Int J Clin Exp Med 2017;10(2):1995-2005
www.ijcem.com /ISSN:1940-5901/IJCEM0042233

Review Article

The effect of lubricants used in indwelling bladder catheterization through urethra on procedure-related pain: a literature review

Dilek Aygin[1], Esra Usta[2]

[1]*Department of Nursing, School of Health, Sakarya University, Sakarya, Turkey;* [2]*Department of Nursing, Institute of Health Sciences, Sakarya University, Sakarya, Turkey*

Received April 1, 2016; Accepted December 20, 2016; Epub February 15, 2017; Published February 28, 2017

Abstract: Objectives: The scope of this review was various lubricants used to mitigate pain during urethral catheterization procedure and it was performed in order to review the published studies and to examine the data obtained from those studies in a systematic way. Methods: The study was performed through retrospective scan of related publications using the keywords "urinary catheterization (urethral catheterization, foley catheterization)" and "pain" on the databases Pubmed, OVID-LWW, Scopus, Taylor & Francis, Science Direct EBSCHO, Medline Complete, Cochrane Library, and ULAKBIM and grey literature scan. The studies obtained were assessed by the researchers separately using the Joanna Briggs Institute Meta-Analysis of Statistics Assessment and Review Instrument (MAStARI). Results: At the end of the scan, 1428 publications were reviewed. 13 publications that met the research inclusion criteria were assessed as full texts and 7 publications that were randomized controlled double-blind, randomized controlled single-blind and cross-sectional analytic were taken into the study scope. At the end of the systematic examination, it was determined that the level of pain caused when inserting a urinary catheter using lidocaine gel was 8.7 mm at the lowest and 38 mm at the highest, while the pain level that occurs when distilled water-or water-based lubricant is used is 19.3 mm at the lowest and 58 mm at the highest. The gel used was directly influential on pain and the level of pain in male and young patients was higher. It was found out that there was no relation between procedure-related pain and prior catheter implementation in the patient, the number of interventions applied to implement catheter, the number of catheter, bleeding during implementing catheter, use of post-operative analgesia, and the existence of urinary retention and prostate. Conclusion: Urethral catheterization procedure ranks among the first in invasive interventions that might cause pain in patients and the level of pain felt can rise to severe level. Thus, it is possible in patients without allergy to minimize the level of pain felt by using gels containing lidocaine in line with the standards of implementation regardless of gender and age. In order to raise the level of generalizability and to provide evidence, comparative studies are needed in which catheterization is implemented by the same implementer with similar patient groups and the same procedure steps.

Keywords: Urinary catheterization, pain, indwelling bladder catheterization, lubricating gel

Introduction

Urethral catheterization is the procedure of inserting a catheter into the bladder through urethra for diagnosis and treatment and it is one of the procedures prevalently implemented in the treatment and care of patients who stay at hospitals and long term care houses or who apply to emergency service [1, 2]. It is reported that urethral catheter is implemented in around 15% and 25% of patients staying at hospitals and in 7.5% and 10% of those who stay at long-term care houses [3, 4]. Even though urethral catheterization is widely applied in patient treatment and care, it also brings about certain risks and complications. Pain, trauma, infection, obstruction, bleeding and discomfort are among the possible complications [1, 2, 5-7]. At the same time, it is highly probable that tissue trauma and damage will occur in urethra during catheter implementation because urethra is rich in blood vessels, connective and nerve tissues [5, 8]. Besides, physiopathologic changes and tightness in urethra, improper catheter choice, inadequacy in catheterization technique and the use of improper lubricants might cause trauma in urethra and patient's feeling pain [1, 8]. One of the interventions towards

mitigating the pain during catheter implementation is lubricating the catheter with proper lubricants [8, 9]. Lubricated catheter can reduce friction on the urethral wall and prevent trauma occurrence, thus decreasing feeling of pain [5, 8].

This review was carried out with various lubricants used to mitigate pain during urethral catheterization procedure and it was performed to review the published studies and to examine the data obtained from those studies in a systematic way.

Methods

Search strategy

The study was performed between March 9th and 23rd, 2015 through retrospective scan and examination of the publications made on the subject between 1995 and 2014. For this purpose, through Sakarya University internet access network, the databases of Pubmed, OVID-LWW, Scopus, Taylor & Francis, Science Direct, EBSCHO, Medline Complete, Cochrane Library and ULAKBİM were scanned using the keywords "urinary catheterization (urethral catheterization, foley catheterization) and "pain", and the databases of National Thesis Center, System for Information Grey Literature in Europe, ProQuest Dissertations & Theses Global, Ethos, Sydney Digital Thesis, Openthesis and Canadian Thesis Center were scanned within the scope of grey literature scan.

Eligibility criteria

The inclusion criteria used by the researchers were determined as follows: a) Being published between January 1995-December 2014 b) Being written in Turkish and English c) Availability of the full text d) The patient group being aged over 18 e) Implementation of indwelling bladder catheterization f) No urological operations performed for the purpose of diagnosis or treatment g) Use of lubricants in catheterization procedure (Water-based gel, lidocaine gel, physiological saline, distilled water, chlorhexidine-lidocaine gel, etc.)

