



## Intraurethral Lidocaine Usage in Office-Based Rigid Cystoscopy on Pain Experience

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**Purpose:** Cystoscopy is one of the most reliable urological examinations. However, it also a painful one. Intraurethral lidocaine gel injection is widely used to relieve pain during cystoscopy. The purpose of this study is to compare between the use of lidocaine gel and lidocaine solution as a pretreatment for cystoscopy.

**Materials and Methods:** Between March 2016 and May 2017, we studied 147 patients who had undergone cystoscopy at our institution. Patients were divided into four groups. Lidocaine gel and solution were administered just 10 minutes before each test. For randomization, the patient groups were divided into either odd or even number for the test day and as the patient number, irrespective of medical condition. The amount of lidocaine gel and solution of 10 ml each was uniformly injected. After the procedure, patients were asked to rate their pain on a 10-point visual analogue scale.

**Results:** The average degree of pain relief was in the order of solution/10 minutes, gel/immediately, gel/10 minutes, and solution/immediately. The gel was associated with significantly less pain in the immediate group than in 10-minute before group, whereas the solution was associated with significantly better pain relief in the 10-minute before group than in the immediate group. There were no complications to report in all groups.

**Conclusions:** Lidocaine gel and solution showed different changes of pain relief over time. Further prospective studies with a larger population is necessary to better develop a less painful method of cystoscopy in the future.

**Keywords:** Cystoscopy; Lidocaine; Pain

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## INTRODUCTION

Cystoscopy is one of the most important and commonly used techniques for diagnosing and treating lower urinary tract diseases [1]. It is the basic method for the diagnosis of lower urinary tract diseases, which can confirm the bladder and urethra optically. However, rigid cystoscopy is straight and stiff, while the male urethra is folded in a right angle, causing pain as the tip of the endoscope

passes. Such pain may induce sudden movement of patients, potentially injuring the urethra or bladder. It can also cause fear in patients and decrease compliance. After the mid-1980s, advancements in the field of urology has led to the development of a flexible cystoscopy, aimed at reducing discomfort and pain; however, due to its cost and optical area, it was not able to completely replace rigid cystoscopies [2].

For this reason, intraurethral injection of 5 to 10 ml of

lubricant containing anesthetic agent before the test is widely used in male patients to relieve pain and prevent urethral injury caused by patients' sudden movement. According to a Taiwanese study conducted by Chen et al. [3] in 2005, it was confirmed that the intraurethral injection of lidocaine gel can effectively relieve pain better than plain lubricating gel. However, this method still does not relieve pain enough in some patients. About 76% of men suffer from mild to severe pain during the examination, and about 27% of patients could feel pain even seven days after the procedure [4]. Therefore, many studies have been performed to find ways to better manage pain.

Hence, the purpose of this study is to investigate the effect of lidocaine gel and solution on pain relief in male patients undergoing rigid cystoscopy.

## MATERIALS AND METHODS

### 1. Study Population

Between March 2016 and May 2017, a total of 147 male patients who answered a questionnaire among the total of 233 male patients receiving rigid cystoscopy due to hematuria (microscopic or gross) or bladder cancer follow-up were included in this study. Fifty-seven patients taking any analgesics were also excluded to minimize interruption of pain assessment. Our study is approved by institutional review board of National Police Hospital (No. 11100176-201709-HR-009) and exempted from written informed consent.

### 2. Study Design

Our study population of 147 patients were divided into four groups. The 1st group received intraurethral injection 10 ml of 2% lidocaine hydrochloride (lidocaine HCl) gel 10 minutes before cystoscopy; the 2nd group also received 10 ml of 2% lidocaine HCl gel just before the test; the 3rd group received 10 ml of 2% lidocaine HCl solution

10 minutes before cystoscopy; and 4th group received lidocaine HCl solution just before the test. Both injected agents were under room temperature. All intraurethral injections was performed with 10 ml disposable syringe. After injection, patient's penis was kept upright to maintain the agent in the urethra. The criteria for classifying patients were odd or even for the date of test and patients' hospital number, regardless of patients' medical condition, such as age, past medical history, purpose of test, or etc.

Cystoscopy was performed with a 22 Fr rigid cystoscope (Karl Storz, Tuttlingen, Germany) by one operator and one assistant. Just after the test, patients were asked to score their pain during the procedure on a 10-point linear visual analogue scale (VAS). Pain perception was classified by utilizing the VAS score; nearly no pain (0-1), mild (2-4), moderate (5-7), and severe (8-10) pain. The question was expressed in the same way in all cases to minimize any bias in the process of data collection. T-test was used to compare pain scores of each group. SPSS for Windows ver. 12.0 (SPSS Inc., Chicago, IL, USA) was used for all statistical analyses, and two-sided  $p < 0.05$  were considered statistically significant.

