Genital Trauma Following Consensual Sexual Intercourse in Adult Volunteers Evaluated by White and Ultraviolet Light

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Minna Joki-Erkkilä

MD, Ob Gyn

Pediatric and Adolescent Gynecology

Departments of Gynecology and Obstetrics and Forensic Child Psychiatry

Tampere University Hospital, **FINLAND**

Minna.joki-erkkila@pshp.fi

FINLAND and some finnish innovations

minna.joki-erkkila@pshp.fi

Prevalence of trauma in external genital after consensual intercourse

- 5-55%
- Possible issues for wide range in prevalence
  - Heterogenousity in participant recruition
  - Timing of examination
  - Reporting such acute genital findings which are commonly caused by other medical conditions or unspesific findings
  - Lack of follow-up
  - Use of different examination techiques
  - Unclear inclusion and exclusion criteria
  - Unclear injury definition

minna.joki-erkkila@pshp.fi

Slaughter L, Brown CR, Crowley S et al.
Patterns of genital injury in female sexual assault victims.
Am J Obstet Gynecol 1997;176(3):609-16

- N=75, Retrospective
- Colposcopy and photography
- Acute anogenital findings (ecchymosis, tear, abrasion)
  - 11% (8/75)
    - 19 volunteers + 6 minors
  - < 24h consensual vaginal penetration
- Prevalence of genital injury in rape is significantly greater than in consensual sex (p=0.000) (Lauber & Souma 1982, (Toluidine blue; 40 vs 4.5%), McCauley et al 1987, Toluidine blue, 58% vs 10%)

minna.joki-erkkila@pshp.fi

McLean I, Roberts S, White C et al Female genital injuries resulting from consensual and non-consensual vaginal intercourse. Forensic Science International 2011;204:27-33

- wall mounted circular magnifying glass with incorporated lamp surround
- > 30 year old females
- within 48h since the consensual intercourse
- 6 % (4/68) acute genital injury
  - 3 genital bruises
  - one laceration
  - one abrasion

minna.joki-erkkila@pshp.fi

McLean I, Roberts S, White C et al Female genital injuries resulting from consensual and non-consensual vaginal intercourse. Forensic Science International 2011;204:27-33

- The incidence of genital ***lacerations*** and ***abrasions*** was significantly higher after non-consensual vaginal intercourse (n=500, a retrospective group) when compared to consensual intercourse group (n=68, prospective)
  - (10% vs **2%**, p= 0.013 and 10% vs **2%**, p=0.02)
  - Anderson 2006; N=56/46; abrasions 16% vs 4%, tears 21% vs 24%)
- No such difference for ***bruises*** (7% vs 4%, p=0.6, respectively)
  - Anderson 2006. ecchymosis 11% vs 2.2%, p= 0.09)

minna.joki-erkkila@pshp.fi

Zink T, Fargo J, Baker R et al. Comparison of methods for identifying ano-genital injury after consensual intercourse. J Emerg Med 2010;39(1): 113-8

- N=120
- > 20 years old women
- first 24 hours after consensual intercourse
- comparing three forensic examination techniques:

  inspection, colposcopy, Toluidine blue
- 55% acute genital injury rate (tears, abrasions, ecchymosis, swelling and redness)
  - Anderson et al (2006) (n=46) with 30%
    - Colposcopy & toluidine
    - Follow-up for 35 women within 48h

minna.joki-erkkila@pshp.fi

Schmidt A et al. Nature, duration of genital lesions after consensual sexual intercourse – Implications for legal proceeding. In press

- N=98
- < 48h and follow-up
- Median age 22 years, 88% nulliparous
- 34% inspection, 49% colposcope, 52% Toluidine blue
- Location of physical finding
  - 78% PF, where Lacerations were predominantly located in
  - 21 % in labia
  - 1% in hymen

Method	Laceration	Abrasions	Hematomas
inspection	31%	2%	2%
colposcope	42%	5%	3%
Toluidine blue	50%	7%	1%

minna.joki-erkkila@pshp.fi

Schmidt A et al. Nature, duration of genital lesions after consensual sexual intercourse – Implications for legal proceeding. In press

- Duration of lesions
  - Median survival time for lesions
  - 24h (max 89h for laceration) for inspection
  - 40h for colposcope
  - 80h for toluidine blue
- At 4 days
  - 12% with colposcopy
  - 22% toluidine blue
- Anderson 2006 found smaller surface area for abrasions and redness in 24 h FU

minna.joki-erkkila@pshp.fi

Tools for Clinical Forensic Examination

- 1. Direct visual inspection with labial separation and traction.
- 2. Colposcopy, a binocular magnifying microscope with an excellent light source and attached camera for photographic documentation
  - improves microtrauma identification
- 3. Application of contrast media to identify microscopic injuries
  - For example, toluidine blue adheres to abrasions and microlacerations highlighting the acute mucosal or skin injury

