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Original article

Comparison of Pelvic Plexus Blockade to other Conventional Techniques of Analgesia in Transrectal Ultrasound Guided Prostate Biopsy

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ABSTRACT

Objectives: To compare the degree of pain, efficacy and safety of pelvic plexus block to other conventional techniques of analgesia in 12 core transrectal ultrasound guided biopsy of prostate.
Materials and Methods: The study included 160 consecutive cases of prostate biopsy, prospectively randomized into four groups of 40 each –Men in group 1 (control arm) received lignocaine gel (2%) only; Group 2 received lignocaine gel with basal periprostatic nerve block (BPNB) with 2% lignocaine; Group 3 received lignocaine gel (2%) with apical periprostatic block (APNB) with 2% lignocaine and Group 4 received lignocaine gel with pelvic plexus block. Pain was recorded on a 10 point visual analogue scale by a nurse.
Results: Patients in pelvic plexus block group had lowest pain score (1.25±0.43) while lignocaine injection than BPNB (1.53±0.45) and APNB (1.58±0.50, P value = 0.008). The mean pain score among 4 groups while taking the biopsy cores were 4.85, 2.67, 2.48 and 1.95, respectively. Patients who received pelvic plexus block experienced least pain than BPNB and APNB groups (p value 0.001 and 0.002, respectively). Perineal pain persisted longer in pelvic plexus block group than apical and periprostatic groups. Duration of dysuria was less in pelvic plexus nerve block group. Hematuria and rectal bleed complications were comparable in all groups.
Conclusion: Prostate biopsy should be performed with either periprostatic nerve block (basal or apical) or pelvic plexus block under Doppler ultrasonography guidance. Pelvic plexus block provides superior analgesia to basal and apical periprostatic block.

Key Words: Transrectal ultrasound guided prostate biopsy, Pelvic plexus block, periprostatic nerve block, Analgesia

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INTRODUCTION

Transrectal ultrasound (TRUS) guided prostate needle biopsy is the standard procedure to diagnose prostate cancer. With the recent trend towards early detection of prostate cancer, it is being used much more frequently. Because TRUS-guided prostate biopsy is painful, different anesthetic techniques are used to make the procedure more comfortable. Studies show that almost 20% of patients report the pain to be significant and that they would refuse re-biopsy without analgesia[1]. Local anesthetic injection has been used by many urologists for taking TRUS guided biopsies of the prostate, but the ideal site, type and amount of local anesthetic are still debated.

Periprostatic infiltration is a widely utilized method of analgesia in TRUS

guided prostate biopsy. However, a standard approach has not been clearly defined. Wu et al have reported that periprostatic infiltration is insufficient for 12-core biopsies[2]. Apical and basal applications may have different results[3]. Pelvic block as a recent technique has optimistic results[4]. Therefore we aimed to design a prospective study comparing these different local anesthetic techniques.

In this study, we aimed to evaluate the degree of pain/discomfort associated with 12-core TRUS guided biopsy in Indian men. We also assessed and compared the efficacy and safety of various analgesic techniques including: (a) lignocaine gel only, (b) lignocaine gel with basal periprostatic nerve block, (c) lignocaine gel with apical periprostatic nerve block and (d) lignocaine gel with pelvic plexus block

MATERIALS AND METHODS

This study was a single center, prospective randomized controlled trial comparing patients who received intrarectal 2% lignocaine gel only with those who received Basal Periprostatic Nerve Block (BPNB), Apical Periprostatic Nerve Block (APNB) or Pelvic Plexus Nerve Block (PPNB) for 12-core TRUS-guided prostate biopsy. After institutional research committee approval, 160 consecutive patients were recruited for the study between January 2008 and June 2010. Randomization and grouping of all patients were done using a computerized random numbers table generated by a statistician.

Biopsy indications were an elevated serum Prostate-Specific Antigen (PSA) or abnormal digital rectal examination. Men with a history of bleeding disorders or lignocaine allergy were excluded. Patients who had local anorectal conditions like fissure, piles or anorectal fistulas were also excluded. Informed written consent was obtained. Oral antibiotics (Ciprofloxacin 500 mg and Tinidazole 1000 mg) were started on the night before the procedure and continued for 3 days.

