



A COMPARATIVE STUDY BETWEEN CLASSIC AND INTERADDUCTOR APPROACH OF OBTURATOR NERVE BLOCK WITH ROPIVACAINE IN PATIENTS UNDERGOING TRANSURETHRAL RESECTION OF BLADDER TUMOUR UNDER SPINAL ANAESTHESIA.

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ABSTRACT

Background: The most significant use of ONB i.e., obturator nerve block is to prevent adductor muscle contraction associated with Transurethral resection of bladder tumours (TURBT). Adductor jerk during TURBT may cause serious injury to urinary bladder like laceration with involvement of blood vessels, severe bleeding, bladder wall tear and perforation and even partial resection of bladder tumour due to frequent distraction and interruption to the surgeon.¹ So, there is need for evaluation and comparison of different techniques of ONB in view of safety and efficacy. We have conducted a randomized clinical study to compare the classic pubic and inter adductor approach for ONB with spinal anaesthesia for transurethral resection of bladder wall tumour masses.

Method: A total number of 50 patients of either sex of ASA physical status I or II, of age group 30-75 years, who were posted for TURBT operation under spinal anaesthesia, were included in this study. A Prospective single blind randomised controlled trial and cross over study was conducted. Peripheral nerve stimulator to localize the nerve and Inj. Ropivacaine 0.5% ,15 ml on each side was used in this study.

Result: The overall success rate in classic pubic approach was slightly lower than interadductor approach which was statistically insignificant. There were more instances of vessel puncture in pubic approach, which was statistically significant (p value = 0.016). There was no incidence of other significant complications.

Conclusion: In terms of ease of obturator nerve block and incidence of complications the interadductor approach is better than classic pubic approach.

KEYWORDS : Obturator Nerve Block, Trans Urethral Resection of Bladder Tumour, Spinal Anaesthesia, Ropivacaine.

INTRODUCTION

TURBT is a common operation where, resection of the tumour mass in the bladder wall is done with the help of electrical resectoscope. Tumours of urinary bladder are usually resected under subarachnoid block. When the urinary bladder is distended with irrigation fluid, then the obturator nerve lies very close to the bladder. So, there is a significant risk of obturator nerve stimulation by electric current, when TURBT is done, which may lead to complication like urinary bladder rupture or injury to bladder due to contraction of adductor muscle.² At the time of TURBT of lateral bladder wall, current of electrical resectoscope can stimulate the obturator nerve. This may cause violent adductor muscle contraction, leading to dangerous complications like vascular and visceral injury, bladder wall perforation, hematoma and incomplete tumour mass resection. A serious complication was reported after ineffective ONB was damage to obturator artery in a case of bladder perforation and conversion to laparotomy subsequently.³

There are reports of significant adductor muscle spasm which could not be avoided with general anaesthesia with muscle relaxants. That operation was postponed and again done after one week, with general anaesthesia and bilateral ONB and surgery proceeded smoothly.⁴ Some measures should be taken to get rid of this complication during surgery. General anaesthesia with muscle relaxants and obturator nerve block (ONB) is commonly advocated for prevention of adductor muscle contraction in patients undergoing TURBT.⁵ In the year, 1924, Gaston Labat described the course and branches of obturator nerve in his book named Regional anaesthesia, and mentioned the adoption of the technique of blocking this nerve by classic pubic approach with injection of local anaesthetic.⁶ As there was lack of knowledge of clear anatomic landmarks, the complexity of procedure, discomfort

of patient and uncertain results, the classic pubic method (as described by Gaston Labat) remained forgotten until 1965, then the method was modified and simplified by Prentis and in 1967, by Parks and Kennedy.^{7,8} They described nerve stimulation technique of ONB with success rate between 83.8 % and 85.7% respectively. Now, apart from the classic pubic approach of Gaston Labat, the inguinal approach to block the anterior and posterior branches of obturator nerve at the inguinal level, was described by Choquet et al., in which the needle is inserted at the mid-point between the femoral arterial pulse and the inner side of the adductor longus muscle on the inguinal fold.⁹ The inter adductor approach a, new, simple and reliable method, was described, in 1993, by Wassef MR, in which a needle is inserted behind the adductor tendon.¹⁰ In this modern age, ultrasound guided nerve blocks have become popular for more efficiency and reliability. The use of peripheral nerve stimulator still remains less expensive and useful way of ONB in developing countries.

