Analgesic Management and Outcomes by QL or PENG Group

Variable	QL (n=50)	PENG (n=50)	p-value
Adverse event in recovery area (n (%))	1 (2.0%)	1 (2.0%)	1.0000[a]
Total time in recovery area (min)	89.5 [77, 113]	72 [56, 94]	0.0008[b]
Maximum verbal rating scale (VRS) pain score in recovery area (0–10)	7 [5, 9]	6 [4, 8]	0.4098[b]
Discharge pain score (0–10)	5 [2, 6.5]	4 [3, 5]	0.2402[b]
IV Fentanyl (mcg)	0 [0, 50]	25 [0, 50]	0.2563[b]
IV Hydromorphone (mg)	0 [0, 0]	0 [0, 0]	0.0899[b]
PO oxycodone (mg)	5 [0, 10]	5 [5, 5]	0.9190[b]
PACU OME	15 [7.5, 32.5]	15.3 [7.5, 30]	0.9611[b]
Total OME (intraoperative and postoperative)	69.5 [47.5, 82.5]	60.0 [47.5, 77.5]	0.4019[b]
Unplanned hospitalization, emergency room visit or patient phone call within 24 hours due to uncontrolled pain (n (%))	0 (0%)	0 (0%)	-
Neurologic complications or motor weakness (n (%))	0 (0%)	0 (0%)	-

Notes: Data shown are % for binary outcomes, and median [25th to 75th percentile range] otherwise.[a] Chi-Square p-value; [b] Kruskal–Wallis p-value.

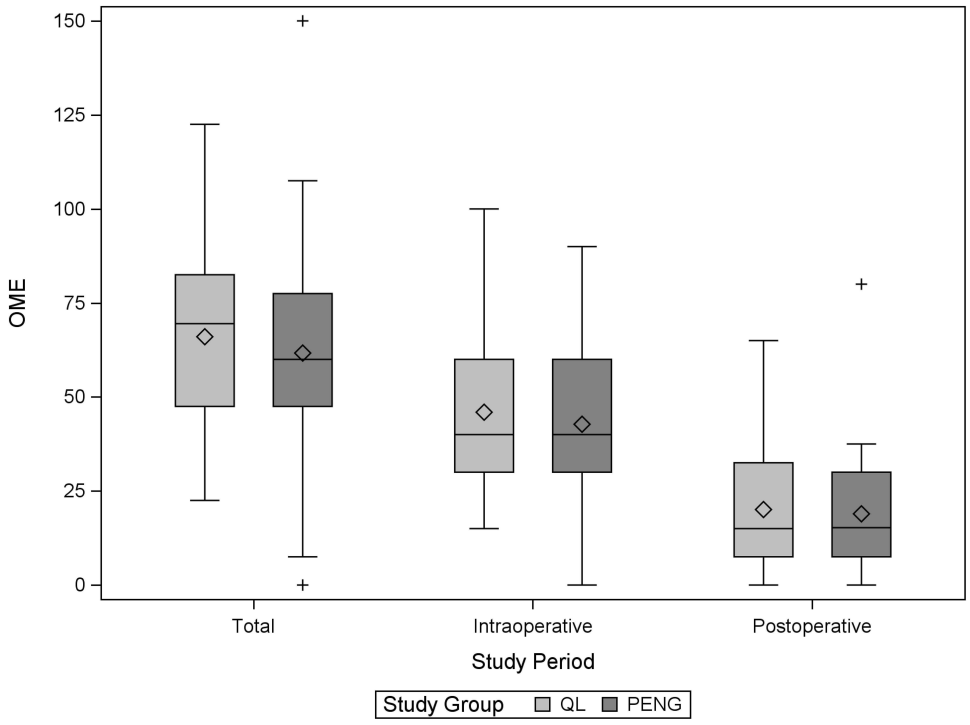

Figure 1 The figure shows the median oral morphine equivalents (OME) consumed by quadratus lumborum (QL) compared to pericapsular nerve group (PENG) block patients for the total perioperative period (p=0.4019), intraoperative period (p=0.6408) and postoperative period (p=0.9611). The horizontal line in the center of each box represents the median OME, and the diamond symbol "◇" inside each box represents the mean OME. Each box's bottom and top edges represent the 25th and 75th percentiles of the sample, and its length is the interquartile range. Vertical lines that extend from the box, called whiskers, show how far the data extends, up to 1.5 interquartile ranges. The "+" symbols denote extreme values. This figure is the property of the author. (OME=oral morphine equivalents, QL=quadratus lumborum, PENG=pericapsular nerve group).

