경직장 초음파 검사를 통한 전립선 조직 검사 시 마취제 주사 방법의 비교

백송이[1] · 오영택[1] · 김장환[2]
나군호[2] · 홍성준[2] · 양승철[2]

[1]연세대학교 의과대학 영상의학과, 방사선의과학센터
[2]연세대학교 의과대학 비뇨기과

J Korean Soc Ultrasound Med
2010;29:165-169
Received July 16, 2010; Revised September 9, 2010; Accepted September 9, 2010.

This study was clinical basic research by funding of 2007 government (Ministry Education, Science and Technology) and supporting by National research foundation of Korea (No. 313-2007-2-E00362).
이 논문은 2007년도 정부(교육과학기술부)의 재원으로 한국연구재단의 지원을 받아 수행된 기초연구사업임(No. 313-2007-2-E00362).

Address for reprints :
Young Taik Oh, MD, Department of Radiology and Research Institute of Radiological Science, Yonsei University College of Medicine, 134 Shinchon-dong, Seodaemun-gu, Seoul 120-752, Korea.
Tel. 82-2-2228-7400
Fax. 82-2-393-3035
E-mail: oytaik@yuhs.ac

Comparison of Two Local Anesthesia Injection Methods During a Transrectal Ultrasonography-guided Prostate Biopsy

Song-Ee Baek, MD[1], Young Taik Oh, MD[1], Jang Hwan Kim, MD[2], Koon Ho Rha, MD[2], Sung Joon Hong, MD[2], Seung Choul Yang, MD[2]

[1]Department of Radiology and Research Institute of Radiological Science, Yonsei University College of Medicine
[2]Department of Urology, Yonsei University College of Medicine, Seoul, Korea

Purpose: To compare the effectiveness of 2 injection methods of lidocaine during a transrectal ultrasound (TRUS)-guided prostate biopsy for pain control and complication rates.

Materials and Methods: We retrospectively evaluated patients who underwent a TRUS-guided prostate biopsy from March 2005 to March 2006. One hundred patients were categorized into two groups based on injection method. For group 1, 10 mL of 1% lidocaine was injected bilaterally at the junction of the seminal vesicle and prostate and for group 2, into Denonvilliers' fascia. Pain scores using a visual analog scale (VAS) as well as immediate and delayed complication rates were evaluated.

Results: The mean VAS score showed no significant differences between the groups (group 1, 3.4±1.78; group 2, 2.8±1.3; p = 0.062). The difference in delayed complication rates and incidence of hematuria, hemospermia, and blood via the rectum was not significant between groups. However, two patients in group 1 complained of symptoms immediately after local anesthesia; one of tinnitus and the other of mild dizziness.

Conclusion: There were no significant differences between pain control and complication rates between the 2 lidocaine injection methods. However, injection into Denonvilliers' fascia is thought to have less potential risk.

Key words : Prostate; Biopsy; Ultrasonography; Local anesthesia; Nerve block

Introduction

A transrectal ultrasonography (TRUS)-guided biopsy of the prostate is the standard method for detecting prostate cancer. After the first report by Hodge et al. suggesting that the sextant systematic biopsy was more efficient than a targeted biopsy for the detection of prostate cancer [1], there have been modifications of the sextant method and a trend towards an increased number of biopsies with the reasoning that the more biopsies are performed, the better the chances are of diagnosing prostate cancer [2, 3]. However, 65−90% of patients who undergo TRUS-guided biopsy experience discomfort or pain [4−6]. The amount of pain is partly associated with the

number of biopsies performed [2, 7]. Nash et al. introduced the periprostatic nerve blockade, a procedure in which lidocaine is injected at the junction of the prostate and seminal vesicle [8]. This method significantly reduced pain compared to the control or the simple installation of lidocaine gel into the rectum [6, 9]. Seymour et al. introduced another lidocaine injection method in which the injection is given into Denonvilliers' fascia [10]. This has been reported to significantly improve immediate pain.