All patients received lignocaine gel (2%) as local application for 15 minutes before TRUS probe insertion. Patients were randomly assigned into 4 groups of 40 each:

- **Group 1:** 2% Lignocaine gel only (no nerve block): Only 2% intrarectal lignocaine gel applied without any nerve block.
- **Group 2:** Basal periprostatic nerve block (BPNB): Under Doppler ultrasonic guidance 2 ml of 2% lignocaine was injected at the basolateral aspect of the prostate, below the seminal vesicles
- **Group 3:** Apical Periprostatic Nerve Block (APNB): The prostate was imaged in the sagittal view at the midline. The needle was introduced at the level of the prostatic apex. The disappearance of the resistance was suddenly felt after passing Denonvilliers' fascia. Resistance to the injection was felt if the needle was in the prostate. Lignocaine (5 ml, 2%) was injected. When the needle was in the correct position, the distribution of the local anesthetic agent was visualized on the ultrasound scan as a separation of the tissue planes toward the base of the prostate under Denonvilliers' fascia.
- **Group 4:** Pelvic Plexus Nerve Block (PPNB): The pelvic neurovascular bundles were well visualized just lateral to the tip of the seminal vesicles on Doppler ultrasonic guidance. Lignocaine injection (2ml, 2%) was injected adjacent to the neurovascular bundle where the pelvic plexus is situated (Fig. 1 A-D).

Local anesthetic was injected under Doppler ultrasound guidance. In all

Table 1: Comparison of different variables in the four study groups using various analgesia techniques for TRUS guided prostate biopsy

Variable	Group 1 lignocaine gel 2%	Group 2 lignocaine gel 2% + (BPNB)	Group 3 lignocaine gel 2% + (BPNB)	Group 4 lignocaine gel 2% + (BPNB)	p-value
Age (years)	67.0 ± 9.7	66.3 ± 10.0	7.9 ± 66.2	66.3 ± 8.2	0.283 *
Serum PSA (ng/ml)	13.5 (4.34-1900)	18.5 (2.6-4826)	13.2 (0.06-2800)	10.8 (0.06-156)	0.325
Prostate volume (cc)	45.4 ± 19.7 (15-134)	45.8 ± 19.7 (20-150)	50.0 ± 25.7 (14-146)	42.6 ± 14.5 (15-71)	0.728
VAS1	1.5 ± 0.5 (1-2.5)	1.2 ± 0.3 (1-2)	1.1 ± 0.2 (1-2)	1.3 ± 0.5 (0.5-2.5)	0.067
VAS2	NA	1.5 ± 0.5 (1-2)	1.6 ± 0.5 (1-3)	1.3 ± 0.4 (0.5-2)	0.008
VAS3	4.9 ± 0.9 (2-6)	2.7 ± 0.8 (1-4)	2.5 ± 0.8 (1-4)	2.0 ± 0.6 (1-3)	0.001
Perineal pain (days)	1.8 ± 0.9 (0-3)	0.4 ± 0.7 (0-2)	0.3 ± 0.3 (0-2)	0.5 ± 0.8 (0-2)	0.001
Dysuria (days)	1.9 ± 0.8 (0-4)	2.1 ± 0.5 (1-3)	1.8 ± 0.7 (0-3)	1.6 ± 0.6 (0-2)	0.02
Hematuria (days)	0.2 ± 0.4 (0-1)	0.4 ± 0.7 (0-2)	0.3 ± 0.6 (0-2)	0.3 ± 0.6 (0-2)	0.95
Rectal bleeding (days)	0.5 ± 0.6 (0-2)	0.9 ± 0.8 (0-2)	7.0 ± 0.8 (0-2)	0.6 ± 0.8 (0-2)	0.20

BPNB: basal periprostatic nerve block, APNB: apical periprostatic nerve block, PPNB: pelvic plexus nerve block, VAS- visual analogue score, VAS1- pain during ultrasound probe insertion, VAS2- pain during lignocaine injection, VAS3- pain during needle core biopsy using the Biopty® gun

the groups, the syringe was aspirated before local anesthetic injection to avoid intravascular injection. A high frequency (7-9 Hz) end-firing probe was used and 12 biopsy cores were taken with an automatic spring-loaded Biopty® gun. A spinal needle (17.8 cm, 22 gauge) was used for giving the injections. Biopsies were taken 15 min after application of the block. All biopsies were done by a single doctor. The 12 biopsy cores were taken from the medial and parasagittal areas of the base, mid-gland and apex of the prostate. Pain scores (0-10 points) on a visual analog scale (VAS) were assessed three times in all cases: (1) at probe insertion (2) after injecting local anesthetic agent and (3) immediately after taking the biopsy cores in all cases. The scale was filled in by the patient with the help of a trained nurse who was blinded to the type of analgesia received by the patient. The patient was also blinded to the site of local anesthesia injection.