OBJECTIVES

The general objective of this study is to compare between classic and interadductor approach of obturator nerve block with ropivacaine in patients undergoing transurethral resection of bladder tumour under spinal anaesthesia. The specific objective of this study is to find out whether the interadductor approach of obturator nerve block is beneficial or not, compared to the classic approach of obturator nerve block, with ropivacaine in patients of TURBT under spinal anaesthesia regarding, (1) success of technique (incidence of no adductor jerk after block), (2) ease of technique (number of attempts to complete the block), (3) complications.

METHODS

After getting the clearance of the ethics committee and written informed consent of the patients, this study was undertaken.

The total number of patients was 50. Patients of ASA physical status I or II of age group 30-75 yrs. of either sex, who were posted for TURBT operation in the Urology operation theatre at Institute of Postgraduate Medical Education & Research (IPGME&R), Kolkata., India, were selected for this study. Prospective single blind, randomised controlled trial and cross over study was conducted. Spinal anaesthesia was done in this operation. Total 50 patients were given obturator nerve block using classic pubic approach on one side and the Inter adductor approach on the other side. The type of ONB - approach was randomized for the right and left side.

Allocation of patients receiving the type of block on either side was made according to the random numbers generated by the computer software. Successful obturator nerve block manifested by absence of obturator nerve reflex intra operatively. Exclusion criteria was patients 'refusal, contraindication to spinal anaesthesia, failed or inadequate spinal anaesthesia, allergic reaction to usual anaesthetics drugs, patients with significant systemic disorders. Patients with inguinal lymphadenopathy, perineal infection or hematoma at the needle insertion site, previous surgery or scars in the region, patients on anti-coagulants and anti-platelet drugs and pre-existing coagulopathy, Pre-existing obturator neuropathy. Study variables were, Palpability of pubic tubercle(well/fair/poor) Ease of block (easy/ difficult/ failed), Number of attempts, Needle depth(cm), successful obturator nerve block. The proportion of successful obturator nerve block was the primary outcome measure on the basis of which sample size had been calculated for the study. Assuming a success rate of 75% for the classic approach and an improvement of 20% for the Inter adductor approach, it was calculated that 49 blocks would be required per group in order to detect this level of difference with 80% power and 5% probability of type I error. Hence, 50 subjects were chosen with each subject contributing one instance of pubic and one instance of inguinal approach of obturator nerve block. Parameters were Ease of obturator nerve block (number of attempts for ONB), obturator jerk present or not, number of failed blocks, any adverse reaction. Frequency of bladder wall puncture, success rate, presence or absence of adductor muscle contraction or obturator jerk during operation, were evaluated. Hemodynamic parameters monitored were, Non-invasive blood pressure (NIBP), Heart rate (HR), ECG, SpO2. A spinal block was performed. The patient was kept in supine position and the sensory blockade was checked with an alcohol swab and pin-prick test. As the block of sensory level reaches above T10 then ONB was performed on the right or left side as per the approach assignment for the side.

A single investigator, who was not involved in further peri-operative care of those patients, had performed the ONB. For both approaches, patient was laid supine, with the lower limb abducted at 30°. In the classic pubic approach, the nerve stimulator needle was inserted at a point 1.5 cm lateral and 1.5 cm inferior to the pubic tubercle. For the interadductor approach, the needle was inserted behind the upper part of the adductor longus (AL) muscle near its pubic insertion. If the adductor muscle contraction did not occur by the 10th attempt, it was defined as a failed block. Needle puncture frequency, success rate of ONB and the presence of adductor muscle contraction during operation were evaluated. The block was defined as successful when adductor muscle contraction occurred within ten attempts and muscle contraction does not occur during the operation.