After the scan performed using the keywords in the first step, the results were limited to the studies written in English and Turkish in the last 20 years, the full texts of which were available. The titles and abstracts of these studies were assessed according to the criteria of being aged over 18, no urological operations performed for the purpose of diagnosis or treatment, and implementation of indwelling bladder catheterization using lubricants.

Quality assessment

The study obtained was evaluated using the Joanna Briggs Institute Meta-Analysis of Statistics Assessment and Review Instrument (MAStARI) [10]. The criteria of the Meta-Analysis of Statistics Assessment and Review Instrument (MAStARI) were as follows:

1. Was true randomization used for assignment of participants yo treatment groups? 2. Was allocation to treatment groups concealed? 3. Were treatment groups similar at the baseline? 4. Were participants blind to treatment assignment? 5. Were those delivering treatment blind to treatment assignment? 6. Were outcomes assessors blind to treatment assignment? 7. Were treatments groups treated identically other than the intervention of interest? 8. Was follow-up complete, and if not, were strategies to address incomplete follow-up utilized? 9. Were participants analysed in the groups to which they were randomized? 10. Were outcomes measured in the same way for treatment groups? 11. Were outcomes measured in a reliable way? 12. Was appropriate statistical analysis used? 13. Was the trial design appropriate, and any deviations from the standard randomized controlled trials design (individual randomization, parallel groups) accounted for in the conduct and analysis of the trial?

Each study was assessed separately by the researchers according to all the criteria and then a consensus was reached. Among the studies assessed, those which did not present sufficient numerical data on pain resulting from indwelling bladder catheterization, in which urological operation was performed towards treatment, topical anesthetics were not applied and which were qualitative were excluded from the review.

Data were gathered from the obtained studies about the country where it was carried out, the research method, the selection criteria of the sample group, the socio-demographic characteristics of the sample group, the tools used to assess the pain, the assessment process of pain, pain levels following catheterization and

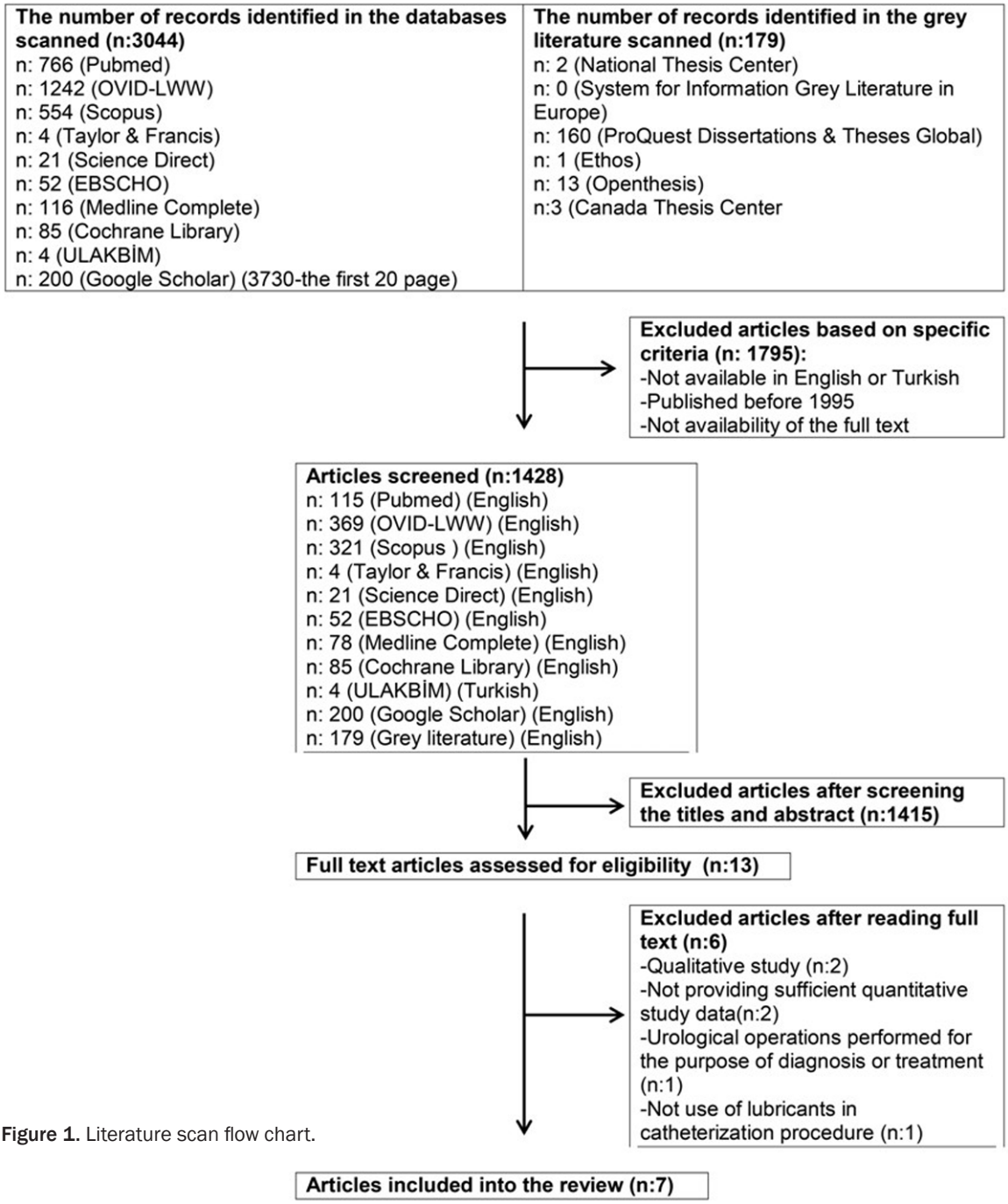

Figure 1. Literature scan flow chart.

its type, and factors that might be related to pain.