Data were collected for all cases in terms of the patient's age, PSA, DRE, prostate volume, indication for biopsy, final histology and complications of the procedure. Data analysis was done using SPSS software 2009 version. Kruskal-Wallis and Wilcoxon rank-sum tests were applied to determine

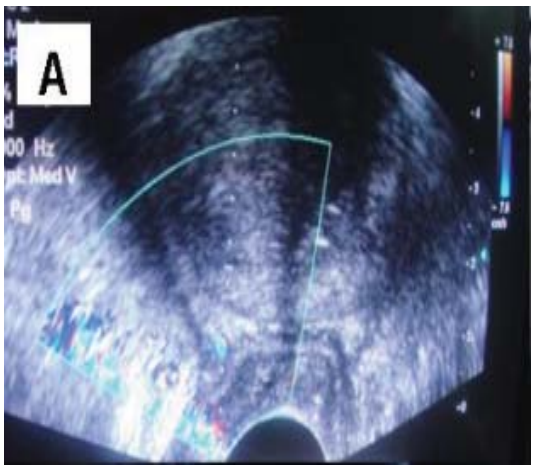

Fig. 1A: TRUS with Doppler showing location of periprostatic nerve plexus.

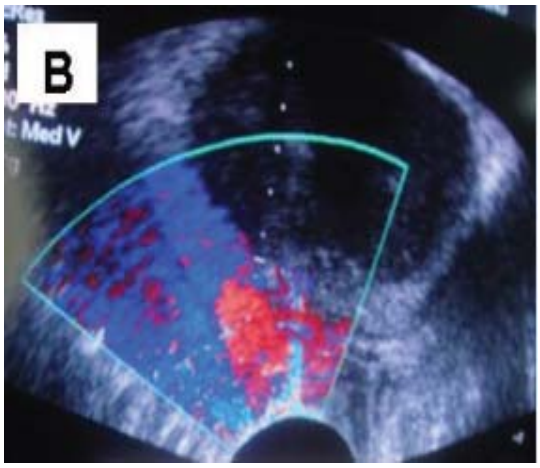

Fig. 1B: TRUS showing injection of lignocaine under Doppler guidance for basal periprostatic nerve block.

the statistical significance of the differences between VAS pain scores in the study groups. One-way analysis of variance (ANOVA) was used to determine differences in the mean patient age. Statistical significance was accepted at $p < 0.05$.

RESULTS

A comparative description of the results is given in Table 1 and Fig. 1E. The mean pain scores during probe insertion did not differ significantly between the F groups. During local anesthesia injection the mean pain score was lowest in the PPNB group ($p= 0.008$). The mean pain scores while undergoing the biopsy were lower in the groups which received any kind of nerve block compared to the control group ($p= 0.001$). The mean pain scores were lower in the PPNB compared with the BPPB and APBB groups ($p= 0.001$ and 0.002, respectively). The mean pain scores during biopsy did not differ significantly between the BPNB and APNB groups. The mean duration of perineal pain was significantly shorter in the groups which received any type of nerve block ($p= 0.001$). The mean duration of hematuria and rectal bleeding did not differ significantly between the 4 groups. The mean duration of dysuria was shorter in the PPNB compared with the BPPB and APPB groups. There were no major complications that required hospitalization

DISCUSSION

Pain during TRUS guided biopsy of prostate may be related to a number of factors including the patient's age, anal sphincter tone, neuropathy, pain threshold, diameter and shape of TRUS probe, number and site of biopsy cores taken, duration, concentration and volume of the local anesthetic agent used, size of the prostate, inflammation of the prostatic and periprostatic tissue, the pathology and perhaps the technique of biopsy. The apical biopsies seem the most painful, possibly relating to probe angulations or needle entry close to the anal canal.

