Vulvovaginal Lacerations Following Consensual Versus Nonconsensual Sexual Intercourse

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Background: The medical literature on vulvovaginal lacerations following consensual versus nonconsensual sexual intercourse is sparse and conflicting.

Objectives: To compare the predisposing factors, injury location and severity, as well as treatment of vulvovaginal lacerations sustained during consensual versus nonconsensual sexual intercourse, in adult women within a community-based cohort.

Methods: This is a retrospective comparative analysis of adult women presenting to the emergency departments of five hospitals and a free-standing nurse examiner clinic during a 7-year study period. All patients had documented vulvovaginal lacerations and reported vaginal penetration via consensual sexual intercourse (CSI) or nonconsensual sexual intercourse (NCSI) within 72 h of presentation.

Results: A total of 598 cases were identified: 81 (14%) reported CSI, and 517 (87%) reported NCSI. CSI patients were younger (21.3 vs. 25.7, $p < 0.001$) and reported a greater incidence of penile penetration (97.5% vs. 75.9%, $p < 0.001$). While NCSI subjects had a higher incidence of vulvovaginal lacerations overall (1.7 vs. 1.0, $p < 0.001$), their injuries were smaller (1.1 cm vs. 4.3 cm, $p < 0.001$) and more likely to be located on the posterior vulva (83% vs. 69%, $p = 0.003$) when compared with the CSI group. In addition, all the lacerations in the NCSI group were superficial. In contrast, 27 (33%) of CSI subjects had lacerations sutured in the ED; 6 (7%) required aggressive fluid resuscitation and 10 (12%) required surgical intervention.

Conclusions: In this community-based population, more severe vulvovaginal lacerations were noticed in women following CSI. The predisposing factors, injury location, and subsequent treatment in this group were significantly different when compared with women reporting NCSI.

Keywords: *consensual; nonconsensual; sexual assault; sexual intercourse; treatment outcomes; vaginal penetration; vulvovaginal lacerations*

INTRODUCTION

In females, the spectrum of vulvovaginal injuries from vaginal sexual intercourse, also known as coitus, can range from superficial lacerations to life-threatening lacerations or perforation. Research has shown that most female vulvovaginal injuries resulting from coitus are minor and often occur during the first sexual experience.[1,2] These vulvovaginal injuries resolve spontaneously or with minor treatment.[2] However, coitus may result in more severe lacerations of the vulvovaginal area causing life-threatening hemorrhage, thus requiring immediate surgical repair.[3] It has been reported that vulvovaginal injuries occur more frequently and with more severity in sexually assaulted women.[2–4] However, data on vulvovaginal lacerations following consensual intercourse are sparse and conflicting.[4–7] In one of the few studies that compare injuries from CSI and NCSI, it was found that while injuries are more common in NCSI, there is no difference in the number of vulvovaginal lacerations and was limited by study number.[6] In another study, genital injuries were three times more likely in NCSI but there was no difference in location, size or type of injury from CSI.[5] A third shows a localized pattern in NCSI victims with injuries more likely in the posterior fourchette, labia minora, hymen and fossa navicularis. However, the study does not specify lacerations versus abrasions or whether a pattern was found in the CSI group.[4] In this study, we focus solely on vulvovaginal lacerations because of the possible need for emergency resuscitation and surgery. The purpose of our study is to compare the injury location, injury severity, predisposing factors, and treatment

of vulvovaginal lacerations sustained during vaginal penetration via CSI versus NCSI in adult women within a community-based cohort. By identifying differences or trends in presentations of vulvovaginal lacerations sustained by CSI and NCSI, clinicians can have a higher index of suspicion on presentation, ultimately leading to better patient outcomes.

METHODS

Study Design and Setting

We conducted a retrospective cohort analysis of adult women (>16 years old) presenting to the emergency departments (ED) of three urban medical centers, two rural community hospitals, and a free-standing nurse examiner clinic during a 7-year study period (2013–2019). The study was reviewed and approved by the local institutional review board.

Patients

Patients were selected for inclusion in the study if they had documented vulvovaginal lacerations (ICD-9 codes 878 and 867; ICD-10 code S31.41) and reported vaginal penetration via consensual (CSI) or nonconsensual sexual intercourse (NCSI) within 72 h. For the purposes of this study, we defined CSI as vaginal penetration by a penis, fingers, or foreign object in a woman who was a willing and cooperative participant in the sexual activity. Nonconsensual sexual intercourse was defined as vaginal penetration involving force or the threat of force, incapacity, or no consent. Exclusion criteria included victims who declined forensic examination, had missing or incomplete documentation, vague or unclear patient history (e.g., intoxication), or prolonged time (greater than 72 h) following vaginal penetration.