Results

3044 publications and 179 theses related to the topic were viewed at the end of the scan. Eleven studies and two theses were evaluated as full texts. Seven studies which met the criteria of Joanna Briggs Institute Meta-Analysis of Statistics Assessment and Review Instrument (MAStARI), were taken into the study scope. The literature scan flow chart was given in **Figure 1**.

The studies on the topic were carried out between 2004 and 2014. Two studies were carried out in 2004 and the other ones were carried out in 2007, 2008, 2010, 2012 and 2013, respectively. One of them is randomized

Table 1. Descriptive information of studies involved in the study

Name of authors and year of study	Country	The research design	Sampling criteria	Age*	The rate of those with catheter experience (%)	Sample group			The number catheter used	The amount of gel used	The waiting duration	The one who implements catheter	Pain assessment cool
						Control	Intervention	Total (n)					
Temel and Zaybak, 2012	Turkey	Randomized controlled double-blind	-Female -Caesarean operation	28.9±5.12 (19-45)	54	Distilled water (n=42)	1. Group: 2% Lidocaine gel (n=42) 2. Group: Lubricating gel (n=42)	126 patient	14 Fr	-	-	Nurse (the same person)	-Visual comparison scale (1-10 cm) (Converted to 0-100 mm)
Chan et al, 2014	Singapore	Randomized controlled double-blind	-Female -Applying to emergency	67.2±13.1 (28-90)	Control: 65.4 Intervention: 76.9 Total: 71.2	Lubricating gel (n=26)	2% Lidocaine gel (n=26)	52 patient	10Fr 12Fr 14Frr	-	-	Nurse (different person) Student nurse (different person)	-Visual analog scale (1-100 mm)
Chung et al, 2007	Sidney	Randomized controlled double-blind	-Female -Applying to emergency	77±14.7 (31-92)	Unspecified	Lubricating gel (n=31)	2% Lidocaine gel (n=31)	62 patient	12Fr 14Fr	-	-	Nurse (different person)	-Visual analog scale (1-100 mm)
Garbutt et al, 2008	Australia	Randomized controlled single-blind	-Male -Applying to emergency	Control: 74 [18] Intervention: 67 [16]	Unspecified	2% lidocaine gel+0.05% chlorhexidine gel without waiting (n=36)	2% Lidocaine gel+0.05% Chlorhexidine gel waiting duration of 2 minutes (n=37)	73 patient	16 Fr	10 ml.	Control: Without waiting Intervention: 2 minutes	Physician (different person)	-Visual analog scale (1-100 mm)
Siderias et al, 2004	New York	Randomized controlled double-blind	-Male -Applying to emergency	62 (22-85)	Unspecified	Lubricating gel (n=18)	2% Lidocaine gel (n=18)	36 patient	16 Fr	15 ml.	15 minutes	Physician (the same person)	-Visual analog scale (1-100 mm) -Difficulty level of procedure (5 point likert scale)
Tanabe et al, 2004	Chicago	Randomized controlled double-blind	-Female -Applying to emergency	56.4±23.4 (18-101)	Unspecified	Lubricating gel (n=50)	2% Lidocaine gel (n=50)	100 patient	16 Fr 8 Fr	5 ml.	1 minute	Nurse (different person)	-Visual analog scale (1-100 mm) -Difficulty level of procedure (1-10 cm)
Tan et al, 2010	Singapore	Cross-sectional analytic	-Female and male -Major abdominal surgery	56 [40-78]	Unspecified	50 patient (16 Female 34 Male) 2% Lidocaine gel used			14 Fr	-	-	Unspecified	-Pain scale (0-10 points) (Converted to 0-100 points)

*Mean±SS (min-max), Mean (min-max), Median [interquartile range], Median [min-max].

