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ความเสียหายของชีววัตถุพยานในคดีความผิดทางเพศ: การศึกษาในโรงพยาบาล

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Damage of Biological Evidences in Sexual Assault Cases: A Hospital-Based Study

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บทคัดย่อ

หลักการและวัตถุประสงค์: คราบอสุจิเป็นชีววัตถุพยาน (biological evidence) ที่มีความสำคัญในคดีความผิดทางเพศ เพื่อใช้ประกอบการสืบสวนคดีหาความสัมพันธ์ระหว่างผู้กระทำความผิดกับผู้เสียหายได้ ดังนั้นการเก็บรักษาและนำส่งวัตถุพยานประเภทนี้เพื่อนำไปตรวจสอบจึงมีความสำคัญอย่างมาก การเก็บรักษาคราบอสุจิรวมถึงการนำส่งที่ไม่ถูกต้องอาจจะส่งผลต่อคุณภาพของวัตถุพยาน ซึ่งมีผลต่อการตรวจทางห้องปฏิบัติการทางนิติวิทยาศาสตร์ต่อไป การศึกษานี้มีวัตถุประสงค์เพื่อศึกษารูปแบบความเสียหายของสิ่งส่งตรวจในคดีความผิดทางเพศที่เสียหายจากการเก็บรักษาและการนำส่ง

วิธีการศึกษา: ข้อมูลจะถูกเก็บจากแบบฟอร์มการส่งสิ่งส่งตรวจในคดีความผิดทางเพศและบันทึกการรับวัตถุพยานที่ห้องปฏิบัติการภาควิชานิติเวชศาสตร์ คณะแพทยศาสตร์ มหาวิทยาลัยขอนแก่น โดยเป็นสิ่งส่งตรวจในคดีความผิดทางเพศที่ถูกนำส่งจากโรงพยาบาลต่าง ๆ ในภาคตะวันออกเฉียงเหนือ ระหว่างวันที่ 1 มีนาคม 2554 ถึงวันที่ 31 สิงหาคม 2559 วิเคราะห์ความสัมพันธ์ข้อมูลโดย binary logistic regression.

ผลการศึกษา: สิ่งส่งตรวจคดีความผิดทางเพศมีจำนวนทั้งสิ้น 4,024 ตัวอย่าง ส่วนใหญ่เป็นไม้พันสำลีจำนวนร้อยละ 97.64 (3,929/4,024) ส่วนที่เหลือเป็นแผ่นสไลด์แก้วจำนวนร้อยละ 2.36 (95/4,024) ไม้พันสำลีที่ส่งมาตรวจอยู่ในสภาพเสียหายจากการเกิดเชื้อราจำนวนร้อยละ 1.68 (66/3,929) นอกจากนี้ยังพบว่าระยะเวลาในการส่งสิ่งตรวจที่เพิ่มขึ้น 1 วัน ส่งผลให้ไม้พันสำลีมีโอกาสเกิดเชื้อราเพิ่มขึ้นอย่างมีนัยสำคัญทางสถิติ โดยคิดเป็น 1.09 เท่า ($p < 0.05$) ในส่วนของสไลด์แก้วพบว่าสไลด์แก้วอยู่ในสภาพแตกเสียหายจำนวนร้อยละ 8.42 (8/95)

สรุป: วิธีการเก็บตัวอย่าง การเตรียมสิ่งส่งตรวจก่อนนำส่ง รวมถึงระยะเวลาในการส่งสิ่งส่งตรวจเป็นสิ่งสำคัญซึ่งส่งผลทำให้เกิดความเสียหายแก่วัตถุพยานในคดีความผิดทางเพศได้

คำสำคัญ: ความผิดทางเพศ, วัตถุพยาน, ไม้พันสำลี, การเกิดเชื้อรา, การรักษาวัตถุพยาน

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Abstract

Background and objective : Semen stains are the biological evidence that is important for charging individuals with sexual offenses because, for investigative purposes, there are used to verify the relationship between the offender and the victim. Therefore, the preservation and delivery of this type of physical evidence for examination is very important. The poor preservation of semen stains, including improper delivery, may affect the quality of the physical evidence and thus, may further affect additional forensic laboratory testing. This study aimed at examining the patterns of damage of specimens from sexual assault cases that can occur during storage and delivery.