Intervention

All patients were examined by board-certified emergency physicians or forensic nurses trained to perform medical forensic examinations. After each examination, clinicians documented the number and types of all vulvovaginal injuries visualized using a standardized classification system.[4] For the purposes of this study, we defined vulvovaginal laceration as any break in tissue (skin and mucous membranes) including fissures, tears, cuts, gashes, or rips.[4] The following nine anatomic sites were routinely evaluated for the presence and type of injury: the labia minora, labia majora, posterior fourchette, fossa navicularis, hymen, vagina, cervix, perineum, and perianal area. When labial traction was insufficient for visualization of the entire hymen, clinicians used the foley catheter technique to document tears to the hymen.[8]

Data Collection

Patient demographics, characteristics of the sexual encounter, predisposing factors, time to presentation and injury location(s) were recorded using a standardized abstraction form. Procedure or operative notes were reviewed to define the extent of vulvovaginal injuries and timing and type of definitive treatment. Derived from previous literature, the predisposing variables listed in Tables 3 and 4 are characteristics found to be associated with genital trauma and thus may predispose women to vulvovaginal lacerations.[9,10,11,12,13] These variables were chosen prospectively for analysis. All data were collected by four research associates who were blinded to the study objective. The research staff were trained in data abstraction using a set of mock case records. Another investigator supervised data abstraction and ensured that data variable definitions were uniformly applied.

Statistical Analyses

The primary outcome of interest was the location and severity of vulvovaginal lacerations in women following consensual versus nonconsensual sexual intercourse. Data were entered into an encrypted Microsoft Excel database (Microsoft Corp, Redmond, WA, USA). All analyses were performed using SAS statistical software (SAS Institute, Cary, NC, USA). One investigator performed a blinded critical review of a random sample of 10% of the medical records to determine inter-rater reliability in the identification, classification, and location of vulvovaginal injuries using the Kappa reliability test. Descriptive statistics (mean, standard deviation) were used to describe the frequency of vulvovaginal laceration, location, and severity of injury. Discrete variables were analyzed with the use of chi-squared tests; unpaired *t*-tests were used for comparisons of two means.

RESULTS

During the 7-year study period, 1545 women were found to have been evaluated for vulvovaginal trauma due to penetration by penis, fingers, or foreign object as pulled by ICD-9&10 codes listed in methods. Of these 1545, 108 (7.0%) had a documented history of CSI while 1437 (93.0%) reported NCSI. A total of 598 of these women sustained macroscopic vulvovaginal lacerations

and were entered into the study. Macroscopic lacerations were defined as those visualized directly without magnification. Eighty-one (13.5%) reported CSI and 517 (86.5%) reported NCSI. The mean age of the patients was 25.1 ± 9 years; the age range was 17–79 years. Seventy-one women (11.9%) were postmenopausal; 54 (9.0%) had no prior history of sexual intercourse. Consensual sexual intercourse and NCSI patients were comparable in terms of ethnicity, marital status, prior history of sexual intercourse, and the frequency of alcohol/drug use (Table 1). Consensual sexual intercourse patients were younger (21.3 vs. 25.7), had a shorter time interval from penetration to examination, and a greater incidence of penile penetration (97.5% vs. 75.9%). Overall, 66.6% (54) of CSI patients presented to the ED with marked vaginal bleeding, while 28.4% (23) reported perineal pain.

A total of 1034 macroscopic vulvovaginal lacerations were documented in the 598 patients included in the study (Table 2). Nonconsensual sexual intercourse victims had a greater mean number of lacerations (1.7 vs. 1.1, $p < 0.001$), injuries tended to be smaller (1.1 cm vs. 4.1 cm, $p < 0.001$), and more likely to be located on the fossa navicularis and posterior fourchette (49.3%). All lacerations in the NCSI population were superficial; none were severe enough to require surgical treatment or resuscitation (95% confidence interval, 0% to 0.6%). In contrast, CSI patients had more extensive lacerations, which were commonly located on the posterior vaginal wall and labia (56.7%). Overall, 27 (33.3%) of CSI subjects had vulvovaginal lacerations repaired in the ED; 10 (12.3%) were taken to the operating room (OR) for repair under anesthesia. A total of 37 CSI patients (45.7%) had lacerations requiring repair in the ED or the OR with a

Table 1. Patient demographics in adult women after consensual (CSI) and nonconsensual sexual intercourse (NCSI).