However, to the best of our knowledge, there are no comparative studies for these injection methods for pain control. The purpose of this study was to compare the effectiveness of pain control and complication rates between the 2 local anesthesia methods.

Materials and Methods

We retrospectively evaluated a series of patients who underwent TRUS-guided prostate biopsies from March 2005 to March 2006. Our study was approved by the institutional review board, and patient informed consent was waved due to its retrospective nature. A total of 100 patients with available clinical data for visual analog scale (VAS) and complications were enrolled in this study. The mean patient age was 64.8 ± 7.6 years (age range, 39−82 years). Each patient was referred for a TRUS-guided biopsy of the prostate due to an abnormal prostate on digital rectal examination and/or elevated prostate-specific antigen (PSA) levels (4 ng/mL or greater). Patients with an allergy to lidocaine, uncontrolled bleeding diathesis, or history of radiotherapy to the pelvis were excluded from the study.

Patients on warfarin or antiplatelet agents were instructed to discontinue the medications 72 hours and 5 days before the procedure, respectively. Oral quinolone antibiotic (Gatifloxacin tablets, 200 mg) was administered prophylactically on the day before biopsy and continued for 2 days.

Patients were placed in the lateral decubitus position and an Acuson Sequoia 512 (Siemens, Mountainview, CA, USA) curved array endocavitary transducer equipped with a 5−10 MHz broadband was used for the procedures. After measuring the prostate volume using the prolate ellipsoid method with TRUS, a lidocaine injection was given.

Two lidocaine injection methods were employed and categorized into two groups by injection. From March

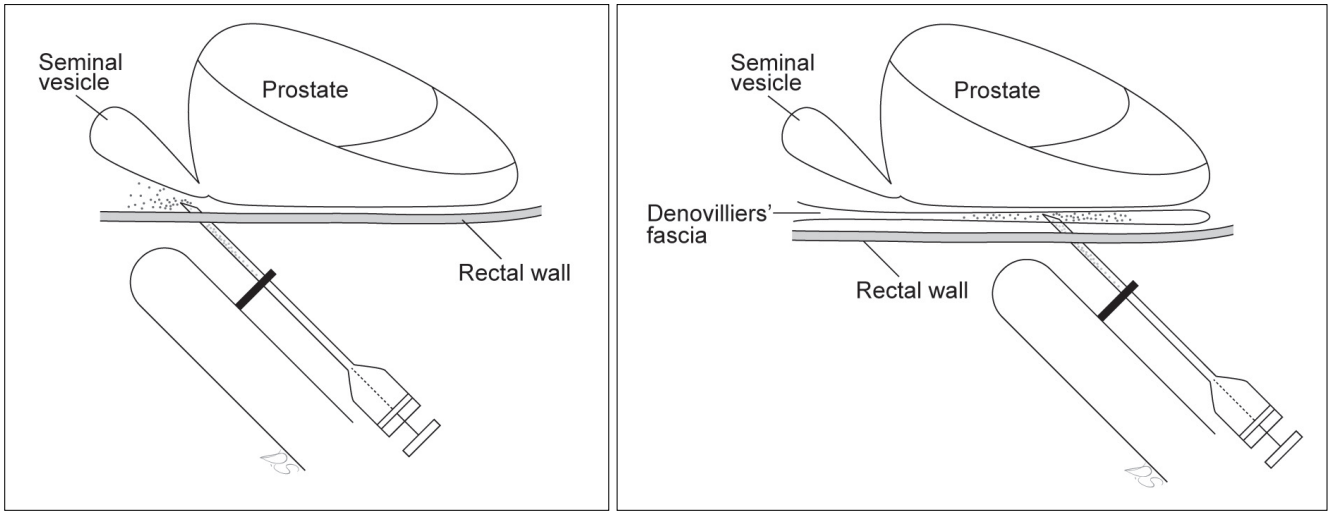

Fig. 1. Para-longitudinal plane of the prostate gland.
A. The tip of the needle is located at the junction of the seminal vesicle and prostate. Injected lidocaine (dots) was dispersed into soft tissue.
B. The tip of needle was located between the planes of Denonvilliers' fascia. The injected lidocaine (dots) dissect 2 planes up to a base of gland and seminal vesicles.