Despite our clinical impression, the results of the present retrospective exploratory study observed few differences in analgesic outcomes between patients that received QL versus PENG block as part of a multimodal analgesic regimen. No significant differences were observed between study groups for intraoperative OME, postoperative OME, total OME or postoperative VRS pain scores (Tables 2 and 3). Notably, patients receiving QL blocks did require a longer time in recovery compared to PENG block patients (median 89.5 vs 72 minutes; p=0.0008). Common factors that may contribute to greater time in the recovery area after surgery include greater pain, nausea or sedation,[28] but it is difficult to definitively determine from retrospective chart reviews which factors accounted for longer PACU times among QL block subjects in the current study. The results of this retrospective exploratory investigation should be interpreted with caution, as the retrospective nature of the study does not allow for a properly controlled trial and it is underpowered to definitively detect the superiority of either QL or PENG blocks for patients undergoing hip arthroscopy. For these

Table 4 Univariable Models Predicting Total Time in Recovery (Minutes)

Effect	Estimate	Standard Error	Lower 95% CI	Upper 95% CI	p-value
Gender	−9.28	6.84	−22.85	4.28	0.1775
Age	−0.06	0.35	−0.75	0.63	0.8668
Body mass index (kg/m^2)	0.33	0.52	−0.69	1.36	0.5234
ASA score	1.54	5.38	−9.13	12.20	0.7756
Initial VRS pain score (0–10)	0.65	1.18	−1.69	2.99	0.5838
Acetaminophen (mg)	0.013	0.009	−0.006	0.033	0.1862
Gabapentin (mg)	0.06	0.01	0.03	0.09	<0.0001
Intraoperative ketamine (mg)	0.13	0.18	−0.21	0.48	0.4439

Table 5 Univariable Models Predicting PACU OME

Effect	Estimate	Standard Error	Lower 95% CI	Upper 95% CI	p-value
Gender	−6.22	3.26	−12.69	0.25	0.0595
Age	−0.05	0.17	−0.38	0.29	0.7896
Body mass index (kg/m^2)	0.07	0.25	−0.43	0.56	0.7900
ASA score	3.31	2.57	−1.78	8.41	0.2002
Initial VRS pain score (0–10)	1.32	0.56	0.21	2.44	0.0207
Acetaminophen (mg)	−0.007	0.005	−0.016	0.002	0.1506
Gabapentin (mg)	−0.001	0.007	−0.015	0.013	0.8822
Intraoperative ketamine (mg)	−0.04	0.08	−0.20	0.13	0.6701

Table 6 Univariable Models Predicting Total OME

Effect	Estimate	Standard Error	Lower 95% CI	Upper 95% CI	p-value
Gender	−7.31	5.29	−17.81	3.20	0.1706
Age	−0.22	0.27	−0.75	0.32	0.4234
Body mass index (kg/m^2)	0.14	0.40	−0.66	0.94	0.7298
ASA score	2.57	4.16	−5.69	10.82	0.5385
Initial VRS pain score (0–10)	2.55	0.90	0.78	4.33	0.0053
Acetaminophen (mg)	−0.004	0.007	−0.019	0.011	0.5940
Gabapentin (mg)	−0.001	0.011	−0.024	0.022	0.9202
Intraoperative ketamine (mg)	−0.16	0.14	−0.43	0.11	0.2469

reasons, there is risk of type 2 statistical error and an adequately powered, prospective, randomized controlled trial with standardized pain medication dosing and management guidelines would be better able to detect any potential differences in opioid requirements or pain scores.

In addition to transitioning to primarily performing PENG blocks for patients undergoing hip arthroscopy, around the same time period anesthesia providers at our institution shifted away from preoperative oral gabapentin and trended toward greater use of intraoperative IV ketamine (Table 2). These changes in non-opioid analgesic medications administered may have confounded the results of the present retrospective exploratory study. The anesthesia providers at our institution make analgesic medication selections based on clinical impression of whether there is benefit to the patient and if there is evidence to support use of a given medication. Some recent evidence suggests benefit of oral gabapentin as part of multimodal analgesia after outpatient orthopedic surgery,[29] while another recent study observed no benefit of oral gabapentin after hip arthroscopy.[30] Perioperative IV ketamine has been observed to improve postoperative analgesia after many types of surgical procedures.[31] For the current study it would have been beneficial to have standardized dosing and management of all analgesic medications to allow even comparison of analgesic outcomes, but this is a limitation due to the retrospective nature of the investigation. The overall impact of greater preoperative oral gabapentin and lower intraoperative IV ketamine dosing for the QL block group on analgesic outcomes is uncertain. It was also observed in this investigation that gabapentin dose was associated with longer time in PACU (Table 4), but it is uncertain whether the time in PACU was impacted by the gabapentin or the fact that QL blocks (rather than PENG blocks) were largely performed in patients receiving preoperative gabapentin (Table 2).