	CSI ($n = 81$)	NCSI ($n = 517$)	*p*-value
Age	21.3 ± 7.1	25.7 ± 9.4	< 0.001
Ethnicity (% white)	59 (72.8%)	361 (69.8%)	0.583
Marital status (% single)	63 (77.8%)	351 (67.9%)	0.073
No prior history of sexual intercourse	11 (13.6%)	46 (8.9%)	0.181
Alcohol or drug use < 24 h	37 (45.7%)	227 (43.9%)	0.762
Time interval to exam, mean hours (SD)	9.6 ± 5.5	17.2 ± 7.4	< 0.001
Time interval to exam < 24 h	62 (76.5%)	308 (68.1%)	0.128
Vaginal penetration			
Penile	79 (97.5%)	392 (75.9%)	< 0.001
Digital	11 (13.6%)	156 (30.2%)	0.002
Foreign body	3 (3.7%)	28 (5.4%)	0.521

Table 2. Injury characteristics (N = 598).

	CSI ($n = 81$)	NCSI ($n = 517$)	*p*-value
Mean no. of lacerations	1.1 ± 0.2	1.7 ± 1.3	< 0.001
Mean laceration length (cm)	4.1 ± 1.8	1.1 ± 0.9	< 0.001
Total lacerations	155	879	
Location of lacerations			
Vaginal wall	54 (34.8%)	71 (8.1%)	0.008
Labia	34 (21.9%)	179 (20.3%)	0.098
Hymen	32 (20.7%)	144 (16.4%)	0.032
Fossa navicularis	20 (12.9%)	239 (27.2%)	0.018
Posterior fourchette	13 (8.4%)	194 (22.1%)	0.013
Perineum	2 (1.3%)	52 (5.9%)	0.018
Lacerations requiring sutures	27 (33.3%)	0	< 0.001
Hemorrhagic shock	6 (7.4%)	0	< 0.001
OR repair	10 (12.3%)	0	< 0.001
Returned with rebleeding	3 (3.7%)	0	< 0.001

95% confidence interval of 34.6% to 57.1%. Lacerations that required repair were generally > 3 cm in length and located on the posterior vagina walls, vaginal vault and posterior fourchette. One patient had a laceration that extended into the peritoneal cavity. Hemorrhagic shock was present in six (7.4%) of the CSI patients. Variables that increased the need for operative intervention included uncontrolled bleeding despite gauze packing, a falling hematocrit, or a combined injury to the vagina and vulva. All patients had an uneventful postoperative course.

Known predisposing and etiologic factors for vulvovaginal lacerations were documented in 69 (85.2%) CSI patients (Table 3). This included alcohol intoxication, 'rough or aggressive' intercourse, awkward positioning, insertion of foreign bodies, and first coitus. Seventeen women (24.6%) had more than one predisposing factor documented. In comparison, the predisposing factors for vulvovaginal injury in NCSI victims are listed in Table 4. Overall, 410 (90.7%) patients had more than one predisposing factor documented; 239 (52.9%) had more than two factors documented; and 191 (42.3%) had more than three factors documented. Interrater reliability of the data abstraction was excellent with a median kappa statistic of 0.87.

DISCUSSION

Vulvovaginal trauma can span a continuum of severity from minor injuries to major lacerations. The actual prevalence of these injuries is difficult to discover, especially if the patient is reluctant to disclose the nature of the injury. In our community-based population, we found that women reporting consensual sexual intercourse had more severe vulvovaginal lacerations than victims of sexual assault, which is in alignment with previous studies.[5–7,14] Injuries from vaginal penetration may include lacerations, ecchymosis, abrasions, erythema, and edema. The vagina and vulva are vulnerable to hemorrhage due to their rich blood supply. The resulting bleeding from lacerations can be considerable and progress to hypovolemic shock and death if not promptly managed emergently and or operatively.[14] Further complications of severe vulvovaginal injuries include hemoperitoneum, pneumoperitoneum, retroperitoneal hematoma, and vaginal perforation.[7,14] Peritonitis from rupture of the posterior fornix of the vagina has also been reported, though very rare.[2]

Vulvovaginal lacerations may be isolated or multiple. Most lacerations will require only symptomatic therapy, but deeper wounds may require surgical care. One study reported that most women who presented to the emergency department with vulvovaginal lacerations required repair.[9] Women may delay presenting for emergent care resulting in significant blood loss. This delay may be due to fear, social stigma or simply embarrassment. The diagnosis of vulvovaginal laceration is often straightforward since most women present with significant bleeding and perineal pain. However, because

Table 3. Known predisposing factors for vulvovaginal laceration in consensual sexual intercourse patients (*n* = 69).