A peripheral nerve stimulator was used to perform ONB. Initially, after piercing the skin, an electric current of 1.5 to 2 mA at a frequency of 2 Hz was set. Once the needle was in contact with the obturator nerve, the initial muscle contraction was elicited. At this point, stimulating current was reduced gradually until visible muscle contraction occurred at lower

current levels (approx. 0.4 to <0.5 mA). At this point 15 ml of 0.5% Ropivacaine was injected. After injection of the drug, the current was again gradually increased and re-checked for any response to stimulation with the needle in situ. Absence of any response to stimulation indicated that the block was effective. A period of approximately 15 minutes was allowed for the local anaesthetic to take effect. The ease of approach was classified according to the number of attempts required to accomplish the block: Easy = attempts 2 or less, Difficult = attempts >2 & < 10, Failed = attempts > 10.¹¹ The ease of block or success rate (number of attempts to accomplish the block) was noted and compared between both approaches. The number of needle attempts and the needle depth were observed and recorded. complications such as nerve injury, obturator hematoma, visceral injury and intra-vascular injection, were noted and compared with both approaches of ONB. Evaluation was done for any adductor spasm during operation. The intra-operative occurrence of adductor spasm during the resection of the lateral bladder wall tumour mass by electrocautery, even after successful ONB with peripheral nerve stimulator was considered as a failure.

Study Parameters

(i) Ease of obturator nerve block (number of attempts to accomplish the ONB), obturator jerk present or not, number of failed blocks, any adverse reaction. (ii) Frequency of bladder wall puncture, success rate, presence or absence of adductor muscle contraction or obturator jerk during operation, were evaluated. (iii) Hemodynamic parameters: (a) Non-invasive blood pressure (NIBP), (b) Heart rate (HR), (c) ECG, (d) SpO2.

RESULT

The overall success rate according to the number of successful blocks, in group P (i.e., pubic) was 82% and in group I (i.e., inter adductor) was 90% and the p value was 0.4240 by McNemar's test which is statistically insignificant. There were 7 instances of vessel puncture in pubic needle insertion depth (group P = 5.77±0.88cm and group I = 4.25±0.84 cm and p value is <0.0001 i.e. significant), number of attempts (group P=4.36±2.62 and group I =2.92±2.27 and p value is <0.001 i.e. significant. The ease of block ,54% easy in group I as against 30% in group P and p value is <0.038 i.e., significant. The success rate of pubic approach was 82% against 90% in inter adductor approach. The rate of complications i.e., vascular puncture was nil in inter adductor approach (0/50i.e. 0%) as compared to the pubic approach (7/50i.e. 14%), as observed in this study which was statistically significant (p value=0.016). There was no incidence of hematoma formation, bladder perforation, obturator nerve injury or incomplete tumour mass resection in either group.

Table1: Distribution Of Demographic Statistical Parameters:

Demographic Pattern		
	Mean	Standard dev
Age (year)	58.64	7.425
Weight (kg)	63.08	6.259
Height (meter)	1.67	0.042
Demographic profile		
SEX (Male/ Female)	39/11	
ASA PS (I/ II)	24/26	

Table2: Distribution Of Other Important Statistical Parameters

Side allocation			
	Left	Right	Total
Group p	26	24	50
Group i	24	26	50
total	50	50	100
Number of attempts			
	mean	Standard dev.	P value
Group P	4.36	2.038	<0.001

Group i	2.92	1.947	
Needle depth (cm)			
	mean	Standard dev.	P value
Group p	5.77	0.884	0.0001
Group i	4.25	0.844	
success rate			
	Group p		
Group i	Success	failure	
Success	36	9	45 (90.0%)
failure	5	0	5 (10.0%)
	41(82.0%)	9(18.0%)	50
ease of block			
	mean	Stan.Dev	P value
Group P	1.88	0.689	0.038
Group i	1.54	0.646	
failure rate			
	Group p		
Group i	no	yes	
No	47	2	49 (98.0%)
yes	1	0	1 (2.0%)
	48(96.0%)	2(4%)	50
McNemar Test			
Difference	2.00%		
95% CI	-4.87 to 5.90		
Significance	P = 1.000		
Complications			
Group i	Group p		
	0	1	
No Vess. injury	43	7	50(100%)
Vessel injury	0	0	0(0.0%)
	43(86%)	7(14%)	50
McNemar test			
Difference	14.00%		
95% CI	2.53 to 14.00		
Significance	P = 0.016		