## RESULTS

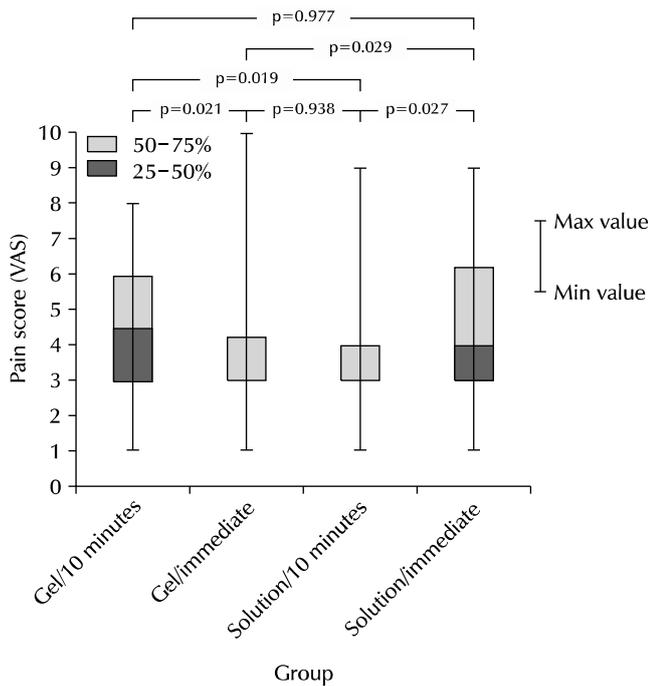
Among the 233 patients who underwent rigid cystoscopy, we excluded 86 patients; 57 for being on analgesics, such as nonsteroidal antiinflammatory drugs, and 29 for not completing the questionnaire. The remaining 147 patients were included in the study.

The mean age in each group was 57.3, 60.5, 59.8, and 59.3 years, respectively. Table 1 shows the purpose of the test and mean pain scores for each group. There was no statistical difference with respect to age between groups. The order of VAS averages was as follows: solution/10 minutes (3.74), gel/immediate group (3.78), gel/10 minutes group (4.73), and solution/immediate group (4.75),

**Table 1.** Baseline characteristics and pain scores according to subgroup

Variable	Gel/10 min (n=37)	Gel/immediate (n=38)	Solution/10 min (n=37)	Solution/immediate (n=35)	Total (n=147)
Mean age (y)	57.3	60.5	59.8	59.3	59.2
Hematuria	21 (56.8)	22 (57.9)	19 (51.4)	20 (57.1)	82 (55.8)
Bladder cancer f/u	16 (43.2)	16 (42.1)	18 (48.6)	15 (42.9)	65 (44.2)
Mean VAS score	4.73±1.85	3.78±1.76	3.74±1.79	4.75±2.06	4.31±1.91

Values are presented as number only, number (%), or mean±standard deviation. VAS: visual analogue scale, f/u: follow up.



**Fig. 1.** Box plot for pain score distribution in each group and the results of t-test. VAS: visual analogue scale.

respectively.

A box plot of the pain score distribution for each group and the results of t-test between groups are summarized in Fig. 1. In the case of using the gel, an injection immediately before the test relived pain better than 10 minutes before. Conversely, lidocaine solution when injected 10 minutes before the exam showed less pain than just before the test. Statistical analysis using a t-test showed a statistical significance according to time difference in both the gel ( $p=0.021$ ) and solution ( $p=0.027$ ). When the elapsed time after intraurethral injection was same, if cystoscopy was performed just after the injection, lidocaine gel relieved pain better than lidocaine solution ( $p=0.029$ ). However, after 10 minutes, solution seemed more effective ( $p=0.019$ ). There was no statistically significant difference between gel/immediate and solution/10 minutes before.

No patients showed any complication, such as urethral rupture, bladder injury, and etc. No serious side effects of lidocaine were observed.

## DISCUSSION

Outpatient cystoscopy is one of the most important procedures performed in urology practice. Because male

patients' urethra is long and curved, straight rigid cystoscope may result in more pain than female patients, especially when the tip of the scope passes through the membranous urethra [5]. The use of intraurethral injection of 2% lidocaine gel from 1949 [6], although with some contradictory claims, shows greater effectiveness in pain relief compared with the simple lubricating gels. According to a study conducted by Goldfischer et al. [2] in 1997, there was no difference between simple lubricating gel and gel containing lidocaine in females, but the latter showed to be significantly more effective in males. Moreover, a Taiwanese study by Chen et al. [3] in 2005 claimed that a lidocaine gel makes a significant difference compared with the simple gel in terms of pain treatment and hospitalization period after endoscopy.