	No. of patients*
Alcohol intoxication	25 (36.2%)
'Rough or aggressive' intercourse	15 (21.7%)
Pre-existing vaginal infection	10 (14.4%)
Awkward positioning during intercourse	8 (11.6%)
Atrophic vagina in postmenopausal women	8 (11.6%)
First coitus	8 (11.6%)
Previous surgery	7 (10.1%)
Disproportion of male and female genitalia	3 (4.4%)
Insertion of foreign bodies	3 (4.4%)
Penile ornamentation	1 (1.5%)
Hx of pelvic radiation therapy	1 (1.5%)

*A total of 17 patients (24.6%) had more than one predisposing factor documented.

Table 4. Known predisposing factors for genital trauma in nonconsensual sexual intercourse patients (N = 452).

	No. of patients*
Assailant known to victim	372 (82.3%)
Presence of nongenital injuries	239 (52.9%)
Alcohol or drug use by assailant	185 (40.9%)
Physical coercion	182 (40.3%)
Digital penetration	156 (30.2%)
Use of weapons	121 (26.8%)
Age between 17–19 years	104 (23.0%)
Postmenopausal women	63 (13.9%)
Multiple assailants	62 (13.7%)
Location of assault outdoors	53 (11.7%)
No prior sexual intercourse	46 (10.2%)
Pre-existing vaginal infection	37 (8.2%)
Insertion of foreign bodies	28 (6.2%)
Previous anogenital surgery	21 (4.6%)

*A total of 410 (90.7%) patients had more than one predisposing factor documented; 239 (52.9%) had more than two factors documented; and 191 (42.3%) had more than three factors documented.

severe lacerations are infrequently seen by clinicians, many centers do not have an organized treatment protocol.[14] Another important consideration is the poor visual estimation of blood loss, including the need for serial hemoglobin and hematocrit levels.[9] In our study, a falling hematocrit, uncontrolled bleeding, or a combined injury to the vulva and vagina increased the need for emergency surgery. Although rare, an expanding vulvar hematoma must be drained under anesthesia in order to prevent secondary infection and necrosis. [10,15]

In our initial population of adult NCSI victims, macroscopic lacerations were documented in 36.0% (517/1437). None of these lacerations in the NSCI group were severe enough to cause extensive bleeding or require surgical repair. However, the upper limits of the 95% confidence interval for this outcome were 0.6. This means that the true incidence of severe lacerations in our NCSI population could be as high as 0.6%. This is comparable to that reported by Geist who found vulvovaginal injuries in almost 50% of sexual assault cases, but only 1% needed surgical repair.[9] Similarly, in a retrospective study of more than 11 000 pediatric patients who were suspected of having been sexually abused or assaulted, only 11 cases requiring surgical repair were identified over a 20-year period at a tertiary care pediatric hospital.[16] One case-control study of 249 sexually assaulted women found that while 32% sustained anogenital injury, none required operative repair. Investigators concluded that the severity of the sexual assault was a poor predictor of injury.[17] A similar study of sexual assault in postmenopausal rape victims found that vulvovaginal lacerations occurred in 18.6%, with one in four severe enough to require suturing.[18] In summation of the literature on this subject, severe vulvovaginal lacerations following sexual assault are more uncommon than expected, but they can and do occur.[19] To postulate this may be due to CSI victims being more likely to present with more severe lacerations compared with NSCI due to the voluntary nature of CSI versus the added trauma and need for forensic examination associated with NCSI patients.

The location of vulvovaginal injuries in our NCSI patients were significantly different when compared with CSI patient (Table 2). Approximately half of the lacerations due to sexual assault were located on the fossa navicularis and posterior fourchette. This indicates that tears in the posterior fourchette, fossa, or along the long axis of the vagina may be more specific for forced vaginal intercourse.[11,20] In contrast, CSI patients had lacerations that were commonly located on the posterior vaginal wall, labia, and hymen. Injuries that required repair were generally located on the vagina walls, vaginal vault or posterior fourchette. Lacerations to the hymen are associated with younger sexual assault victims as well as those lacking prior sexual intercourse experience.[1] Both characteristics were more common among our CSI patients. Hymenal lacerations tend to be posterior (between the 5 o'clock and 7 o'clock positions) and to cause only minor bleeding and pain.[2] On rare occasions, hymenal lacerations may extend into the walls of the vagina, the perineal tendon or rectum, resulting in significant hemorrhage.[9]