Table 2. The pain assessment and related factor of studies involved in the study

Name of authors and year of study	Time of pain assessment		Rates of pain incidence	Average pain level		Difference	Related factors
	Before procedure	After procedure		Before procedure	After procedure		
Temel et al, 2012		+	Control: 78.6% 2% Lidocaine: 52.4% Lubricant: 78.6% Total:69.8%		Control: 21.9±19.9 Lidocaine: 12.9±18.7 Lubricant: 20.3±19.1 Total: 18.2±19.2	Lower pain incidence in the intervention group using 2% Lidocaine gel than the one using Lubricating gel.	-Age and pain level not related -Catheter intervention and pain incidence rate not related -The type of lubricant used and the pain type not related
Chan et al, 2014	+	+		Control: 20.6±16.5 Intervention: 28.3±27.5	Control: 19.3±14.2 Intervention: 8.7±6.6	Significantly lower pain incidence averages following the procedure in the intervention group using 2% Lidocaine gel than the one using Lubricating gel	-Unspecified
Chung et al, 2007	+	+		Control: 11±21.5 Intervention: 10±20.8	Control: 37±34.7 Intervention : 11±30.4	Significantly lower pain incidence averages following the procedure in the intervention group using 2% Lidocaine gel than the one using Lubricating gel	-Unspecified
Garbutt et al, 2008 Male	+	+			Control: 22.2±23.4 Intervention: 27.8±35.3	No different in pain level between catheter insertion without waiting after 2% Lidocaine gel+0.05% Chlorhexidine gel application and insertion with waiting for 2 minutes after the application	-Unspecified
Siderias et al, 2004 Male	+	+		Control: 23±17 Intervention: 40±25	Control: 58±17 Intervention: 38±28	Significantly lower pain incidence averages following the procedure in the intervention group using 2% Lidocaine gel than the one using Lubricating gel	-Age and pain level not related -No difference across the groups in terms of difficulty of catheter insertion, bleeding occurrence, urinary retention, and the number of interventions to insert catheter -If given a chance to choose, the patients will choose Lidocaine catheter implementation
Tanabe et al, 2004	+	+			Control: 24.9 Intervention: 21.9 Total: 23.5±27.2	No different in pain level between the intervention group using 2% Lidocaine gel and the one using Lubricating gel	-No difference across the groups in terms of difficulty of catheter insertion -No relation between existence of urinary system infection and pain -Higher pain level and discomfort in the age group 18-59 tan the one aged over 60 -No relation between catheter number and pain
Tan et al, 2010		+			Female: 11.3 Male: 28.8	Higher pain level averages among male patients than female patients	-No relation between catheter-related pain and age, urinary system infection, the existence of prostate and the use of postoperative analgesia

controlled single-blind [11], one is cross-sectional analytic [12] and the other five studies are randomized controlled double-blind [13-17]. Written and oral permission from each patient included into the sample group, the approval from the institution and ethical committee approval were taken (**Table 1**).

The ages of sample group of the studies generally vary between 18 and 101. When assessed in terms of genders, it can be seen that in four studies the sample group consists of females [13, 14, 16, 17], in two studies of males [11, 15], and in one study of both males and females [12]. As the criteria to be included into the sample, one study determined patients who will undergo caesarean operation [17], five studies patients who apply to emergency service [11, 13-16], and one study patients who will undergo major abdominal surgery (except for laparoscopy and transurethral surgery) [12]. The sample size in all the studies was determined by power analysis and the sample consisted of at least 36 and at most 126 patients. The total sample number size of all the studies is 499 (**Table 1**).

Visual Analog Scale (0-10 cm or 0-100 mm) and the 0-10 points scale were used in order to assess the pain the patients defined during urethral catheterization. In this review, the results in the form of 0-10 cm and 0-10 points were converted to 0-100 mm and 0-100 points to express the assessment results of pain occurring after the procedure in common terms. Pain assessment was carried out both before and after the procedure in five studies (before urethral catheter was implemented or after the gel was applied on the urethra), while in two of them it was performed only after the procedure. Besides, in order to assess the difficulty of implementing urethral catheter, a five-point Likert scale (effortless, easy, fair, difficult, and very difficult) [15] was used in one study and the 0-10 cm scale, in which the rating of procedure was in terms of its difficulty level from easy to difficult, was used in another one [16] (**Table 1**).

In studies with the design of control and intervention groups, Chan et al [13], Chung et al [14], Siderias et al [15], Tanabe et al [16] implemented urethral catheterization using water-based lubricating gel in the control group and using 2% Lidocaine gel in the intervention group. In Temel and Zaybak [17], while they used distilled water in the control group, they formed two intervention groups and applied lubricating gel in in the first group and 2% Lidocaine gel in the second group. Garbutt et al [11], on the other hand, implemented 2% Lidocaine gel plus 0.05% chlorhexidine gel in the intervention and control groups and divided them by setting different waiting durations for each group. In the cross-sectional study by Tan et al [12], 2% Lidocaine gel was used in catheterization in all of the sample group. Though the amount of gel used is not stated in every study, Garbutt et al [11] used 10 ml of gel, Siderias et al [15] 15 ml of gel, and Tanabe et al [16] used 5 ml of gel. Again, the waiting duration required for the gel to be effective is not stated in every study. However, Tanabe et al [16] waited for one minute and Siderias et al [15] for 15 minutes after the implementation of the gel and then inserted the catheter into urethra. Since Garbutt et al [11] determined the control and intervention groups according to the waiting duration of the gel, they implemented the gel without waiting in the control group and waited for two minutes after the gel was applied (**Table 1**).

The type of catheter used was not signified in the studies and the numbers of catheters used were 10 Fr, 12 Fr, 14 Fr and 16 Fr. However, Tanabe et al [16] used the 8 Fr catheter in their patients from which they took samples via urinary catheter. In terms of the person who implements catheter, one study does not indicate who implements it [12], while in one study states it was the same physician who implemented the catheter [15], in one study it was different physician [11], in one study it was the same nurse [17] and in three studies it was different nurse [13, 14, 16] (**Table 1**).