It is important to identify patient risk factors that may contribute to postoperative pain and potentially delay timely discharge. Orthopedic surgery, increasing age, longer surgical times and higher BMI have been previously reported as factors that may result in longer PACU times or increase risk of severe postoperative pain.[28,32] Further, there is evidence that hip arthroscopy that requiring labral repair or removal of bone are associated with greater severity of post-operative

pain.[33] Among all patients in the present investigation, the preoperative VRS pain score was the only factor examined that was predictive of higher PACU OME and total OME received (Table 5 and Table 6). Consideration of individual patient characteristics is important to optimize their multimodal analgesic regimen. For patients predicted to potentially require a longer time in the PACU (due to increasing age, obesity, anticipated longer surgical duration or greater preoperative pain levels), it may be useful to identify these patients and schedule their procedures earlier in the day to minimize risk of prolonging the work hours of the ambulatory surgery center.

Compared to no regional block, there are multiple recent studies to support the use of PENG blocks in patients undergoing hip arthroscopy, resulting in less pain, lower opioid consumption and shorter PACU times.[17,18] QL blocks have also been shown to improve analgesia after hip arthroscopy compared to no regional block.[13,14,16] To our knowledge, this is this first study to directly compare QL and PENG blocks for arthroscopic hip surgery. Based on our clinical experience and the observations of this retrospective exploratory investigation, both QL and PENG blocks may be utilized as part of a multi-modal analgesic regimen for patients undergoing hip arthroscopy. In our own current practice, PENG blocks continue to be preferred for patients undergoing hip arthroscopy due to the relative ease of performance, lower total dose of local anesthetic, and decrease in PACU length of stay. Importantly, no neurologic complications, instances of motor weakness or patient falls were documented for any of the patients in either study group.

This retrospective exploratory study has several limitations and confounding factors. The study was underpowered, and a prospective study design with a priori sample size calculations would be beneficial to ensure a future study is adequately powered. As mentioned, there was not standardized dosing of local anesthetic and other preoperative and intraoperative analgesic medications, which were at the discretion of the anesthesia providers. Many anesthesia providers are similar in their management, but there is not a standardized protocol for preoperative and intraoperative analgesic medication administration or local anesthetic dosing. A prospective, randomized, controlled study design with standardized dosing of all local anesthetic and perioperative pain medications would be beneficial to more accurately detect any potential differences in analgesic outcome measures. This study was also limited given that pain medications and VRS pain scores were only documented while in PACU and did not assess any analgesic outcomes after discharge from the outpatient center. A prospective study design would have allowed for examination of opioid medications taken and pain severity extending beyond the time of discharge and would potentially enable better understanding of the effectiveness QL or PENG blocks for the first 24 postoperative hours rather than being limited to the patient time in the PACU. Lastly, the present investigation retrospectively compared two types of interventions (QL vs PENG) and there was not a control group that did not receive a block. Baseline analgesic outcome measures for hip arthroscopy patients not receiving any type of nerve block our institution are not presently available for comparison.

Conclusion

Hip arthroscopy is a common outpatient surgical procedure that has the potential for significant postoperative pain. Many types of regional blocks have been reported to be beneficial for analgesia after hip arthroscopy, though concern for postoperative fall risk has led to interest in motor-sparing nerve block techniques such as QL and PENG blocks. This is the first study comparing the analgesic effectiveness of QL versus PENG blocks for patients undergoing arthroscopic hip surgery.

In this retrospective study, patients receiving QL and PENG blocks were observed to have similar perioperative opioid requirements and pain scores, though PENG block patients had significantly shorter times in the recovery area. No neurologic complications or cases of motor weakness were reported for any patients in this study. The results of this exploratory retrospective investigation should be interpreted with caution and a future prospective, randomized, controlled trial would be beneficial to further clarify or confirm the findings of this investigation.

Data Sharing Statement

Requests for data should be addressed to the corresponding author.

Ethics and Informed Consent

Ethical approval was obtained from the Ohio State University IRB prior to beginning this study (IRB#: 2022H0203). This was a retrospective investigation and no subject consent forms were required by the IRB. Patient confidentiality was maintained throughout the investigation, and this study was conducted in accordance with the declaration of Helsinki.

Disclosure

The authors report no conflicts of interest in this work.

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