2005 to August 2005, 50 patients were injected with 5 mL of 1% lidocaine on each side at the junction of the seminal vesicle and prostate (Group 1) (Fig. 1A) [8]. From September 2005 to March 2006, 50 patients were injected with 5 mL of 1% lidocaine on each side between Denonvilliers' fascia as part of a method change (Group 2) (Fig. 1B) [10]. A 22-gauge, 7-inch Chiba needle was used for the lidocaine injections. During and just after the injection, we checked the immediate complications and asked patients if they experienced any symptoms or discomfort. After 2 minutes, the prostate biopsy was performed with an 18-gauge spring-loaded biopsy needle. A biopsy routinely includes 12 cores but a lower number of cores were obtained in patients with advanced prostate cancer on TRUS or with small-sized prostates. Some patients with a suspicious lesion on TRUS underwent additional core biopsies.

Pain scores for the entire procedure were recorded using a VAS of 0-10 (0 indicates no discomfort; 10, the most severe and unendurable discomfort) immediately after the procedure. All patients were given a questionnaire to record the presence of hematuria, hemospermia, or blood via the rectum for a week after the biopsy. Signs of infection such as fever, chills, urinary retention, and hospital visits in relation to the procedure were also recorded. The questionnaires were returned during the next visit. A statistical analysis was performed using Student's t-test and Chi-square test.

Table 1. Patient Characteristics

	Group1	Group2	P-Value
No. of patients	50	50	
Mean age	63.9	65.5	0.318*
Mean prostate volume	43.5	40.3	0.354*
Mean No. biopsy	11.3	11.1	0.590*
Mean VAS	3.4	2.8	0.062*
Hematuria	21	18	0.340†
Hemospermia	4	3	0.622†
Blood via rectum	9	13	0.424†

* : The results from the Student's t-test
† : The results from the Chi-square test

Results

All 100 patients included in this study answered the pain questionnaires using the VAS. Eighty-five patients (85%; 41 in group 1; 44 in group 2) returned the questionnaire about complications. Patient age, mean prostate volume, and mean biopsy number are shown in Table 1. These data did not show significant differences between the groups.

The mean pain scores in groups 1 and 2 were 3.4±1.78 and 2.8±1.3, respectively. Although the pain score was lower in group 2, there no statistical difference was found between the 2 groups ($p=0.062$). There were no serious or immediate complications observed during or just after injection. However, 2 patients in group 1 complained of tinnitus and mild dizziness immediately after the lidocaine injection. These symptoms spontaneously resolved after a few minutes. The complication rates showed no significant difference between the groups (Table 1). The incidence of hematuria ($p=0.340$), hemospermia ($p=0.622$), and/or blood via the rectum ($p=0.424$) was not different between the 2 groups. One patient in group 1 complained of a mild fever but it subsided by treatment with antibiotics. Urinary retention developed in 2 patients in each group and catheterization was required.

Discussion

The number of TRUS-guided prostate biopsies has drastically increased with the advent of PSA testing. This is usually performed as an outpatient procedure with infrequent serious complications. Numerous studies have measured the level of pain during biopsy and reported discomfort or pain in up to 90% of patients [10]. Furthermore, the degree of pain increased with the number of biopsy cores performed [2, 7]. Therefore, a TRUS-guided prostate biopsy under local anesthesia is the preferred method [11, 12].

Various methods of delivering local anesthesia have

been used. Rectal installation of lidocaine gel decreased pain mainly related to probe insertion but was not satisfactory for pain control during the biopsy itself [13, 14]. This is because pain is mostly caused by the needle penetrating the prostatic capsule through the rectal wall [9, 13]. A periprostatic lidocaine injection has been most widely used and shown to be effective for pain control [8−10, 15]. According to our results, the mean pain score and total complication rates for the 2 injection methods showed no significant differences. Therefore, we can choose either method for pain control during the TRUS-guided biopsy with a similar complication rate, even though they have anatomically different sites of nerve block.

