

Anatomical consideration in evaluation of different block techniques for hydrocoele surgery: a prospective randomized study.

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Abstract

Background: Abnormal collection of fluid in the tunica vaginalis or processus vaginalis presenting as hydrocoele is best managed surgically under loco regional anesthesia technique. Understanding of anatomical implication of relevant nerve blocks is a mandate for successful outcome in different approaches for appropriate regional anaesthesia. Local and regional anaesthesia provides several benefits over neuraxial or general anaesthesia.

Objectives: to assess and evaluate block performance time and pain scores at various stages after block and during hydrocoele surgery.

Patients and methods: A prospective study was carried out over a period of 11 months on 100 adult ASA PS I/II patients presenting with mild to moderate hydrocoele in a urology super-specialty centre. After obtaining informed consent for the study design, the patients were randomized in two groups of 50 each. In Group S, spermatic cord block was performed. In the other Group C, Ilio-inguinal and ilio-hypogastric in

combination with genital branch of genitofemoral block was blocked. In both groups, local anaesthetic infiltration was done at surgical incision site. The drug volume, block needle, anesthetist, surgeon and assessor were kept same. The observations were compared for block performance time, surgical duration and pain score at five arbitrary stages of anaesthetic and surgical procedure.

Results: the two groups were comparable in demographic criterion namely age (p 0.73) and weight (0.88). Significant difference was observed in block performance time (p 0.039) between two groups. However, difference between surgical duration (p 0.33) in either group was insignificant. While assessing pain score at various stages, the difference was insignificant immediately after the block (p 0.86), at 5 min prior to skin incision (p 0.20), at skin incision (p 0.30) and at traction of sac (p 0.77). Conversely, at the end of surgery Group S had significantly (p 0.014) better pain score than Group C. Overall pain scores were within acceptable reference range in all patients, except five

who were dropped in the study for further evaluation and rescue analgesia. **Conclusion:** hydrocoelelectomy done under various loco-regional approaches is practical and acceptable for fair control of pain in majority of patients. We recommend both methods of regional anaesthesia to be adequate for the same as an advantageous modality despite anatomical disposition and variations of nerve supply to scrotum.

Keywords: Hydrocoele, Scrotum, Spermatic Cord, Anaesthesia, Regional, Block.

Introduction

Hydrocoele is an abnormal collection of serous fluid in the tunica vaginalis or a patent processus vaginalis. It is commonly encountered in our clinical practice and often requires surgical treatment. Hydrocoele is idiopathic in most cases apart from being secondary manifestation of orchitis, epididymitis, tuberculosis or filariasis, torsion, trauma or tumor. Patients presenting with mild to moderate idiopathic hydrocoele⁽¹⁾, are best managed surgically under loco-regional anaesthesia. For open hydrocoelelectomy through scrotal incision; scrotal block, also called as spermatic cord block anaesthesia alongwith skin infiltration of scrotum at incisional site is most commonly used anaesthetic procedure in day care surgery for exploration of testis, epididymis or spermatic cord itself. It provides adequate analgesia thereby facilitating surgical interventions and proceedings. This technique has least complications related to procedure per se, in addition to safety and cost effectiveness. Regional block techniques are particularly appropriate when the subject is poor candidate for general or neuraxial anaesthesia.

Apart from spermatic cord block, combination block of ilio-hypogastric nerve (IIN) and ilio-inguinal nerve (IHN), together with block of genital branch of genitofemoral nerve (GFN) had been commonly used

technique as an adjunct or sole procedure.⁽²⁾ The successful outcome of patient satisfaction concerning pain depends upon effectiveness of block.

Aim of study

This study is designed at observing the quality and efficacy of block in two different approaches for hydrocoele surgery, namely

- A. Scrotal block also called as spermatic cord block anaesthesia vs.
- B. Combination block of ilio-hypogastric, ilio-inguinal with genital branch of genitofemoral nerve.

All approaches have intrinsic benefits and complications associated with it owing to anatomical configuration and variations. Concerns for patient discomfort, acceptability and technical difficulties in different methodologies needs evaluation of the feasibility of various regional anaesthesia modes for hydrocoelelectomy as a day care procedure. The literature is devoid of any such comparison of different block approaches specific to hydrocoele surgery. This comparison will help in decision making, if a local cause precludes the use of either block in conditions like swelling or poor anatomical localization of landmarks.