Methods : The data was collected from the submission form of the specimens in sexual assault cases and the records from the receipt of physical evidence at the Laboratory of the Department of Forensic Medicine at the Faculty of Medicine at Khon Kaen University. The specimens, which were investigated, had been delivered from hospitals in the Northeast from 1 March 2011 to 31 August 2016. Analyzing the statistical relationship by binary logistic regression.

Results : The majority were cotton swabs at 97.64 percent (3,929 / 4,024), and the remaining samples consisted of glass slides at 2.36 percent (95 / 4,024). However, it was found that 1.68% (66 / 3,929) of the cotton swabs, which had been sent for examination, had been damaged by fungal contamination. In addition, every day that the period of testing was extended was found to have resulted in significantly increased fungal contamination by 1.09 times ($p<0.05$). Moreover, 8.42% (8/95) of the glass slides had been broken.

Conclusion : The pre-delivery process and the timely delivery of the specimens are both important. In addition, with poor preservation and slow delivery, the physical evidence, which is required for the sexual assault cases, can be damaged.

Keywords : Sexual assault, physical evidence, cotton swab, fungal contamination, physical evidence preservation

Introduction

Sex offenses under the Criminal Code include "Rape" (Section 276), "Sexual Offenses" (Section 277) and "Obscenity" (Section 278-279). Sexual victims can be found in children[1], adults, or even seniors. According to Police General Hospital, statistics about sexual offenses in Thailand revealed that 62.4% of incidences were found to have taken place among middle school adolescents and that 50.3% of the offenders had been male friends.[2] In regard to finding proof, witnesses, and evidence, the prosecution of convicted suspects is problematic. In addition, sexual offenses are cases in which only the offenders and victims truly know the truth. Therefore, the examination results from specimens, which are taken from the bodies of the victims of sexual offenses, especially in rape cases, are greatly important.

Semen is vital biological evidence for sexual assault cases, and it is used to detect sperm. Currently, there are several methods for detecting sperm, such as the presumptive test by acid phosphatase test, the prostate-specific antigen (PSA)[3], and the semenogelin (Sg or SEMG). In addition, the sperm detection is also performed by the H&E stain and the Christmas tree, etc.[4] The success of sperm detection depends upon all levels of pre-analytic and analytic procedures. Implementation of incorrect procedures could damage the biological evidence, which leads to an inability to verify the evidence and to the misinterpretation of the results. Consequently, the offenders are not convicted or punished because of a lack of sufficient evidence. However, no studies were found on the damage patterns that are related to the storage or to the delivery of specimens in sexual offenses, particularly in the Northeast.

Therefore, the objective of this research was to study the patterns of specimen damage related to sexual offenses during the storage and delivery. Information about the specimens to be examined were sent from various organizations in the Northeast to the Laboratory of the Department of Forensic Medicine at the Faculty of Medicine, Khon Kaen University. The results from this research will be helpful in finding suitable solutions and in providing knowledge about how to preserve physical evidence in sexual offenses.

Materials and Methods

This was a retrospective study. The data were collected by utilizing the submission forms of the specimens in sexual assault cases and the records of receiving physical evidence at the Laboratory of the Department of Forensic Medicine at the Faculty of Medicine, Khon Kaen University. In order to prevent access to the patients' information, this study concealed all personal information, and the study was verified by the Human Research Ethics Committee (Project number HE 571266). The criteria for selecting data included those specimens from sexual assault cases originating from hospitals in the Northeast, which had been examined from 1 March 2011 to 31 August 2016. The total number of the specimens in sexual offenses consisted of 4,024 samples. The criteria for determining the damage included improper storage of the physical evidence and physical evidence, which was determined to be damaged, broken, or moldy. Analyzing the statistical relationship by binary logistic regression.

Result

Most of the specimens had been collected by cotton swabs (3,929 samples), accounting for 97.64 percent, and the remainders consisted of 95 samples, which had been collected from microscope slides, accounting for 2.36 percent. Of cotton swabs sent for examination, 66 had been damaged by fungal contamination, representing 1.68 percent, while 8 samples of glass slides had been damaged, representing 8.42 percent, as shown in Table 1.

There were 1,740 pieces (44.29 percent) of all 3,929 cotton swabs, which had a period that had not exceeded 14 days for delivery to a forensic laboratory. Of the cotton swabs, there were 1,687 pieces (96.95%) that were in good condition for the analysis, while the remaining 53 cotton swabs had been damaged by fungal contamination, which accounted for 3.05% as shown in Table 2.

