Journal of Advanced Medical and Dental Sciences Research

@Society of Scientific Research and Studies ***NLM ID:*** *101716117*

Journal home page: www.jamdsr.com doi: 10.21276/jamdsr Index Copernicus value = 85.10

(e) ISSN Online: 2321-9599; (p) ISSN Print: 2348-6805

Original Research

Quadratus Lumborum Bock for Postoperative Analgesia Following Total Hip Arthroplasty

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ABSTRACT:

Background: Hip pain due to osteoarthritis is a leading indication for hip arthroplasty and is most common joint replacement surgery second to knee arthroplasty. Postoperative pain has several detrimental effects in postoperative recovery and rehabilitation of these patients. Quadratus Lumborum (QL) block is an emerging modality for postoperative analgesia.

Aim: The aim of our study was to retrospectively analyse effectiveness of QL block in providing postoperative analgesia, its opioid sparing effect and to see if it contributes to early rehabilitation and shorter length of hospital stay. **Settings and design**: Retrospective study in the setting of a tertiary care hospital with surgeries done by a single surgeon. **Material & Methods:** Medical records of 78 patients who underwent total hip arthroplasty by a single surgeon were reviewed. 39 of these patients underwent QL block postoperatively in the operation theatre for postoperative analgesia and 39 patients were managed with other modalities of pain management. Record was made of pain assessment with visual analogue score (VAS) for first 24 hours, opioid consumption, time to mobilisation for rehabilitation and length of hospital stay. **Results** : The mean pain score was comparable on arrival in postoperative ward in both the groups 2.46 for group Q and 2.52 for the group N. Pain scores subsequently at 6, 12 and 18 hours were significantly lower in group Q compared to group N (p value <0.05). Mean morphine equivalent consumption in 24 hours was 11.88 ± 6.84 mg in group Q and 29.16 ± 11.62 mg in group N which was statistically significant. Time to mobilisation was significantly less in group Q ,18.68 ± 4.62 hours compared to group N 24.32 ± 5.36 hours. There was no significant difference in length of hospital stay in either group. **Conclusion**: Ultrasound guided QL3 block is a safe and effective postoperative pain management strategy after total hip arthroplasty which appears to facilitates early mobilization and rehabilitation.

Key words: QL block, Hip Arthroplasty, Postoperative analgesia.

Received: 03/05/2020 **Modified:** 22/06/2020 **Accepted:** 24/06/2020

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This article may be cited as: Ramprasad R, Chaudhary V, Adya A, Deshwal V. Quadratus Lumborum Bock for Postoperative Analgesia Following Total Hip Arthroplasty. J Adv Med Dent Scie Res 2020;8(8):91-95.

INTRODUCTION

Osteoarthritis of hip joint is the leading cause of hip pain and is the most frequent indication for hip arthroplasty. Hip arthroplasty is the only viable option to provide significant improvement in pain and functional status in most of these patients.[1] Total hip replacement is most frequent joint replacement procedure performed in most centres second to knee joint replacement.[2] Hip arthroplasty causes significant pain postoperatively which can adversely affect the postoperative recovery, mobility and rehabilitation besides prolonging length of hospital stay.[3] Pain relief after hip arthroplasty has traditionally been achieved with multimodal approach including administration of acetaminophen, opioids, NSAID's, gabapentanoids, nerve blocks and periarticular infiltration.[4] The Quadratus Lumborum (QL) nerve block was introduced in clinical practice for the first time in the year 2007 by Blanco and Mc Donnell mainly for abdominal surgeries.[5] Later the use of this extended to hip surgeries including fracture neck femur, hip arthroplasties and hip arthroscopies.[6]

The aim of our study was to evaluate the effectiveness of single shot QL block as a modality of postoperative

analgesia after unilateral hip arthroplasty by a single surgeon in joint replacement centre of a tertiary care hospital.

