



## Short report

## Patterned genital injury in cases of rape – A case–control study



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## ABSTRACT

A pattern of genital injury that separates trauma seen in sexual assault cases from trauma seen following consensual sexual intercourse has been a matter of debate. This study aimed at clarifying the question by eliminating as many confounders as possible in a prospective, case-control setup. A total of 98 controls and 39 cases were examined using the naked eye, the colposcope and toluidine blue dye followed by colposcopy. The overall frequency of having at least one lesion was strikingly similar in the two groups, but cases had significantly more abrasions, a trend towards more haematomas and a higher frequency of multiple lesions. Cases had a higher frequency of lesions in locations other than the 6 o'clock position. Our data suggests that cases have larger, more complex lesions. In conclusion, this study has confirmed the existence of different patterns of genital lesions. Background data for detection of genital lesions using the three most commonly used techniques is provided. These results will aid in the interpretation of findings seen when examining sexual assault victims.

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## 1. Introduction

The existence of a pattern of genital injury distinguishing trauma seen in rape cases and trauma seen following consensual sexual intercourse has been a matter of debate. Typical different patterns was suggested by Slaughter et al. in 1997 i.e. multiple genital lesions at multiple locations seen in rape victims as opposed to single lesions in the posterior forchette following consensual sexual intercourse.<sup>1</sup> This pattern has to some degree been confirmed in adults<sup>2</sup> and adolescents,<sup>3</sup> whereas a third study could not confirm such a pattern.<sup>4</sup> A more detailed description of a pattern would aid the medico-legal expert when giving evidence based testimony in court proceedings.

This study aimed to describe the pattern of injury in a prospective, controlled setting using the three most commonly used objective measures worldwide – the naked eye, colposcopy and toluidine blue dye followed by colposcopy.<sup>5,6</sup>

## 2. Methods

The present study was part of a larger study conducted at the Southern Denmark Sexual Assault Referral Centre (SDSARC) as

collaboration between the Institute of Forensic Medicine, University of Southern Denmark and the Department of Gynaecology and Obstetrics, Odense University Hospital. Data and results regarding the control group has been published in detail.<sup>6</sup> The SDSARC is a 24 h service that receives victims of sexual assault of both sexes,  $\geq 15$  years of age, with or without prior police contact. It is staffed with specialized nurses (not forensic nurses) from the gynaecological department and doctors specializing in forensic medicine.

## 2.1. Participants

Female cases were included consecutively over a two year period (August 2009 to July 2011). Adolescents, 15–17 years of age were only asked to participate if a parent or legal guardian was present. Controls were recruited over a two months period (Spring 2010) among students at the University College Lillebaelt, Health and Social Sciences. An e-mail with information was sent to all students (approximately 1200) through the intra-net of the school. The first 110 women responding were included and inclusion was then closed due to limitations in investigative capacity. All controls were instructed to have sexual intercourse in accordance with their normal routine, including penile penetration as a must within 48 h of the examination. Just before the examination, they answered a

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questionnaire with questions concerning gynaecological matters, sexual habits and the nature of their latest intercourse.

## 2.2. Clinical investigations

Examinations were performed by five physicians (registrars) from the Institute of Forensic Medicine, University of Southern Denmark, all experienced in the examination and evaluation of findings in sexual assault victims. The colposcope used was a Zeiss 150 (Carl Zeiss, Meditec, Inc. Dublin, California). The toluidine blue dye was applied using the Forensic Blue Swabs<sup>®</sup> (National Forensic Nursing Institute (NFNI), Inc. USA), and applied according to their guidelines. Toluidine blue dye is taken up by exposed nucleated cells, leaving them blue, whereas it is easily washed off intact mucosa.

The examinations followed the same strict routine sequence:

1. Naked eye examination of external genitalia. Recording of all findings; positive or negative.
2. Colposcopy of the external genitalia. Recording of all findings, positive or negative. Digital photography using the integrated camera of the colposcope. Photographic data was not included in this paper.
3. Toluidine blue dye was applied to the external genitalia and removed with 1% acetic acid after drying as recommended by NFNI.<sup>7</sup>
4. Point 2 was repeated.
5. Inspection of the vagina and cervix using speculum and colposcope. Findings were noted.