Patients and methods

This study was conducted on 100 adult patients between 18-60 years, with ASA PS I &II patients⁽³⁾, having mild to moderate hydrocoele scheduled for Jaboulay's hydrocoelelectomy⁽⁴⁾ and proceedings. No history of chronic cough, leg swelling or trauma to the scrotum was present. All the patients have normal external genitalia without remarkable abnormality in penis or scrotum. In all patients, palpable testicles were bilaterally descended in normal anatomical position. The abdomen was essentially normal with intact hernial orifices. Any recent fluctuation in size of hydrocoele,

thereby indicating patent processus vaginalis was ruled out. No inguinal lymphadenopathy or evidence of scrotal cellulitis was evident. In all cremasteric reflex was intact. All surgery was conducted at Urological super-specialty centre over a period of last 11 months. Exclusion criterion included the following cases: giant hydrocoele⁽¹⁾, neuromuscular, psychiatric, neurological, history of convulsions, coagulation disorders, infection at the block injection sites, patient with a body mass index (BMI) more than 30 and those who refused the procedure and informed consent at pre-anaesthetic check up.

Patient was advised fasting according to guidelines⁽⁵⁾. Half an hour prior to surgery intravenous catheter was placed in the upper limb contralateral to the surgical site and 1mg intravenous midazolam was given for Anxiolysis. On arrival in operating room, Standard anesthesia monitors (ECG, Pulse Oximeter, and Non-invasive Blood Pressure) were applied. The patients were positioned in the supine position with the face turned to the contra-lateral side. Proper sterilization and draping of the block area was performed. During entire perioperative period, communication with patient was maintained. Patients were randomized in two groups of 50 patient each using computer generated number and concealed using sequentially numbered, sealed opaque envelope technique to be opened only just prior to institution of blocks. 100 patients scheduled for hydrocoelelectomy following regional block and skin infiltration were divided into two groups:

Spermatic cord block anaesthesia (GROUP S) and

- Combination of ilio-hypogastric, ilioinguinal and genital branch of genito-femoral nerve (GROUP C).

In both groups:

- Local anaesthetic used for nerve blockade and skin infiltration consisted of 30 ml of 1:1 volume of 0.5% Bupivacaine and 2% of Lignocaine; 20ml to be used for regional block and rest 10 ml for skin infiltration.
- 10 ml standard syringe with needle size 0.70 x 40 mm was used for administering local anaesthetic. Drug solution was administered in small aliquots with repeated aspiration in between.

Measured parameters for demographic data of patients were recorded in either group under:

- Age
- Weight
- ASA Physical status

Additionally other specific entities were recorded as:

- Block performance time: this is the interval between the first needle insertion and its removal at the end of administering block.
- Surgical duration for the procedure: it is noted time between skin incision to last suture for repair.
- Assessment of pain: was made by asking the patient to quantify verbally between 0 to 10, 0 means no pain and 10 means excruciating pain.

VAS score was recorded at following different point of times:

1. Immediately after block performance indicating procedure related pain.
2. 5 minutes prior to planned skin incision.
3. At skin incision.
4. At traction of hydrocoele sac.
5. At the end of surgery.

Nerve block was assessed using feeling of cold sensation with alcohol soaked swab and blunted needle pricks at 5 min interval for 20 minutes after withdrawal of last injection. Those having no complain with

pinpricks and ascertained loss of cold sensation at incisional area of scrotum were taken up for surgery.

Block failure criterion was arbitrarily fixed at VAS Score ≥ 4 .

Diclofenac 75mg intramuscularly, Paracetamol 1000mg infusion with butarphanol 1 mg as multimodal analgesia was given as rescue for pain. Those subjects were subsequently removed from further observation, owing to intervention.

Anesthetist providing the block and surgeon operating the cases were same in the entire study to minimize inter-observer variations.

Statistical analysis of data was performed using:

- Calculation of mean with standard deviation for age and weight
- Independent sample two tail t-test for other numerical variables of observations.
- $P < 0.05$ was considered statistically significant for inference.