MATERIAL AND METHODS

After obtaining approval of Institutional ethics committee we conducted this retrospective study in which we reviewed medical records of patients who underwent unilateral total hip arthroplasty by a single surgeon and received postoperative single shot QL block. This group was matched with another group of patients with matching demographic profile who underwent similar procedure by the same surgeon but did not receive QL block after the procedure and were managed with other modalities of pain management namely, intravenous opioids, acetaminophen and local wound infiltration with local anaesthetics. The patients who were excluded from the study were the ones with incomplete charts with deficient data. A total of 78 patients 39 in each group were matched and included in the study. The data recorded were demographic profile including age, sex, weight, duration of procedure. The outcome data recorded included pain score in postoperative ward every 6 hours, twenty four hours opioid consumption, time to initiation of mobilisation and length of hospital stay. The pain is evaluated in joint replacement centre (JRC) of our hospital by visual analogue scale (VAS) on a scale of 1-10 [7] and is recorded after arrival of the patient in postoperative ward and every 6 hours thereafter till first 24 hours. The postoperative patients in our JRC are given analgesia on demand when the patient reports pain worse than 4 on VAS scale of 10. Note was made of morphine equivalent administered in first 24 hours and the time of administration. Morphine equivalents were calculated using conversion factor described by Von Korff etal.[8] Our patients post hip arthroplasty are mobilised on the morning following surgery if they are comfortable and cooperative, time to initiation of mobilization was recorded for all the patients and so was time to discharge from hospital. All our patients were operated under spinal anaesthesia and ultrasound guided QL3 block was administered in the Post anaesthesia care room with 30 ml of 0.25% Bupivacaine plain with 4 mg dexamethasone as additive. They were observed for any side effects of the block for 30 mins in recovery room and then shifted to postoperative ward in JRC.

STATISTICAL ANALYSIS

For normally distributed measurable data over the two groups, their means were compared using Student's t-tests; whereas for skewed (non-normally distributed) or ordinal data, their distributions over the two groups was compared using Mann Whitney test .

The data were presented with descriptive statistics with mean ± SD or median and inter-quartile range as also their minimum and maximum values, depending upon whether the data is normally distributed or skewed.

For Categorical / Classified data, their association with the two groups was analyzed using Chi-Square test or Fisher's exact test.

RESULTS

A total of 92 patients were enrolled in the study 14 patients were excluded from the study because of incomplete data collection. The records for 78 patients were analysed out of which 39 patients underwent QL block postoperatively (group Q) and 39 patients did not receive QL block for postoperative analgesia (group N). The demographic data is as in table – 1. The demographic variables noted were age, weight, height, BMI, sex and the duration of surgery. There was no significant difference in any of the variables. The mean pain score (Table -2) was comparable on arrival in postoperative ward in both the groups 2.46 for group Q and 2.52 for the group N. Pain scores subsequently at 6, 12 and 18 hours were significantly lower in group Q compared to group N (p value <0.05). The mean scores were 2.64, 3.84 and 3.96 at 6, 12 and 18 hours in group Q and the corresponding scores for group N were 6.26, 6.72 and 5.24. At 24 hours the mean pain scores were statistically not significant being 5.38 ± 3.12 for group Q and 5.76 ± 2.89 for group N. Mean morphine equivalent consumption in 24 hours (Table -3) was 11.88 ± 6.84 mg in group Q and 21.16 ± 10.62 mg in group N. The difference was statistically significant. The mean time to first demand of analgesia (Table – 3) was significantly higher in group Q being 10.12 ± 2.10 hours and 3.16 ± 1.18 hours for group N. Time to mobilisation postoperatively (Table – 4) was significantly lower in group Q 18.68 ± 4.62 hours compared to group N 24.32 ± 5.36 hours. The time to discharge from hospital was not different in either groups being 5 ± 2.0 days for group Q and 6 ± 1.50 days for group N.