Victims of rape had trace evidence secured at appropriate times during the above routine.

## 2.3. The nature of lesions

Three types of lesions were described in accordance with international literature on the subject<sup>8</sup> lacerations, abrasions and haematomas. More ambiguous lesions, such as redness or swelling of the TEARS (Tear, Ecchymosis, Abrasion, Redness and Swelling) classification were not included, as they were considered ambiguous, and neither was a distinction between raised and confluent contusions made, as this was considered equally ambiguous in the soft tissue of the external genitalia.

1. Laceration: discontinuity of epidermis and dermis. Often caused by blunt force such as tearing, crushing or overstretching. Takes up toluidine blue dye if not covered by fibrin.
2. Abrasion: traumatic exposure of lower epidermis or upper dermis. The outermost layer of the skin is scraped away from the deeper layers. Often caused by lateral rubbing or sliding against the skin in a tangential rather than a vertical manner. Does only take up Toluidine blue dye if the upper dermis is exposed.
3. Contusion/haematoma/bruise: extra-vasation of blood in tissues below an intact epidermis. Often caused by blunt force. No distinction between the three was made.

Number of lesions and position (labia, 6 o'clock position, hymen, vaginal wall or cervix) was noted.

## 2.4. Frequency of lesions

Frequency of lesions is reported as the number of women having at least one lesion. The frequency is given for each of the three examination techniques and each of the three types of lesions.

## 2.5. Location of lesions

The following locations were used: (1) 6 o'clock position, defined as the entire commisura posterior from the outer hymenal rim, including the fossa navicularis and the posterior fourchette down to the perineal body. (2) Labia minora, including both sides of the labia, (3) Vestibule, defined as the area outside the hymenal rim, between the labia and including the urethral orifice, (4) Clitoral hood, defined as the commisura anterior, clitoral hood and glans clitoris, (5) Hymen, defined as the hymenal tissue only, (6) Vagina, defined as the vaginal wall from behind the hymen and backwards and (7) Cervix.

## 2.6. Statistical analysis

All data were entered in the EpiData software system securing a simple and certified double entry ([www.epidata.dk](http://www.epidata.dk)). Data were entered twice, once by investigators and once by secretaries. Discrepancies were caught in the data check mode and corrected according to the original questionnaires. Analysis of data was performed using the STATA (version 10.1) software package ([www.stata.com](http://www.stata.com)). Frequencies were given as proportions with a 95% confidence interval (c.i.) calculated using the exact probabilities of the Binomial distribution. Categorical data were analysed using the Fisher's exact test for significance. As for non-categorical data, normality was not assumed and data were analyzed using the Mann–Whitney *U*-test for significance. To investigate the influence of more than one explanatory variable, logistic regression modelling and a technique of stepwise reduction in the number of non-significant variables was used. Significance level was set at 95%.

## 2.7. Ethical considerations

The study was approved by the Medical Research Ethics Committee of Southern Denmark. Written consent was obtained from all participants. Full anonymity was secured by anonymous e-mail addresses for communication and an anonymous, secured storage code for data and photographs. If any significant medical conditions were discovered, the woman was referred to the gynaecologist on duty.

## 3. Results

### 3.1. Study population

A total of 71 women were seen by a forensic physician at SDSARC in the inclusion period. Of these, 32 were excluded: 12 did not wish to participate, 9 were minors accompanied by other than a legal guardian, 8 were excluded due to psychological issues such as psychiatric disease, mental retardation or severe intoxication, and 3 cases due to technical problems. All cases, including minors, had previous sexual experience. After inclusion it was revealed, that 12 of the 110 controls did not fulfil the inclusion criteria of vaginal intercourse within 48 h prior to examination. The results of these women did, however, not differ from the rest of the women and data could be excluded from the analysis without affecting the results. In the case group, three had more than 48 h but less than 72 h since the non-consensual intercourse and two had no clear recollection of time. The rest had less than 48 h since intercourse. All women in the control group were Caucasian. In the case group, two were of Inuit descent, one Middle Eastern, and the rest were Caucasian. Table 1 summarizes the gynaecological history of the women and the nature of their latest intercourse.

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