Almost all patients feel some degree of pain while undergoing prostatic biopsy. Many patients who did not receive adequate analgesia during the procedure may refuse if repeated biopsies are needed[5]. The prostate is supplied by sympathetic fibres which reach the pelvic plexus via the superior hypogastric

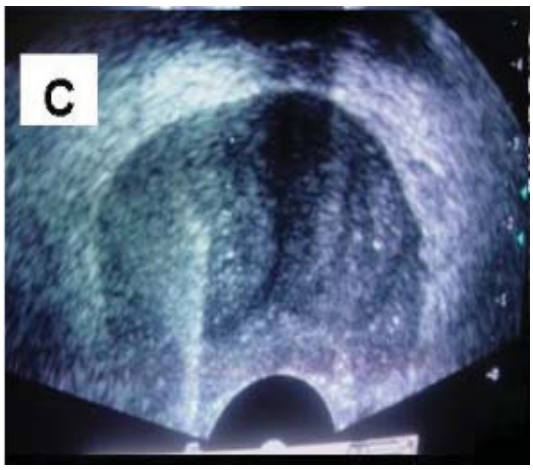

Fig. 1C: TRUS showing biopsy needle going into the right lobe of the prostate after nerve block

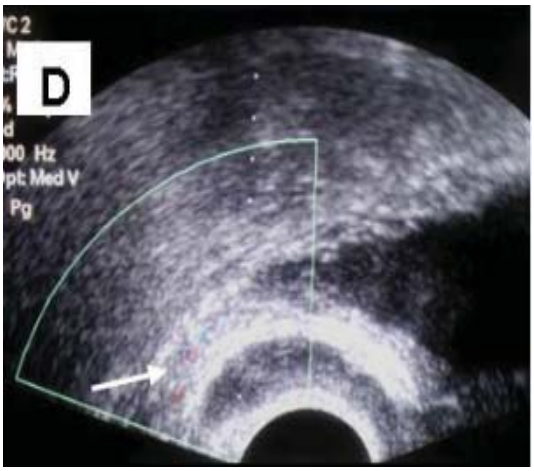

Fig. 1D: TRUS showing location of pelvic plexus lateral to the tip of the right seminal vesicle (arrow)

plexus and pelvic part of the sympathetic trunks[6]. Fibers from the celiac plexus and the first 4 lumbar splanchnic nerves form the superior hypogastric plexus, which is divided into two hypogastric nerves. The parasympathetic fibers in the nervi erigentes and hypogastric nerves join the fibers from the sacral sympathetic ganglia and form the pelvic (inferior hypogastric) plexus[7]. The pelvic plexus is rectangular and 4-5 cm in length. Its midpoint is at the tips of the seminal vesicles[8]. The pelvic plexus courses on either side of the rectum and is penetrated by numerous vessels going to and from the rectum, bladder, seminal vesicles and prostate. The pelvic plexus provides innervation of the prostate and cavernosal nerves via the most caudal portion (prostatic plexus)[7]. The pain associated with prostate biopsy is contributed by direct contact of the biopsy needle with the nerves within the stroma and the prostatic 'capsule', which are richly innervated[9].

Periprostatic infiltration of local anesthetic has been evaluated in several studies[10, 11]. In a randomized study, Mallick et al showed no difference in pain relief between topical and infiltrated local anesthesia during the biopsy and much less pain during administration in the topical group[12]. Intravenous sedation or even general anesthesia has been used rarely when patients have to undergo a large number of repeat prostate biopsies[13]. Walker et al. studied the effect of pericapsular lignocaine injection in TRUS guided biopsy of the prostate and reported a statistically significant lower mean pain score in the lignocaine group than in the placebo-injection group[14]. In another prospective, randomized trial conducted by Lynn et al., patients who were given periprostatic 1% lignocaine injection had significantly less pain than the others. The rectal instillation of 2% lignocaine gel did not reduce pain significantly compared with the controls[15]. In a randomized, double blind, placebo controlled trial Lee et al found that combining periprostatic nerve block and intraprostatic local anesthesia provided significantly better pain control than periprostatic nerve block alone. The combination was found to be of maximum benefit in patients with a smaller prostate volume or younger patients[15].