The method of injection performed in group 1 is based on a study by Nach et al., in which lidocaine is injected at the junction of the prostate and seminal vesicle [8]. This method comes from the idea of blocking the inferior hypogastric plexus that passes between the prostate and rectum on the inferolateral border of the prostate and is believed to relieve the pain caused by the needle penetrating the prostatic capsule. There is, however, a potential risk associated with this procedure. There is a rich vascular network around the prostate where intravasation of lidocaine can occur. Therefore, careful aspiration of the syringe and gentle injection are emphasized to prevent intravasation of lidocaine. Of our patients injected using this method, 2 patients complained of tinnitus and dizziness after the injection. These side effects occurred despite careful aspiration of the syringe and gentle injection at the junction of the prostate and seminal vesicle. It may be questionable as to whether these symptoms occurred due to lidocaine intravasation, but the symptoms coincided with the known side effects of lidocaine intravasation, which include drowsiness, mental/mood changes, ringing in the ears, dizziness, vision changes, tremors, numbness, headache, and backache. Therefore, it is implied that a small amount of lidocaine intravasation might occur despite careful aspiration. Although the symptoms resolved spontaneously within a few minutes and were not clinically significant, we believe that aspiration of the syringe before injection and a slow and careful injection should be done to prevent intravasation of a large amount of lidocaine. This will probably help prevent more serious side effects of lidocaine intravasation, which include fever, unusually fast or slow pulse, trouble breathing, seizures, and chest pain [16].

Patients in group 2 received anesthesia by injecting lidocaine between Denonvilliers' fascia as described by Seymour et al. [10]. This method targets the neurovascular bundles that course along the posterolateral margins of the gland between the capsule and Denonvilliers' fascia, and then pierces the prostatic capsule at the base and apex at the 4 and 8 o'clock positions [10]. Because there is less vascular structure in Denonvilliers' fascia than periprostatic tissue, the risk of lidocaine intravasation may theoretically be lower in group 2 than group 1. Indeed, no patient in group 2 complained of symptoms related to lidocaine intravasation.

Our study had limitations. First, the number of patients was not large and it was a retrospective study with a chart review. Additionally, group 1 and 2 patients were obtained consequently without randomization. Subsequent studies with larger numbers of patients and prospective with a randomized study design should be performed to verify our results. Second, we assessed pain for the entire procedure. The question we answered was if pain was present after the entire procedure with no consideration of the detailed processes such as probe insertion, lidocaine injection, and the biopsy procedure. Pain experienced by patients was different in each step, but this was not considered in this study. A subsequent study would need to record pain for each step of the biopsy procedure.

In conclusion, both injection methods of lidocaine showed similar effects during a prostate biopsy with respect to pain control and complication rates. However, Denonvilliers' fascia was thought to have less potential risk.of lidocaine intravasation.

Acknowledgement

We are grateful to Mr. Dong-Su Jang for the illustrations.

요 약

목적: 경직장 초음파 검사를 통한 전립선 조직 검사 시 두 가지 리도카인 주사 방법이 통증조절과 합병증의 발생에 있어서 차이가 있는지를 비교한다.

대상 및 방법: 2005년 3월부터 2006년 3월 사이 경직장 초음파검사를 통한 전립선 조직 검사를 받은 100명 환자의 의무기록을 후향적으로 분석하였다. 그룹 1에서는 1% 리도카인 10 ml를 정낭과 전립선 사이에 양쪽으로 주사하였고, 그룹 2에서는 Denonvilliers' fascia에 주사하였다. 통증의 정도는 visual analog scale (VAS)를 사용하여 측정하였고, 즉각적인 합병증과 지연 합병증 여부를 조사하였다.