When the procedure-related pain level averages following catheterization are examined, it is seen that in intervention groups in which 2% Lidocaine gel is used, the pain level is 8.7 mm at the lowest and 38 mm at the lowest. In control groups in which distilled water- or water-based lubricants are used, on the other hand, the pain level is 19.3 mm at the lowest and 58 mm at the highest [11-17] (**Table 2**).

In the study carried out by Temel and Zaybak [17] with one control and two intervention groups, the pain level averages of the control

group, in which urethral catheter was implemented using distilled water, and of the intervention group, in which catheter was inserted using lubricating gel, were over 20.3, while the average was 10.29 in the intervention group in which 2% Lidocaine gel was used. However, no statistical difference was identified between the groups. When assessed in terms of pain incidence rates, while pain was experienced at a rate of 78.6% in the control group and 78.6% in the intervention group in which lubricating gel was used, this rate was found to be 52.4% in the intervention group in which Lidocaine gel was used, which is lower than the other groups (**Table 2**).

In Tan et al [12] in which there was only one study group, urethral catheter was applied in all the patients using 2% Lidocaine gel and then the pain level was assessed. At the end of the study, it was determined that the pain level of male patients was significantly higher than that of female patients (Female: 11.3, Male: 28.8 points). In the studies of Chan et al [13] and Chung et al [14] performed on females, the pain level averages in intervention groups in which urethral catheter was applied using 2% Lidocaine gel (8.7±6.6 and 11±30.4, respectively) were found to be significantly lower compared to control groups in which urethral catheter was applied using lubricating gel (19.3± 14.2 and 37±34.7, respectively). Similarly, in the study by Siderias et al [15] performed on male patients applying to the emergency service, the pain level average of the intervention group in which 2% Lidocaine gel was used was found significantly lower than the control group (Control: 58±17, Intervention: 38±28). However, in Tanabe et al [16], which was performed with females applying to the emergency service, the pain level average of the control group, in which lubricating gel was used, was 24.9 while the average of the intervention group, in which 2% Lidocaine gel was used, was found 21.9, and no significant difference was detected between two groups (**Table 2**).

Garbutt et al [11], who assessed the waiting durations following the application of 2% Lidocaine gel plus 0.05% chlorhexidine gel used in catheterization, found no significant difference between the control group in which catheter was inserted without waiting after the gel was applied and the intervention group in which there was a 2-minute waiting period after the gel was applied in terms of pain level averages (Control: 22.2±23.4, Intervention: 27.8± 35.3) (**Table 2**).

While generally the level of pain that occurs during catheter implementation is assessed in studies, Temel and Zaybak [17] also assessed the type of pain and it was determined that 31.7% of the patients experienced burning pain, 23% stinging pain and 15.1% aching pain, whereas there was no difference in the pain type in terms of the type of gel. Furthermore, based on the view that prior catheterization experience might influence the pain level, the same study examined the catheterization experiences of patients and it was detected that 54% had some experience but there was no relation between the experience and the pain incidence. Also, in Chan et al [13], 65.4% of the patients in the control group and 76.9% of patients in the intervention group had catheterization experience. However, there is no data showing the relation between pain incidence and catheterization experience (**Table 1**).

When the assessments as to the factors considered to be influential on pain during catheter implementation are examined in the studies under examination, in three studies [12, 15, 17], no relation was found between age and the level of pain, while in one study [16] it was determined that the pain level and discomfort related to urethral catheterization among individuals aged 18-59 was higher than individuals aged over 60. No significant relation was found between the level of procedure-related pain and urinary system infection [12, 16], the existence of prostate [12], use of postoperative analgesia [12], bleeding during catheterization [15], urinary retention [15], the number of interventions applied to implement catheter [15], and the number of catheter [16] (**Table 2**).

When the assessments made by the person who implemented the catheter in terms of difficulty of the implementation process are examined, it was determined that differences in the gel used did not influence the difficulty level of catheterization [15, 16] (**Table 2**).

Moreover, in Siderias et al [15], the patients in the intervention group, in which 2% Lidocaine gel was used, stated that if they were subject to catheterization again and were given a chance

to choose, they would prefer procedure to be implemented with Lidocaine gel (**Table 2**).

Discussion

At the end of this systematic review, in which the ways to relieve pain during indwelling urethral catheterization were scrutinized, it was determined that lubricants used during the catheterization procedure, gender and age influence the pain level related to catheterization and the pain incidence. In the studies reviewed, it is seen that the levels of average pain based on urethral catheterization procedure vary between 8.7 mm and 58 mm, which means they differ from mild pain to moderate pain levels. In general, certain invasive procedures for the purpose of diagnosis or treatment are used for patients who apply to the emergency care units for any reason and are accepted to inpatient treatment units. A considerable part of these invasive procedures involves urethral catheterization. Singer et al [7] report that 3% of patients applying to emergency unit are treated with urinary catheter. In Apisarnthanarak et al [18], it is reported that urinary catheterization is applied in 10% of patients in inpatient treatment units. Besides, Saint et al [4] state that urinary catheterization is implemented in 25% of patients in inpatient units.

The procedure of urinary catheterization also ranks in the first three in studies on pain levels related to invasive procedures applied in hospital setting [7, 19]. Singer et al [7] found out the average of pain level related to urinary catheter as 40.5 mm and Kelley et al [19] as 26.0 mm. When compared to the literature, pain levels ranging from mild pain to moderate pain experienced in the procedure of urethral catheterization are similar in the reviewed studies.