Results and discussion

Demographic characteristics of patients in both groups were comparable in terms of age (p 0.73), weight (p 0.88) and ASA physical status. (TABLE 1)

Table 1	Patients Demographic Criteria		
Demographic Criteria	Group S (n=50)	Group C (n=50)	
		Mean \pm S	P value
	Mean \pm SD	D	
Age	45.3 \pm 2.32	43.9 \pm 2.6	0.73*
Weight	60.3 \pm 4.31	59.2 \pm 4.9	0.88*
ASA PS I/II	39/11	42/08	

*Statistically significant between group difference (P \leq 0.05)

Regarding block performance time, Group S has significant difference (p 0.039) compared to group C. This can be related to bit cumbersome 3-site injection compared to 2-site injection in different study group. Overall, the procedure in-group S was less lengthier than in group C. (TABLE 2)

Table 2	Block Performance Time (Min)	
Number	Group S (N=50)	Group C (N=50)
Mean	7.62	8.5
Median	7.5	8.5
Sd \pm	1.0427	1.336
Variance	1.0873	1.7857
P Value	0.039*	

*Statistically Significant Between Group Difference (P \leq 0.05)

As regards duration of surgeries in each group it was found to be comparable in either group (p value= 0.337). (TABLE 3)

Table 3	Duration Of Surgery (Min)	
Number	Group S (n=47)	Group S (n=48)
Mean	21.87	21.47
Median	22	21
Sd \pm	1.377	2.44
Variance	1.89	5,95
P value	0.33*	

Concerning pain assessment at different stages of observation period it can be said, when scored immediately after procedure the difference was non-significant (p 0.86). When assessed 5 min prior to skin incision, the difference was non-significant (p 0.20). When assessed at skin incision the difference was non-significant (p 0.30). There was an interesting observation in assessment during traction of sac.

Although pain score were fairly comparable with no significant difference(p 0.77), however owing to moderate pain rescue analgesia was administered patients in Group S and 2 patients in Group C (Table 4). As per study design, they were considered failure and excluded in subsequent observation. . However, at the end of surgery however group S had significant lower score then Group C (p value=0.014).

Nonetheless, overall at all stages in the surgery, VAS score was observed to be fairly low and acceptable as a satisfying study. (GRAPH 1).



Graph 1

Nerve supply of scrotum

Classical anatomical studies describes that the scrotum has a unique pattern of innervations. The anterior and lateral third aspect of scrotum is supplied by genital branch of genitofemoral nerve and anterior cutaneous branch of iliohypogastric and ilioinguinal nerve⁽⁶⁾. Together they are popularly called as ‘border nerves’⁽⁶⁾. Additional posterior third supplies are derived from mainly the scrotal branches of perineal nerve, a branch of pudendal nerve and from inferior pudendal branch of femoral cutaneous nerve.

This demarcation in supply by L1 and S3, indicates the ‘ventral axial line’ of the lower limb development, hence neuraxial anaesthesia must be administered much higher to anaesthetize the anterior region⁽⁶⁾. Anatomical dissection demonstrated, the dissimilarity of cutaneous branches of the ilioinguinal and genitofemoral nerves. The genitofemoral nerve was found to be missing in

almost a third of human cadavers⁽⁶⁾. In addition, the sensory branch of the ilioinguinal nerve was absent in 40% of patients⁽⁷⁾. This limits the unswerving description of traditional pattern of distribution and the terminal course of the ilioinguinal and genitofemoral nerve, to only 20% of cadaveric dissections⁽⁷⁾. Hence, an unambiguous understanding of the innervations of the scrotum is relevant to anatomically sound surgery⁽⁶⁾. Nerves accompanying the testicular vessels are derived from T10-11 spinal segments with variable interconnections to level above and below. This might account for the pain observed at traction of sac. Other attributing cause of pain in particularly at manipulation of SAC may be equated to anatomical variations in distribution of supply of component nerves⁽⁸⁾.

Spermatic cord is a collection of various structures around ductus deferens, which exits the abdomen and extends from deep inguinal ring to corresponding testicle⁽⁹⁾. It is covered by internal spermatic fascia, cremasteric fascia and external spermatic fascia in addition to remnants of processus vaginalis.