결과: 평균 VAS 점수는 두 그룹간에 통계적으로 유의한 차이는 없었다. (group 1, 3.4±1.78; group 2, 2.8±1.3; p=0.062), 지연 합병증 발생율과 혈뇨, 혈정액증, 직장 내 출혈의 빈도도 두 그룹간 차이가 없었다. 하지만 그룹 1에서 두 명의 환자가 국소마취제를 주사한 직 후 이명과 약간의 어지러움증을 호소하였다.

결론: Lidocaine의 두 가지 주사 방법에 따라서 통증조절과 합병증의 통계적인 유의한 차이는 없었다. 하지만 lidocaine의 혈관 내 유입 위험의 잠재성을 고려할 때 마취제를 Denonvilliers' fascia에 주사하는 방법이 더 안전할 것으로 생각된다.

References

1. Hodge KK, McNeal JE, Terris MK, Stamey TA. Random systematic versus directed ultrasound guided transrectal core biopsies of the prostate. J Urol 1989;142:71-74; discussion 74-75
2. Eskew LA, Bare RL, McCullough DL. Systematic 5 region prostate biopsy is superior to sextant method for diagnosing carcinoma of the prostate. J Urol 1997;157:199-202; discussion 202-203
3. Gore JL, Shariat SF, Miles BJ, et al. Optimal combinations of systematic sextant and laterally directed biopsies for the detection of prostate cancer. J Urol 2001;165:1554-1559
4. Clements R, Aideyan OU, Griffiths GJ, Peeling WB. Side effects and patient acceptability of transrectal biopsy of the prostate. Clin Radiol 1993;47:125-126
5. Collins GN, Lloyd SN, Hehir M, McKelvie GB. Multiple transrectal ultrasound-guided prostatic biopsies--true morbidity and patient acceptance. Br J Urol 1993;71:460-463
6. Alavi AS, Soloway MS, Vaidya A, Lynne CM, Gheiler EL. Local anesthesia for ultrasound guided prostate biopsy: a prospective randomized trial comparing 2 methods. J Urol 2001;166:1343-1345
7. Pareek G, Armenakas NA, Fracchia JA. Periprostatic nerve blockade for transrectal ultrasound guided biopsy of the prostate: a randomized, double-blind, placebo controlled study. J Urol 2001;166:894-897
8. Nash PA, Bruce JE, Indudhara R, Shinohara K. Transrectal ultrasound guided prostatic nerve blockade eases systematic needle biopsy of the prostate. J Urol 1996;155:607-609
9. Lynn NN, Collins GN, Brown SC, O'Reilly PH. Periprostatic nerve block gives better analgesia for prostatic biopsy. BJU Int 2002;90:424-426
10. Seymour H, Perry MJ, Lee-Elliot C, Dundas D, Patel U. Pain after transrectal ultrasonography-guided prostate biopsy: the advantages of periprostatic local anaesthesia. BJU Int 2001;88:540-544
11. Scattoni V, Zlotta A, Montironi R, Schulman C, Rigatti P, Montorsi F. Extended and saturation prostatic biopsy in the diagnosis and characterisation of prostate cancer: a critical analysis of the literature. Eur Urol 2007;52:1309-1322
12. Bertaccini A, Fandella A, Prayer-Galetti T, et al. Systematic development of clinical practice guidelines for prostate biopsies: a 3-year Italian project. Anticancer Res 2007;27:659-666
13. Desgrandchamps F, Meria P, Irani J, Desgrippes A, Teillac P, Le Duc A. The rectal administration of lidocaine gel and tolerance of transrectal ultrasonography-guided biopsy of the prostate: a prospective randomized placebo-controlled study. BJU Int 1999;83:1007-1009
14. Tiong HY, Liew LC, Samuel M, Consigliere D, Esuvaranathan K. A meta-analysis of local anesthesia for transrectal ultrasound-guided biopsy of the prostate. Prostate Cancer Prostatic Dis 2007;10:127-136
15. Heidenreich A, Aus G, Bolla M, et al. EAU guidelines on prostate cancer. Eur Urol 2008;53:68-80
16. Mao J, Chen LL. Systemic lidocaine for neuropathic pain relief. Pain 2000;87:7-17