The most important reason why pain occurs during catheterization is tissue trauma due to friction of catheter inside the urethra, which is rich in blood veins, connective tissue and nerve tissue. As the first symptom of tissue trauma appears as pain [1, 2]. The 2012 update of the manual prepared in 2003 for infection control by The National Institute for Health and Care Excellence, it was repeated that “a proper single use lubricant should be used in order to minimize urethral trauma and infection during catheter insertion” [20]. Similarly, in the national evidence-based guideline prepared by National Health Service (NHS) to prevent infections related to health care [21], in the guideline “Indwelling Catheters in Adults - Urethral and Suprapubic” prepared by the European Association of Urology Nurses in 2012 [22] and in “the Guideline for Prevention of Catheter-associated Urinary Tract Infections” prepared by Centers for Disease Control and Prevention in 2009, the use of proper sterilized single-use lubricants are recommended during catheter implementation [23].

Water-based gels or gels containing lidocaine, antiseptic or different combinations of these are available in the market, which are produced to be used in catheter insertion procedure or in various urological operations [24, 25]. The use of topical anesthetic lidocaine gels in urological procedures date back to the 1940’s. They were started to be used especially in such procedures as cystoscopy, in which the rate of pain incidence is high, and nowadays their use has been widespread in different urethral procedures like difficult catheterization as well [26]. However, studies in which pain in urological procedures performed with lidocaine gel is examined yield different results. Although there are studies showing that pain wears off with the use of lidocaine gel in patients undergoing cystoscopy [27, 28], there also some other studies reporting that use of lidocaine gel has no minimizing effect on pain [29, 30].

There are also differences in the levels of pain related to urethral catheterization performed with different lubricants in the studies taken into the scope of this review. In the studies of Chan et al [13] and Chung et al [14], which were performed on female sample groups, the results were in favor of lidocaine gel in terms of pain incidence in Temel and Zaybak [17] according to the pain level due to urethral catheterization while Tanabe et al [16] found no significant difference in terms of pain in urethral catheter insertion using lidocaine gel and lubricating gel. The differences in results might emerge either from the characteristics of the sample group, their experiences or the waiting duration of lidocaine gel and its amount, technique of catheter insertion and the skill of the person implementing it.

It is advised that there is at least a 10-minute waiting duration so that topical anesthetics such as lidocaine gel can be effective, though there may be differences according to the gel

each company produce [1, 8, 24, 25]. No information is given as to the waiting duration following the gel application in Chan et al [13], Chung et al [14] and Temel and Zaybak [17]. Still, it was stated in Siderias et al [15] that pain level was lower in the patient group in which catheter was implemented 15 minutes after lidocaine gel application than the one in which lubricant gel was used. In Tanabe et al [16], which was carried out with the catheterized patient group after a one-minute waiting duration, and Garbutt et al [11], performed after a two-minute waiting duration, they reported that lidocaine gel had no effect on pain. Based on this, it might be concluded that performing catheter insertion after waiting for the action time for the gel may be effective on pain.

In Tan et al [12], the pain level was found 11.3 points among females and 28.8 points among males after urethral catheterization procedure using lidocaine gel. Anatomical differences between male and female urethra are also a factor that might be influential on pain incidence. The male urethra measures between 17.5-22 cm in length, while the female urethra is 3-5 cm long. Their structural properties are similar and there are cells that release mucin inside the male urethra in urothelium. Until the 1990's, anesthetic gels had been used in catheterization based on the notion that pain incidences were high since male urethra was longer. On the other hand, in female catheterization lubricating or anesthetic gels were not required. However, since there are no cells that release lubricating mucin in the female urethra and because of folds in epithelium, the risk of trauma is high during catheterization procedure. Therefore, recently there has been a consensus that urethral gels are used on a regular basis in order to prevent trauma, pain and discomfort in female and male catheterization [9, 25]. Moreover, it is a dominant view in certain literature works that use of lubricating gels might help catheterization to sight in female urethra [5, 31, 32].

Even though pain is a condition that can be experienced in all ages, there are variations in responses to pain. While children generally express pain with behavioral responses like restlessness and crying, elderly people regard this as an experience they have to go through and tolerate with since they perceive grandeur, religious beliefs, desire to be a good patient and pain as natural consequences of aging and they are sometimes unwilling to report their pain. Furthermore, due to changes that take place in the nervous system and skin during the aging process, cutaneous pain might decrease while there may be increases invisceral pain [33, 34]. In all the studies apart from that of Temel and Zaybak [17], the mean or median ages are 56 and over. Among those studies, a significant relation between pain and age was detected only in Tanabe et al [16] and pain and discomfort related to catheterization procedure was found higher in patients aged 18-59 than those aged over 60. The authors explain this with high the existence of an amount of muscular tonus and anatomical changes.