However, there is still no formal standard; various methods of different amounts of gel or combination of other ingredients or anesthesia are still being studied. Brekkan et al. [7] asserted that more than 16 ml of gel should be injected, exceeding the bladder neck, to effectively relieve pain. However, Ho et al. [8] focused on the temperature of the injected gel; they found that there was a significant pain reduction when using lidocaine gel at 4°C. Henry et al. [9] studied lidocaine alkalization with sodium bicarbonate and concluded that alkalization increases lipid proportion and agent absorption, resulting in better anesthetic effect. There has also been a study showing the opposite result from our study. Choong et al. [10] back in 1997 found that the most adequate time of 20 ml of 2% lidocaine gel exposures to urethra may be 15 minutes; they assert that time is needed for the anesthetic ingredients to infiltrate the urothelium. We believe that the discrepancy may be due to the differences in the volume of the injected lidocaine gel.

There has also been a number of studies about the effectiveness of anesthetic lubricant in flexible cystoscopy. Although it remains to still be a controversial issue, the claim that there is no difference between anesthetic gel and plain one seems more prevalent [11-14]. Flexible cystoscopy's softness and pliability results in less pain than the rigid one; however, due to technical limitations, such as visual acuity, image quality, or difficulty, it still cannot completely replace the rigid cystoscopy [2].

In our study, lidocaine gel and lidocaine solution showed different changes of pain relief over time after intraurethral

injection, Lidocaine gel was more effective when applied just before the test when compared with 10 minutes before the test; however, lidocaine solution achieved better pain relief when it was applied 10 minutes before the test than just before the test. We presumed this is due to the difference in mechanisms of the two agents. In case of the lidocaine gel, despite it having some anesthetic effect, its main mechanism is lubricity. As time elapses, gel evaporates, losing its lubricity and resulting in decreased pain relief. On the contrary, lidocaine solution has little lubricity, but it has anesthetic characteristics that reduces pain. Therefore, it is presumed that some time may be required to be effective.

Although not in the urologic area, the pain relieving effect of various lidocaine preparations has been suggested in two randomized, controlled trials in the field of obstetrics and gynecology. Li et al. [15] asserted that the use of local lidocaine gel application reduces the overall intraoperative pain in multiparous women undergoing first-trimester suction termination of first-trimester pregnancy. Guney et al. [16] reported that intrauterine instillation of urethral lidocaine solution seems to be effective in decreasing pain in parous women undergoing sonohysterography. In that study, there were significantly positive correlations between VAS pain scores and patients' distress recorded during, immediately after, and 20 minutes after the procedure. We have designed our research based on this point. Moreover, the results of our study showed that an application of lidocaine solution was effective and there was less pain when the procedure was performed 10 minutes after the injection.

In addition, the two drugs used in this study may have synergistic effects when used together due to the differences in the major mechanisms of pain reduction. In fact, a study published by Gooran et al. [17] reported that an injection of lidocaine into the glans with lidocaine gels into the urethra resulted in significantly pain relief than gel alone. Qiu et al.'s study [18] in 2016 also showed better pain relief with dorsal penile nerve block in addition to intraurethral gel injection.

Given that this study is a fragmentary study conducted by a single institution, it has some limitations. First, this study evaluated only pain during examination. The possibility of urethral damage is estimated to be higher when using solutions than gels due to the lack of lubricity. This could be evaluated by patients' discomfort after a certain

period of time, the degree and duration of hematuria and the incidence of complications, such as urethral stricture or infection, in further study. Second, there are still other possible factors, which can affect pain, such as the presence or absence of patients' past cystoscopy experience, duration of test, and etc.; however, they are overlooked in this study. Greenstein et al.'s study [19] in 2014 asserted that a first-time cystoscopy may be more painful than repeat cystoscopy, regardless of the type of cystoscope. Third, a double-blind method was not possible in this study because the operator can recognize injection agent; hence, we conducted this study in a single-blind manner. The main strength of this study lies in the originality of direct comparison between lidocaine gel and solution, which has not been reported in Korea or abroad to the best of our knowledge.

## CONCLUSIONS

In this study, we found that lidocaine gel and lidocaine solution show different changes of pain relief over time. Lidocaine gel showed to be more effective in reducing pain when injected just before the test than 10 minutes before the test, while lidocaine solution showed the opposite effect. When the elapsed time after intraurethral injection is the same, lidocaine gel may be better in the case of immediate test; however, as time elapses, lidocaine solution may be more effective. There was no statistical differences between gel/immediate and solution/10 minutes before the test. This result may contribute to reducing pain in patients undergoing rigid cystoscope and increase compliance in clinical field. For example, patients showing difficulty maintaining a lithotomy position for a long period of time due to spinal conditions, such as herniated inter vertebral disc, hip joint problem, or etc., may benefit from lidocaine gel since lidocaine solution requires time to be effective.

## CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

## ACKNOWLEDGMENTS

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