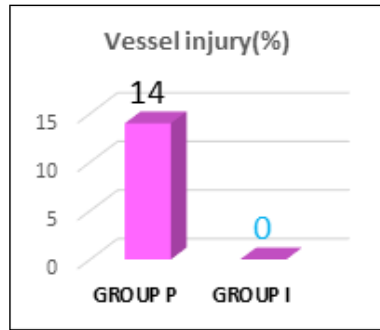


Diagram 3

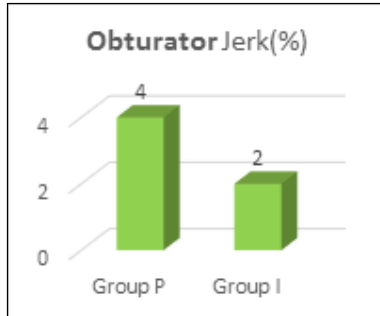


Diagram 4

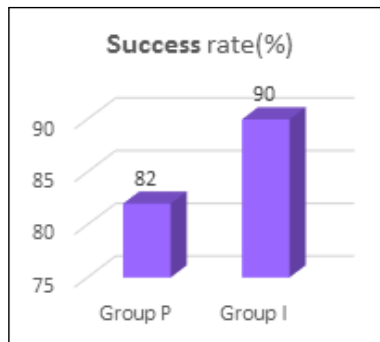


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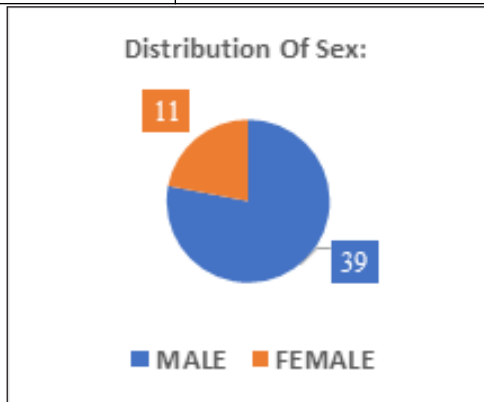


Diagram 1

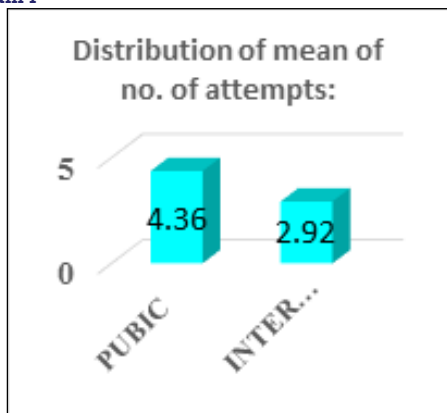


Diagram 2

DISCUSSION

There is significant risk in TURBT operation as the electrical resectoscope can transmit electrical stimulation when resection of tumour is done at the inner lateral or infero lateral wall of the urinary bladder. This may lead to occurrence of contraction of adductor longus muscle which is innervated by obturator nerve. The obturator nerve contains both motor and sensory nerve fibre and is situated close to the urinary bladder.^{12, 13, 14} Due to this adductor contractions or jerks, the resectoscope may injure the wall of the bladder. So, bladder perforation, injury to pelvic viscera and blood vessels may lead to severe haemorrhage and shock.⁹ Postponement of surgery or conversion to open procedure, incomplete tumour mass resection, has also been happened. Some methods have been tried to get rid of this problem. General anaesthesia (GA) with muscle relaxation is a good choice to avoid jerk of the adductor muscles during TURBT.^{5, 11} But, this may be risky as significant number of patients belong to geriatric age group.¹⁵ Patients also may have coexisting disease. In case of patients with chronic obstructive pulmonary disorders and cor pulmonale, general anaesthesia is risky due to chance of bronchospasm due to airway instrumentation, increased pulmonary artery pressure, atelectasis due to decreased functional residual capacity and lithotomy position, mismatch of ventilation perfusion and pneumothorax due to possibility of rupture of emphysematous bullae, if present, with positive pressure ventilation.¹⁶ there are reports of obturator jerk occurring, even