Since pain is a sensational and emotional intervention of individual, it is always subjective and can be remembered. In consequence, the responses to pain are considerably influenced by prior pain experiences. If an effective and timely pain control has been achieved in prior pain experience of the individual, tolerance to current pain might increase [34, 35]. In the studies reviewed, Temel and Zaybak [17] and Chan et al [13] questioned the patients' prior catheterization experiences. In Temel and Zaybak [17], it was reported that 54% of patients in the control and intervention groups had catheterization experience before, while this rate is 71.2% in Chan et al [13]. The relation between pain during catheter insertion and prior pain experience was compared in Temel and Zaybak [17] but no significant result was obtained.

As in all care applications, the training and skills of the implementer are also among the factors that can affect such conditions as pain and discomfort that the patients might experience. Invasive procedures performed by people without proper and sufficient training and skills in improper ways may increase the pain patient feels. In the studies reviewed, Tan et al [12] excluded the influence of implementer on pain and did not give information as to this issue, which is one of the limitations of the study. The physician performed the catheterization procedure in two studies [11, 15] whereas in four of them it was the nurse who performed the procedure [13, 14, 16, 17]. While the average pain levels are above 25 mm in intervention groups

of studies in which physicians performed the implementation, the average pain levels are below 20 mm in studies in which nurses were the implementers. This might result from the fact that health staff in two occupational groups receive different trainings and have different experiences.

At the end of this systematic examination, in which the influence of various lubricants used in urethral bladder catheterization on procedure-related pain was investigated, it was determined that the level of pain caused when inserting a urinary catheter using lidocaine gel was 8.7 mm at the lowest and 38 mm at the highest, while the pain level that occurs when distilled water or water-based lubricant is used is 19.3 mm at the lowest and 58 mm at the highest. The gel used is directly effective on pain and pain level in male young patients is higher. No relation was detected between procedure-related pain and prior catheter implementation in the patient, the number of interventions applied to implement catheter, the number of catheter, bleeding during implementing catheter, use of post-operative analgesia, and the existence of urinary retention and prostate.

This reviews study was limited to seven studies. Since pain is a subjective expression, carrying out the studies in different cultures and with different sample groups might influence the generalizability of results. Furthermore, the technical knowledge and skill of implementer is a factor that might have an effect pain. The existence of different implementers in the studies of this review can be regarded as a condition that might negatively affect reliability. Even though the steps to implement catheter are similar in the studies that were reviewed, there are some studies that do not give detail about how much gel is applied or how long the implementer should wait after applying the gel. This might cause variations in study results.

The procedure of urethral catheterization ranks among the first in invasive interventions that may bring about pain in patients and the level of pain felt can rise to severe levels. Thus, the level of pain can be minimized in patients without allergy by using gels containing lidocaine in line with the standards of implementation regardless of gender and age.

In order raise the level of generalizability and to provide evidence, comparative studies are needed in which catheterization is implemented by the same implementer with similar patient groups and the same procedure steps.

Acknowledgements

We express our sincerest gratitude to Assis. Prof. Dr. Serap Bulduk and Assis. Prof. Dr. Havva Sert for their invaluable contributions to this study.

Disclosure of conflict of interest

None.

Address correspondence to: Dr. Esra Usta, Department of Nursing, Institute of Health Sciences, Sakarya University, Sağlık Bilimleri Enstitüsü Esentepe Kampüsü, 54187, Serdivan, Sakarya, Turkey. Tel: +90 555 280 1691; Fax: +90 380 542 1251; E-mail: esrakillikliogl u@gmail.com

References

[1] Ghaffary C, Yohannes A, Villanueva C and Leslie SW. A practical approach to difficult urinary catheterizations. Curr Urol Rep 2013; 14: 565-579.

[2] Potter PA and Perry AG. Urinary elimination. In: Potter PA, Perry AG, editors. Fundamentals of nursing. 7 th edition. St. Louis, Mo, USA: Mosby Elsevier; 2009. pp. 1130-1166.

[3] Bardsley A. Use of lubricant gels in urinary catheterisation. Nurs Stand 2005; 20: 41-46.

[4] Saint S, Wiese J, Amory JK, Bernstein ML, Patel UD, Zemencuk JK, Bernstein SJ, Lipsky BA and Hofer TP. Are physicians aware of which of their patients have indwelling urinary catheters? Am J Med 2000; 109: 476-480.

[5] Devine AL. Female catheterisation: what nurses need to know! Accid Emerg Nurs 2003; 11: 91-95.

[6] Hadfield-Law L. Male catheterization. Accid Emerg Nurs 2001; 9: 257-263.

[7] Singer AJ, Richman PB, Kowalska A and Thode HC Jr. Comparison of patient and practitioner assessments of pain from commonly performed emergency department procedures. Ann Emerg Med 1999; 33: 652-658.

[8] Wilson M. Causes and management of indwelling urinary catheter-related pain. Br J Nurs 2008; 17: 232-239.

[9] Kyle G. Should lidocaine gel or lubricating gel be used during catheter insertion? Nurs Times 2009; 105: 17.