Pelvic plexus block has been recently reported as an effective method for analgesia during TRUS guided prostate biopsy. In a placebo controlled trial done by Wu et al, 5 ml of 1% lignocaine was injected directly lateral to the tip of

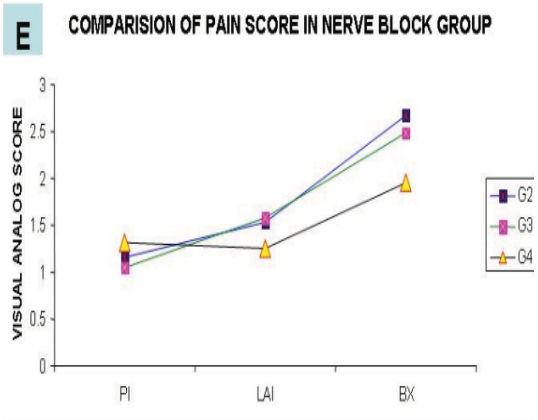

Fig. 1 E: Comparison of pain score among patients with different nerve blocks
G2: Basal periprostatic block, G3: Apical periprostatic block, G4: Pelvic plexus block, PI- probe insertion, LAI- local anesthetic injection, Bx- prostatic biopsy)

the seminal vesicles with gray-scale ultrasound guidance. They found that this did not diminish biopsy-associated pain[2]. Akpınar et al did a randomized controlled study in 80 patients to compare the efficacy of basal periprostatic nerve block with pelvic plexus block and reported significantly lower biopsy VAS pain scores in the pelvic plexus block group[4]. The reason for the disparity in these studies may be the use of Doppler ultrasound and larger cohorts in the latter study.

In our study, the patient reported pain score was highest during the taking of the biopsy and lowest during insertion of the probe. Lignocaine administration caused less pain than the biopsy itself. The mean pain score in the group which did not receive any kind of local anesthetic injection was higher than in the groups which received any type of nerve block. Intrarectal lignocaine gel has limited efficacy due to rapid systemic absorption. The mean pain scores in the nerve block groups were less than 3 and patients had acceptable levels of discomfort. There was no statistically significant difference between the pain scores in the basal and apical nerve block groups. The periprostatic nerve fibers that course posterolaterally are anesthetized in apical as well as periprostatic block, which explains this lack of difference. However Akan et al have reported that apical periprostatic nerve block causes better analgesia compared with basal nerve block, because a single injection was administered in the midline in the periprostatic block group whereas two injections were given in basal block group 3. The reason for our divergent result may be due to the mean prostate volume, which was 17.9 cc in the study done by Akan et al whereas it was 50.0 cc in our study. It is probable that 5 ml of lignocaine may be sufficient for apical block in patients with small prostates, but not in those with larger prostates.

Patients who received PPNB experienced significantly less pain than those who received BPNB or APNB. As there is an abundance of nerve fibers in the pelvic plexus area, local anesthetic injection here may block a larger number of nerve fibers. In PPNB the local anesthetic is delivered to nerves that give rise to the prostatic plexus and other sensory fibers. Nociceptive nerves to the prostate are more likely to be anesthetized during PPNB, as the action is more proximal than in BPNB and APNB, where the action is more distal. When local anesthetic is injected near the apex or base of the prostate some sensory nerve fibers entering the prostate at its superolateral and anterior aspect may not be anesthetized. This may explain the greater efficacy of pelvic plexus block over apical and basal periprostatic block.

The incidence and duration of complications in the PPNB group were almost the same as in the BPNB and APNB groups. The duration of dysuria was shorter in the PPNB than in the BPNB and APNB groups (1.6, 2.1 and 1.8 days, respectively). In PPNB lignocaine was injected at a location away from the

prostate, near the seminal vesicle tips, so the risk of prostatic inflammation leading to dysuria was less as compared to BPNB or APNB, where lignocaine was injected around the prostate.

Perineal pain persisted for longer after PPNB compared with BPNB and APNB (0.5, 0.4 and 0.3 days, repectively). This may be due to the learning curve of the clinician administering the pelvic plexus nerve block, due to the unfamiliar anatomy of the pelvic plexus on Doppler ultrasound. This finding needs to be confirmed in a study of a larger number of patients.

The time taken in achieving the PPNB was 4-6 minutes, which was almost equal to that of BPNB or APNB. One of the major concerns in PPNB is the possibility of major bleeding. However, the use of Doppler ultrasound allows injection of local anesthetic directly into the pelvic plexus without damaging major vessels.

In this study, APNB and BPNB had limited pain and discomfort, but was less effective in attenuating pain compared with PPNB. Based on these results, combined use of 2% lignocaine gel with PPNB appears to be an effective mode of analgesia during TRUS guided prostate biopsy.