Table -1 Demographic Details of the Patients

	Group Q (QL Block)	Group N (No Block)	P - Value
Mean age (Years)	68 ± 6.4	69.6 ± 3.8	0.32
Mean weight (Kg)	67.2 ± 4.2	71 ± 4.8	0.14
Mean height (cms)	169.4 ± 8.6	170.6 ± 7.4	0.20
Mean BMI (Kg/m^2)	22.2 ± 1.8	22.45 ± 2.1	0.44
Sex M F	28 22	32 18	0.22
Mean surgery duration (Min)	54.8 ± 6.2	56 ±5.4	0.18

Table – 2 Postoperative Pain Score

	Mean Pain Scores (VAS)				
	On arrival	**6 Hrs**	**12 Hrs**	**18 Hrs**	**24 Hrs**
Group Q	2.4 ± 1.81	2.64 ± 2.34	3.84 ± 194	3.96 ± 1.64	5.38 ± 3.12
Group N	2.52 ±2.12	6.26 ± 1.96	6.72 ± 2.64	5.24 ± 2.12	5.76 ± 2.89
P value	0.1	**<0.001***	**<0.001***	**0.04***	0.08

*Significant p value

Table – 3 Mean opioid consumption (morphine equivalent)

	Opioid Consumed (mg)	Time to first demand of analgesia (hr)
Group Q	11.88 ± 6.84	10.12 ± 2.10
Group N	21.16 ± 10.62	3.16 ± 1.18
P value	< 0.001*	0.01*

*Significant p Value

Table – 4 Mean time to mobilisation and length of hospital stay

	Time to mobilisation (hrs)	Time to discharge from Hospital (days)
Group Q	18.68 ± 4.62	5 ± 2.0
Group N	24.32 ± 5.36	6 ± 1.50
P value	**0.03***	0.82

*Significant p value

DISCUSSION

Hip Joint has a complex innervation with many anatomical variants, the main nerves supplying the hip joint are lateral cutaneous nerve, femoral, obturator and sciatic nerves. Blocking these nerves provides better analgesia and lesser opioid requirement after hip surgery. Femoral nerve may branch out higher and is the principal nerve supplying the hip joint and in nearly half of the patients the accessary obturator nerve may innervate the hip, thus blocking the femoral and obturator nerves conventionally in the inguinal region may not give effective analgesia for femoral surgeries.[9] Lumbar plexus block may thus be an ideal block for analgesia for hip arthroplasties but is associated with more complications and requires more expertise than single nerve block.[10] QL block has emerged as a novel technique of nerve block for hip surgeries. There are various approaches to QL block namely QL1, QL2, QL3. QL 1 block is referred to as the anterolateral QL block because it involves injecting local anaesthetic lateral to the QL muscle with the spread at the junction of QL with transversalis fascia, similar to the pattern of transversalis fascia plane block. By the same rule, the QL 2 block is considered a posterior QL block. The transmuscular QL block is named the anterior QL or QL3 block because it involves injecting the local anesthetic at the anterior aspect of the QL muscle. Finally, the intramuscular QL block involves injecting the solution with in the QL muscle.[11] Most appropriate technique of QL block for hip surgeries is not known, a cadaveric study showed that QL3 block may lead to injectate being spread to L1, L2, L3 nerve roots,[12] hence can be effective analgesic strategy for hip surgeries. We in our institute use QL3 block for most of the patients for postoperative analgesia for hip surgeries.

The comparison of the results between the group in which patients received QL block postoperatively with the group that did not receive the block showed significantly lesser pain in the group Q at 6 hours, 12 hours and 18 hours. The mean pain score did not differ between the two groups at the time of arrival in postoperative ward possibly because the effect of spinal anaesthesia did not fade away and accounted for analgesia in both the groups. The mean pain score was also comparable at 24 hours because of termination of the effect of QL block in the group Q. The lower postoperative pain scores observed in the group Q in our study is similar to many other studies which have compared regional nerve block techniques for postoperative analgesia with the conventional multimodal analgesia techniques mainly parenteral opioids and other drugs. Study by Dold etal on preoperative femoral nerve block for hip arthroscopy concluded that the patients who had preoperative nerve block had better analgesia and lower opioid requirement.[13] A prospective study by Jian He etal on QL block for postoperative pain in patients undergoing total hip arthroplasty concluded that the block was effective analgesic modality for 48 hours postoperatively,[14] they found VAS scores consistently and significantly lower in QL block group for 48 hours after the surgery. We in our study found the block to be effective but we limited our observations to first 24 hours and found significant pain relief for