[10] The Joanna Briggs Institute. Joanna Briggs Institute Reviewers' Manual: 2014 edition. Australia: The Joanna Briggs Institute; 2014.
[11] Garbutt RB, Mc DTD, Lee V and Augello MR. Delayed versus immediate urethral catheterization following instillation of local anaesthetic gel in men: a randomized, controlled clinical trial. Emerg Med Australas 2008; 20: 328-332.
[12] Tan GW, Chan SP and Ho CK. Is transurethral catheterisation the ideal method of bladder drainage? A survey of patient satisfaction with indwelling transurethral urinary catheters. Asian J Surg 2010; 33: 31-36.
[13] Chan MF, Tan HY, Lian X, Ng LY, Ang LL, Lim LH, Ng WM, Tan MC and Taylor BJ. A randomized controlled study to compare the 2% lignocaine and aqueous lubricating gels for female urethral catheterization. Pain Pract 2014; 14: 140-145.
[14] Chung C, Chu M, Paoloni R, O'Brien MJ and Demel T. Comparison of lignocaine and water-based lubricating gels for female urethral catheterization: a randomized controlled trial. Emerg Med Australas 2007; 19: 315-319.
[15] Siderias J, Gaudio F and Singer AJ. Comparison of topical anesthetics and lubricants prior to urethral catheterization in males: a randomized controlled trial. Acad Emerg Med 2004; 11: 703-706.
[16] Tanabe P, Steinmann R, Anderson J, Johnson D, Metcalf S and Ring-Hurn E. Factors affecting pain scores during female urethral catheterization. Acad Emerg Med 2004; 11: 699-702.
[17] Temel A and Zaybak A. The effect on pain of the use of two different lubricants in urethral bladder catheterization. Journal of Anatolia Nursing and Health Sciences 2012; 15: 75-79.
[18] Apisarnthanarak A, Rutjanawech S, Wichansawakun S, Ratanabunjerdkul H, Patthranitima P, Thongphubeth K, Suwannakin A, Warren DK and Fraser VJ. Initial inappropriate urinary catheters use in a tertiary-care center: incidence, risk factors, and outcomes. Am J Infect Control 2007; 35: 594-599.
[19] Kelley L, Sklar DP, Johnson DR and Tandberg D. Women's perception of pain and distress during intravenous catheterization and urethral mini-catheterization. Am J Emerg Med 1997; 15: 570-572.
[20] National Institute for Health and Care Excellence-NICE. Partial update of nıce clinical guideline 2. infection: prevention and control of healthcare-associated infections in primary and community care. London: National Institute for Clinical Excellence; 2012.
[21] Loveday HP, Wilson JA, Pratt RJ, Golsorkhi M, Tingle A, Bak A, Browne J, Prieto J, Wilcox M; Health UKDo. epic3: national evidence-based guidelines for preventing healthcare-associated infections in NHS hospitals in England. J Hosp Infect 2014; 86 Suppl 1: S1-70.
[22] Geng V, Cobussen-Boekhorst H, Farrell J, Gea-Sanchez M and Pearce I. Catheterisation: Indwelling catheters in adults: Urethral and suprapubic. European Association of Urology Nurses (EAUN), Arnhem, The Netherlands 2012.
[23] Gould CV, Umscheid CA, Agarwal RK, Kuntz G, Pegues DA; Healthcare Infection Control Practices Advisory C. Guideline for prevention of catheter-associated urinary tract infections 2009. Infect Control Hosp Epidemiol 2010; 31: 319-326.
[24] MontavitCathejell anaesthetizing gel. 2013. Available from http://www.montavit.com/en/products/cathejell-anaesthesierendes-gel, [Cited June 08, 2015].
[25] Wilson M. Catheter lubrication and fixation: interventions. Br J Nurs 2013; 22: 566,-569.
[26] Tzortzis V, Gravas S, Melekos MM and de la Rosette JJ. Intraurethral lubricants: a critical literature review and recommendations. J Endourol 2009; 23: 821-826.
[27] Choe JH, Kwak KW, Hong JH and Lee HM. Efficacy of lidocaine spray as topical anesthesia for outpatient rigid cystoscopy in women: a prospective, randomized, double-blind trial. Urology 2008; 71: 561-566.
[28] Ho KJ, Thompson TJ, O'Brien A, Young MR and McCleane G. Lignocaine gel: does it cause urethral pain rather than prevent it? Eur Urol 2003; 43: 194-196.
[29] Chitale S, Hirani M, Swift L and Ho E. Prospective randomized crossover trial of lubricant gel against an anaesthetic gel for outpatient cystoscopy. Scand J Urol Nephrol 2008; 42: 164-167.
[30] Stein M, Lubetkin D, Taub HC, Skinner WK, Haberman J and Kreutzer ER. The effects of intraurethral lidocaine anesthetic and patient anxiety on pain perception during cystoscopy. J Urol 1994; 151: 1518-1521.
[31] de Courcy-Ireland K. An issue of sensitivity. Use of analgesic gel in catheterizing women. Prof Nurse 1993; 8: 738-742.
[32] Woodward S. Use of lubricant in female urethral catheterization. Br J Nurs 2005; 14: 1022-1023.
[33] Aslan FE. Postoperatif ağrı yaşlıların kaderi mi? Journal of Anatolia Nursing and Health Sciences 2003; 6: 57-66.
[34] Aslan FE. Yaşlılarda ağrı. In: editors. Ağrı Doğası ve Kontrolü. Istanbul: Mart Matbaacılık; 2006. pp. 318-334.
[35] Aslan FE. Ağrı değerlendirme yöntemleri. C.Ü. Hemşirelik Yüksekokulu Dergisi 2002; 6: 9-16.