CONCLUSION

Prostate biopsy should be performed with either periprostatic nerve block (basal or apical) or pelvic plexus block under Doppler ultrasonographic guidance. Administration of lignocaine in the area of the pelvic plexus provides superior analgesia to basal and apical periprostatic block. Although perineal pain persisted for longer after pelvic plexus block, it is safe, easy to perform and effective, compared with basal and apical periprostatic nerve block for doing TRUS guided prostate biopsy.

REFERENCES

1. Coley CM, Barry MJ, Fleming C, Wasson JH, Fahs MC, Oesterling JE. Should Medicare provide reimbursement for prostate-specific antigen testing for early detection of prostate cancer? Part II: Early detection strategies. Urology. 1995; Aug;46 (2): 125-41.

2. Wu CL, Carter HB, Naqibuddin M, Fleisher LA. Effect of local anesthetics on patient recovery after transrectal biopsy. Urology. 2001; May; 57 (5): 925-9.

3. Akan H, Yildiz Ö, Dalva I, Yücesoy C. Comparison of two periprostatic nerve blockade techniques for transrectal ultrasound-guided prostate biopsy: Bilateral basal injection and single apical injection. Urology. 2009;73 (1): 23-6.

4. Akpinar H, Tüfek I, Atuğ F, Esen EH, Kural AR. Doppler ultrasonography-guided pelvic plexus block before systematic needle biopsy of the prostate: A prospective randomized study. Urology. 2009; 74 (2):267-271.e1.

5. Bulbul MA, Haddad MC, Khauli RB, Hemady K, Shaar A, Khouzami R, et al. Periprostatic infiltration with local anesthesia during transrectal ultrasound-guided prostate biopsy is safe, simple and effective: A pilot study. Clin.Imaging. 2002; Mar-Apr; 26 (2): 129-32.

6. Rodrigues AO, Machado MT, Wroclawski ER. Prostate innervation and local anesthesia in prostate procedures. Rev.Hosp.Clin.Fac.Med.Sao.Paulo. 2002; Nov-Dec; 57 (6): 287-92.

7. Walsh PC, Donker PJ. Impotence following radical prostatectomy: Insight into etiology and prevention. J.Urol. 1982; Sep; 128 (3): 492-7.

8. Schlegel PN, Walsh PC. Neuroanatomical approach to radical cystoprostatectomy with preservation of sexual function. J.Urol. 1987; Dec; 138 (6): 1402-6.

9. Hollabaugh RS, Jr, Dmochowski RR, Steiner MS. Neuroanatomy of the male rhabdosphincter. Urology. 1997; Mar; 49 (3): 426-34.

10. Lynn NN, Collins GN, Brown SC, O'Reilly PH. Periproztatic nerve block gives better analgesia for prostatic biopsy. BJU Int. 2002; Sep; 90 (4): 424-6.

11. Ozden E, Yaman O, Gogus C, Ozgencil E, Soygur T. The optimum doses of and injection locations for periprostatic nerve blockade for transrectal ultrasound guided biopsy of the prostate: A prospective, randomized, placebo controlled study. J.Urol. 2003; Dec;170 (6 Pt 1): 2319-22.

12. Mallick S, Humbert M, Braud F, Fofana M, Blanchet P. Local anesthesia before transrectal ultrasound guided prostate biopsy: Comparison of 2 methods in a prospective, randomized clinical trial. J.Urol. 2004; Feb; 171 (2 Pt 1): 730-3.

13. Borboroglu PG, Comer SW, Riffenburgh RH, Amling CL. Extensive repeat transrectal ultrasound guided prostate biopsy in patients with previous benign sextant biopsies. J.Urol. 2000; Jan; 163 (1): 158-62.

14. Walker AE, Schelvan C, Rockall AG, Rickards D, Kellett MJ. Does pericapsular lignocaine reduce pain during transrectal ultrasonography-guided biopsy of the prostate? BJU Int. 2002; Dec; 90 (9): 883-6.

15. Lee HY, Lee HJ, Byun SS, Lee SE, Hong SK, Kim SH. Effect of intraprostatic local anesthesia during transrectal ultrasound guided prostate biopsy: Comparison of 3 methods in a randomized, double-blind, placebo controlled trial. J.Urol. 2007; Aug;178 (2): 469,72; discussion 472.