Several known risk factors for vulvovaginal lacerations were present in our CSI population. In addition to those listed in Table 3, other studies have suggested previous anogenital surgery, congenital abnormalities of the vagina, friability of tissues, vaginal spasm, retroversion of the uterus, and clumsiness as etiologic factors.[1–3,6,14] Our study design prevents analysis of the contribution of each predisposing factor to the risk of developing vulvovaginal laceration. Details pertaining to the use of foreign bodies, coital positions, drug or alcohol use, and unusual activities during sexual intercourse should be elicited from the patient or from their partner. A patient might refer to a sexual act by its street name or use a euphemism to refer to a particular sex act. The clinician should clarify the meaning with the patient to accurately assess the possibility of injury. Even with a history of consensual intercourse, domestic abuse should be considered as a possible cause for anogenital injury and investigated.

Predisposing or etiologic factors specific for vulvovaginal lacerations following sexual assault in adult women are also not well defined in the literature. The variables listed in Tables 3 and 4 are characteristics associated with genital trauma in general and thus may predispose women to vulvovaginal lacerations.[9,10,11,12,13] The most consistently documented risk factors associated with genital injury are victim age (adolescent and postmenopausal), virginal status, the presence of a general body injury, foreign body, and multiple assailants. Preexisting vaginal infection and digital penetration were found to be associated with the presence of genital injury in one previously documented analysis.[6] Interestingly, sedative use or alcohol intoxication within hours of the sexual assault have been shown to be protective of anogenital injury.[21,22] It is prudent to notice that this broad assortment of risk factors is likely affected

by examiner training and experience, differences in injury definitions, patient population, as well as examination technique.

There is scant data in the current literature regarding risk factors for requiring surgical intervention after vulvovaginal laceration.[10] Women with lacerations less than 3 cm can be conservatively treated in the emergency department or clinic with local wound care, analgesia, suturing if needed, and antibiotics. In our study, clinical red flags that increased the need for operative intervention included uncontrolled bleeding, a falling hematocrit, or a combined injury to the vagina and vulva. All patients should undergo a rectal examination to ensure that the rectal mucosa is undamaged. A cystoscopic examination of the bladder and urethra may be necessary to rule out urinary tract injury. Sloin et al. created a guideline that provides a systemic approach to treating women with vulvovaginal lacerations.[14] According to these investigators, 'preparation for these uncommon emergencies may circumvent dangerous delays and inadequate examination and treatment.'[14]

LIMITATIONS

This study has several potential limitations that warrant consideration. Firstly, the sample population was drawn from emergency departments (EDs) of three urban medical centers, two rural community hospitals, and a free-standing nurse examiner clinic located in a single state of the Midwest United States. It is unknown how patient demographics and injury characteristics might differ in other settings or locations. Secondly, in this retrospective study we could not control for the differences in documentation or evaluations by different examiners. Five of the CSI patients had such profuse bleeding that a complete evaluation was not possible in the ED and the location and severity of vulvovaginal lacerations was determined in the operating room by gynecologic surgeons. Thirdly, although our examiners routinely use colposcopy with nuclear staining to document genital injuries including lacerations, we chose to count only macroscopic lacerations (those visualized directly without magnification). This made the clinical evaluation of the two groups (CSI vs. NCSI) more consistent. It is unlikely that that any microtrauma detected using the colposcope had any clinical significance.[22,23]

CONCLUSIONS

The assumption that genital injuries such as vulvovaginal lacerations are more severe in sexual assault cases is antiquated. It is important for the forensic clinician to recognize that physical findings in adult women who sustain vulvovaginal lacerations from consensual intercourse significantly differ from the findings in women who report sexual assault. In this community-based population, almost half of the women who presented to the ED and were found to have sustained a macroscopic vulvovaginal laceration following consensual intercourse required laceration repair in the ED or operating room. In contrast, while vulvovaginal lacerations were documented in over one-third of the women evaluated within 72 h after a sexual assault, none of these lacerations were severe enough to cause extensive bleeding or require repair. The predisposing factors and location of injury in victims of sexual assault were significantly different when compared with women presenting with lacerations due to consensual sexual intercourse. With an improved understanding of the types and severity of injuries sustained by NCSI and CSI, specifically vulvovaginal lacerations, clinicians can better anticipate clinical course, expedite diagnosis, and direct definitive management.

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