if the patients were under GA with muscle relaxation. So PC, in 2004,⁴ reported a case of TURBT where obturator nerve block was given to prevent the obturator jerk, with electrical nerve stimulator guidance which enabled the surgeons to continue the TURBT. Another technique to prevent the occurrence of obturator jerk during TURBT include, using vaporising resection with the use of one electrode.¹⁷ Avoidance of over distension of the bladder (so that obturator nerve is to some extent away from the lateral bladder wall) and the use of Argon laser resectors also done to prevent obturator nerve stimulation.¹⁸ Change of electrical circuitry by unmodulated high frequency current for the resectoscope also adopted.⁷ Change in site of inactive electrode also done to prevent adductor jerk.¹⁹ Use of saline irrigation and modification of current flow also tried to overcome obturator nerve stimulation.^{20, 21} Periprostatic infiltration with local anaesthetics also adopted to prevent obturator nerve stimulation.²² Prentiss et al in 1965 reported a 20% incidence of severe adductor muscle contraction in patients undergoing transurethral surgery for large intra-urethral prostatic adenomas or laterally located bladder tumours.⁷ He was the first to propose regional block to prevent obturator jerk in TURBT. Gaston Labat et al in 1922, first described the classic pubic approach to obturator nerve block which is a landmark guided procedure as it requires identification of pubic tubercle.⁶ Park et al in 1967, simplified this method.⁸ The authors, studied the branches and course of obturator nerve and popularised the classical technique of Labat by successful ONB with less drug volume. Kobayashi et al in 1991 administered ONB by using insulated needle and peripheral nerve stimulator.²³ Thus, ONB has undergone evolution through many stages viz. interadductor approach, para vascular superficial inguinal approach and ultimately leading to the introduction of ultrasound guided nerve blocks. As the availability of ultrasound in the operating theatres is limited, nerve stimulator guided blocks remain the commonly practised technique in most of the centres in our country. Labat in 1922, described the classic pubic approach of ONB and it still remains the commonly performed technique where identification of pubic tubercle and the obturator foramen is the basis for localizing the obturator nerve. The pubic tubercle is difficult to identify in obese patient and in patients with the blunt pubic bone.¹² When identification of the tubercle is difficult, the needle may pass above the pubic ramus and may injure the surrounding structures (bladder, rectum, spermatic cord).²⁴ ONB is done in a highly vascularized region. Painful periosteal contact of needle with multiple needle redirection occurs during the Classic Pubic approach.²⁵

So, the rate of complications such as obturator vessels injury due to their close proximity to the nerve is high. This problem remains as an obstacle to this approach. The search for an optimum approach to overcome the difficulties of classic pubic approach has led to the advent of a new interadductor approach. The interadductor approach does not necessarily require the palpation of pubic tubercle. The patient compliance rate of ONB by pubic and interadductor approaches in unanaesthetised patients may be low. Pain and discomfort of the patients had been observed during the attempt of ONB. Therefore, all blocks were performed after administering spinal anaesthesia.⁹ In this study it is apparent that the inter adductor approach (success rate of 90%) was easier to perform than the pubic approach (success rate of 82%) though it was statistically insignificant (p value = 0.4240). Incidence of vascular puncture was less in inter adductor approach (0/50 i.e., 0%) as compared to the pubic approach (7/50 i.e. 14%), as demonstrated in this study which was statistically significant (p value=0.016). In this study it was observed that the interadductor approach is better and safer than the classic pubic approach in terms of vessel injury, needle depth, number of attempts and mean ease of block. The success rate of interadductor approach was found to be

clinically higher (90%) in comparison to pubic approach (82%), though statistically insignificant. The complication like vessel puncture was found to be significantly lower (p value = 0.016) in group I i.e., in interadductor approach (0%) compared to group P i.e., pubic approach (14%). Incidence of failure (i.e., jerk), was slight less in group I (2%) compared to group P (4%), though statistically insignificant.

CONCLUSION

In this study we observed that the interadductor approach is better than classic pubic approach in terms of needle insertion depth, number of attempts, ease of obturator nerve blocks and incidence of complications (vessel injury). From this study we can conclude that, the inter adductor approach of obturator nerve block is better, safer, causes less complication and easier to perform in comparison to the pubic approach, to prevent adductor muscle jerk by blocking the obturator nerve during TURBT under spinal anaesthesia.

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Conflicts Of Interest

There is no conflict of interest

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