By analyzing the statistical relationship by binary logistic regression, it was found that when the pre-delivery period had increased by 1 day, there had been a statistically significant increase in the fungal contamination of the cotton swabs ($p = 0.034$) to 1.09 times (95% confidence interval was between 1.008 and 1.182 times) as shown in Table 3.

Table 1 Conditions of biological sample in in sexual assault cases

Samples	Numbers	Sample conditions	
		Normal	Damage
Semen Swab	3,929	3,863	66*
Glass slide	95	87	8**
Total	4,024	3,950	74

Remark: *Fungal contamination, **Glass slide broken

Table 2 Delivery period and fugal contamination

Time (Day)	Cotton swab (Number)	
	No contamination	Fungal contamination
1	50	1
2	179	2
3	192	4
4	210	3
5	192	7
6	198	9
7	193	5
8	113	7
9	92	5
10	86	3
11	50	2
12	44	1
13	40	2
14	48	2
Total (%)	**1,687 (96.95%)**	**53 (3.05%)**

Table 3 Correlation between time and Fungal contamination

Cotton swab	No.	Time (Day)			p-value
		Median	25^{th}, 75^{th} percentile	Odds ratio (95%CI)	
Fungal contamination	53	7	5, 9	1.091 (1.008, 1.182)	0.034
No contamination	1687	6	4, 8		

Discussion

The examination to find evidence in the semen consisted of two parts: sperm and biological markers (Acid phosphatase enzyme, PSA and SEMG), both of which require different methods of examination. Therefore, separating the samples from the submitted specimens was required. The samples collected by glass slides were unable to be separated for examination for each method. In addition, the glass slides are also likely to break. In other words, collecting samples using the glass slides is not an appropriate method. This study found that a proportion of the sexual assault specimens, which are important as physical evidence, had been damaged by using glass slides. This damage resulted in specimens, which could not be analyzed (2.36 percent).

For the correct sampling method, a clean cotton swab is required. This method relies upon swabbing the semen from the victim's genitals. In the next step, the cotton swab must dry in order to prevent fungal contamination. In general, DNA can be tested from physical evidence that has been dried and collected for more than 10 years. This study found that a proportion of cotton swabs with fungal contamination (3.05%) had been caused by improper delivery. The fungi can normally be found in vagina[5] in both the mycelial and yeast forms, which are spore-producing.[6] Most fungi are *Candida albicans*.[7,8] which can be found since childhood[9] and may change during menstruation.[10,11] Therefore, there is a chance that the fungus is detected on the cotton swab in sex offense cases with girls or during menstruation. When the cotton swabs develop a fungus, it is difficult to identify sperm because the spores of the fungus appear in many sizes, including the size of the head of the sperm. In addition, the shape of the spore is likely to be different; likewise, the head of the sperm may differ too.

Moreover, not only does semen differ from one male to another, but it also differs in the same ejaculation.[12] This includes abnormalities in the male genital tract, which can also change the shape of the head of the sperm. Therefore, the prevention of fungal contamination is very important.

Meanwhile, the act of performing a vaginal douche after being sexually abused in order to remove the *Candida* fungus does not only change

the fungus[13], but it also destroys the semen, which is the most important evidence in many cases. Preventing fungal contamination by drying the cotton swabs is, therefore, the correct procedure.

Additionally, the amount of time that lapses before specimens reaches the laboratory is also very important. According to a study of the relationship between pre-delivery period of cotton swabs in sexual assault cases and the likelihood of fungal development, it was found that after samples from a victim's female genitalia had been collected and when the proper delivery procedures for those samples did not take place within 14 days, there was a statistically significant increase in the likelihood of fungal contamination by 1.09 times for each day of delay (p=0.034). Therefore, when a sample is collected, the specimen must be submitted for examination as soon as possible. If specimen submission is not possible immediately, then the cotton swab must be air-dried at room temperature and the sample must not be exposed to sunlight. This is the proper procedure to prevent fungal contamination.

Conclusion

Incorrectly obtaining the material for sampling, employing improper methods for specimen preparation, and allowing an unreasonably long period of time to pass before delivering the sample can destroy the value of the physical evidence, which is so very important in sex assault cases. Therefore, awareness of the importance of the correct and timely processes can provide fair results for all of those involved in sex assault cases.

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