It contains testicular, cremasteric arteries and artery of the ductus deferens, lymphatic vessels, the pampiniform plexus of veins, genital branch of genitofemoral nerve (L1-2), ilio-inguinal (T12-1) nerve, plexus of sympathetic nerve (T10) and visceral afferent nerve fibres⁽¹⁰⁾. These nerve supplies cremasteric muscles and sensation to intrascrotal contents⁽¹¹⁾. Spermatic cord can be identified by manual palpation immediately lateral to pubic tubercle⁽¹²⁾.

Spermatic cord nerve block aka SCAB(spermatic cord anaesthesia block): Based on tactile location, spermatic cord is temporarily stabilized at inguino-scrotal junction with non dormant hand against the bone , and needle is injected immediately lateral to cord, superficial to the bone at a landmark, being 1cm

below and 1 cm medial to pubic tubercle⁽¹³⁾. The local anaesthetic is injected at different angles in the spermatic cord, in small aliquots while aspirating in

Table 4

Vas score observed at different point of time

Parameters	Score immediately after procedure		Score 5 min prior to skin incision		Score at skin incision		Score at traction of sac		Score at end of surgery	
	Group S	Group C	Group S	Group C	Group S	Group C	Group S	Group C	Group S	Group C
Numbers	50	50	50	50	50	50	50	50	47	48
Mean	1.26	1.82	0.38	0.38	0.8	0.96	1.04	1.1	0.74	1.06
Median	1	2	0	0	1	1	1	1	1	1
Standard deviation	0.52	0.62	0.53	0.70	0.83	0.7	1.02	1.03	0.67	0.56
Variance	0.27	0.39	0.28	0.49	0.69	0.77	1.05	1.07	0.45	0.31
P value	0.86*		0.20*		0.30*		0.77*		0.014*	

*Statistically significant between group difference (P<0.05)

between to avoid penetrance of peritoneum and femoral vessels⁽¹⁴⁾. This technique was used as early as 1960s⁽¹⁵⁾. A skillfully performed SCAB provides anaesthesia to the scrotal contents without providing skin anaesthesia, which needs local anaesthetic infiltration at incision site⁽¹²⁾.

Genito Femoral Nerve Block⁽¹⁶⁾: Genital branch of genitofemoral nerve provides sensory supply to the scrotum. As it emerges from superficial inguinal ring, it positions itself immediately lateral to the spermatic cord. This branch supplies efferent arm of cremasteric reflex⁽¹⁷⁾(a reflex elicited as distortion and apparent shrinkage of the scrotal surface area and ascent of ipsilateral testis). The genitofemoral nerve was blocked immediately proximal to the pubic tubercle on a line

joining the anterior superior iliac spine to the pubic symphysis⁽¹⁶⁾.

Ilioinguinal nerve(IIN) and ilio-hypogastric(IHN) nerve block: The landmark for point of injection was localized at 5cm cranial and 5 cm posterior to anterior superior iliac spine⁽²⁾. In cadaveric studies both the nerves were found quite close to each other, between internal oblique and transverses abdominis muscle. At this point, both IIN and IIH lie under internal oblique fascia^(18,19). Local anaesthetic was given in small 5ml aliquots. At this point both nerves are not ramified, and lies in the same layer of abdominal wall with high probability, in this manner increasing the chance of block success to as much as 90%⁽²⁾, despite having myriads of anatomical variations⁽¹⁸⁾. IIN and IHN block

in the TAP plane with GFN supplementation is recommended as an excellent anesthesia technique for inguinal surgery⁽²⁾.

Conclusions

We put forward successful experience with regional anaesthesia as validated in the past⁽²⁰⁾. Local and regional anesthetic nerve blocks for surgery in scrotal region owe its appropriateness and amicability to scrotal nerve anatomical configuration. Success in block is proportionate to the comprehension of neural supply of the region. The testis, epididymis and cord structure can be maneuvered without pain. However, traction of the hydrocoele sac produced noteworthy discomfort and pain. The shortcoming of regional blocks related with landmark guided blind techniques are vascular injury to testicular artery, possible intra-arterial injection, damage to ducts, bleeding and cord hematoma apart from partial to complete failure of blocks warrants prudence and acquisition of recommended learning curve^(2,21). For the patients; the length of time spent in the recovery room, postoperative starvation, the chances of intraoperative anaesthetic complications owing to neuraxial or general anaesthesia and restrains of late domiciliary care are all addressed and reduced. We conclude modified spermatic cord block is a simple safe and effective technique in urological practice.

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