first 18 hours. Paras and Blanco et al in their study compared QL1 block with femoral nerve block and found QL1 block superior to FNB for analgesia in patients with femur neck fractures.[15] Michael Stuart Green etal in their study which included patients receiving QL block for total hip arthroplasty found no difference in 24 hours VAS pain scores and also did not find any significant opioid sparing effect of the QL block which is in contrast to our study and most other studies in the literature. They however found a significant lower hospital length of stay in QL block group than group without the block.[16] In our study there was no significant difference observed in the length of stay in hospital.

Mean opioid consumption in 24 hours which is another measure of efficacy of pain relief, in our study was significantly lower and the time to first demand of analgesia was significantly longer in group Q compared to the group N. Study by Jian He et al on patients who underwent total hip arthroplasty and were managed with QL block for pain relief showed a similar trend of significantly low morphine requirement in first 48 hours in the QL block group than the group with no block(16 mg V/s 34 mg morphine).[14] Study by Stuart Green M et al on patients who underwent total hip arthroplasty under general anaesthesia and postoperative analgesia with parenteral analgesics or QL block did not show any significant difference in pain scores or total opioid consumption. This was possibly due to the small sample size of total 20 patients and inconsistency in standardisation in data collection as admitted by the authors.[16] Study by CL McCrum et al on patients undergoing hip arthroscopy with or without QL block noted a significant decreased requirement of opioids in immediate postoperative period in PACU.[17] Their study was confined to the day care patients but conceptually supports the findings of our study.

Early rehabilitation and mobilization form a very important part of postoperative management after hip arthroplasty. Adequate postoperative analgesia and patient's comfort are important factors in early mobilisation and rehabilitation of these patients. In our Institute, most of the patients are mobilised morning after the surgery if they are pain free and cooperative. Our patients in group Q could be mobilized with in an average time frame of 18.68 ± 4.62 hours whereas the group N patients took 24.32 ± 5.36 hours on an average for mobilization, better pain relief (lower VAS scores) and lower requirement of opioid for pain relief were possible contributing factors.

Better pain control and lesser use of opioids facilitates early mobilization and rehabilitation, it should also reduce hospital stay, in our study we did not find statistically significant difference in length of stay in hospital in either of the study groups. Study by Stuart Green M et al on patients undergoing hip arthroplasty with QL block as a modality of postoperative analgesia showed a significant reduction in length of hospital stay compared to the no block group, their study group was small comprising of total 20 patients, 10 in each group making the study grossly underpowered.

LIMITATIONS OF THE STUDY

Our study was a retrospective study in which patient selection bias in to two group could not be ruled out. Being a retrospective study the blinding could not be done hence there could have been bias in administering analgesia during postoperative period between the groups in joint replacement centre. Besides the analgesic efficacy noted by VAS score and opioid use, there was no measure of overall patient satisfaction and comfort.

CONCLUSION

Hip arthroplasties are one of the commonest procedures carried out in elderly population for chronic hip pain. Adequate analgesia, patient comfort, early mobilization and rehabilitation are of paramount importance in successful outcome of these procedures. There are several techniques of postoperative analgesia that can be used for this group of patients including different types of peripheral nerve blocks. Many studies have been published using QL block for multitude of different procedures including many intraabdominal and lower extremity procedures. We in our study found ultrasound guided QL3 block to be a safe and effective postoperative pain management strategy after total hip arthroplasty which facilitated early mobilization and rehabilitation.

ACKNOWLEDGEMENTS

We acknowledge the co- operation extended by the joint replacement team of our hospital in making the records available of the patients included in the study.

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Source of support: The study was carried out in a government institute and no grant or financial support was taken from any agencies.

Conflict of interest: None declared