minna.joki-erkkila@pshp.fi

UV-light

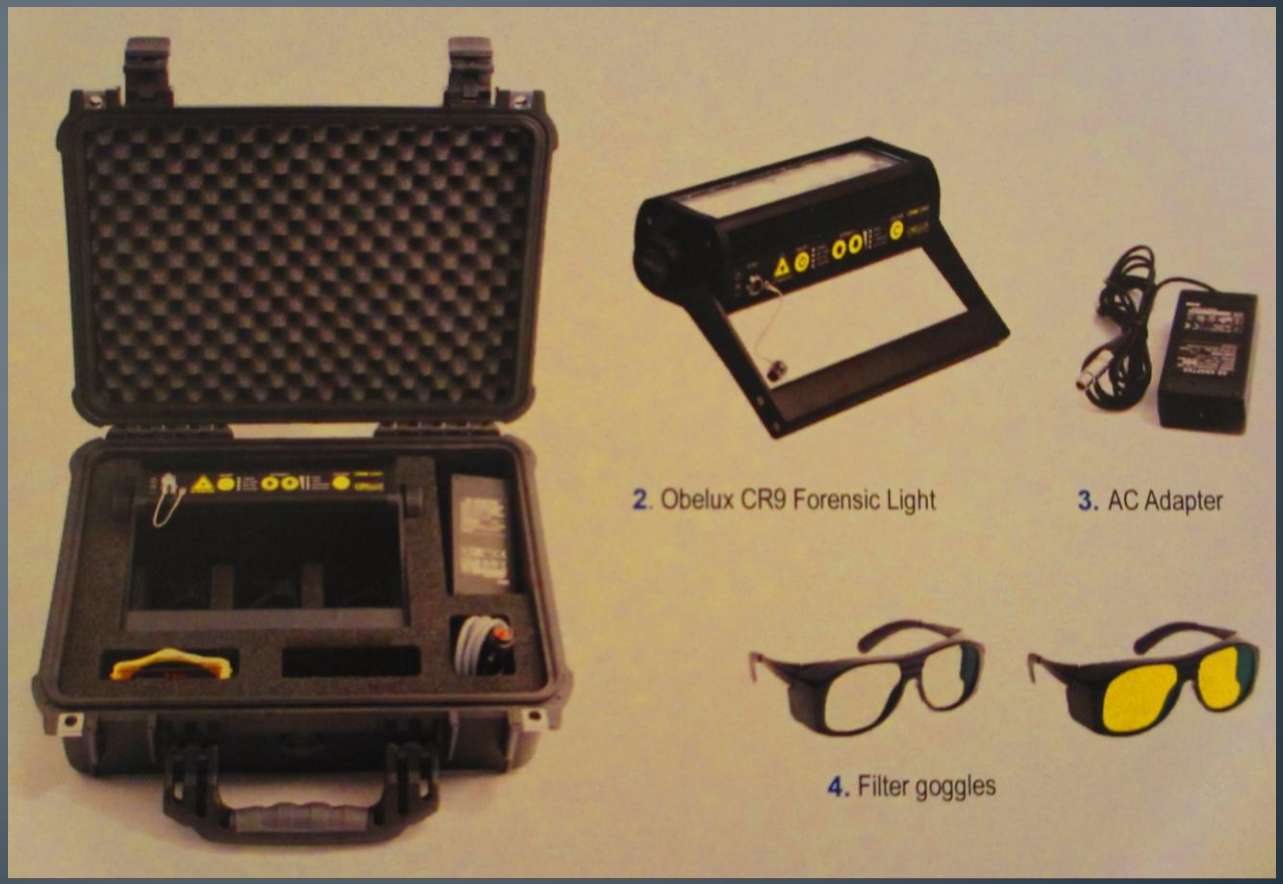
minna.joki-erkkila@pshp.fi

UV-light:368nm

- Electromagnetic radiation
  - Wavelenght shorter than in visible light
  - UVA: 315-400 nm
  - UVB: 280-315 nm – produces D-vitamin
  - UVC: 100-280 nm – most harmful
- UVA limited to lower energy
  - Does not have straight damaging effect on DNA
- Daily limitations
  - Max energy to the
    - skin 50J/m2
    - Eye 30 J/m2 (180-400nm)
      - eyeglasses
  - Max daily use 11 min

minna.joki-erkkila@pshp.fi

In our study we used a prototype of this UV-light



minna.joki-erkkila@pshp.fi

Prelimary results

minna.joki-erkkila@pshp.fi

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minna.joki-erkkila@pshp.fi

The purpose of this study

- To determine whether UV-light might be useful tool for clinical forensic evaluation and evidence documentation in anogenital area

minna.joki-erkkila@pshp.fi

Prospective study series

- 87 white adult female volunteers who were invited to participate in a gynecological examination after consensual intercourse
  - May 2008 - December 2009
- Inclusion criteria
  - Adult
  - Heterosexual
  - Willingness to share discrete details from personal life
  - Signed consent to photography

minna.joki-erkkila@pshp.fi

Examination method

- Colposcope with attached camera for photodocumentation
- Supine position
- Labial separation and traction

minna.joki-erkkila@pshp.fi

Definitions

- Submucosal hemorrhage
  - A small hemorrhage under mucous membrane
- Abrasion
  - A mucous membrane or skin excoriation caused by removal of epidermal layer
- Laceration
  - A skin or mucosa wound with separation of connective tissue elements
- Scar
  - An area of firous tissue which replaces the normal skin after injury

minna.joki-erkkila@pshp.fi

Participant demographics

- Mean age 31.5 years (range 20 – 52 years, SD 9.5)
  - 51 (58.6%) nulliparous
  - 9 (10%) one delivery
  - 20 (23%) two deliveries
  - 6 (7%) three deliveries
  - 1 (1%) five deliveries
- All had penile vaginal penetration
  - Only one anal penetration
  - 58% one position during intercourse

minna.joki-erkkila@pshp.fi

The mean time from the intercourse to the examination

- In white light
  - 70 hours (range 13.5-133; SD 45) for positive findings
  - 56 hours (range 1.5-183; SD 45) for negative findings
- UV-light
  - 54 hours (range 1.5-133; SD 47) for positive findings
  - 57 hours (range 2.4-183; SD 45) for negative findings

minna.joki-erkkila@pshp.fi

After consensual intercourse

- *Submucosal hemorrhages*
  - 6/87 (6.9%) in white light
  - 11/87 (12.8%) in UV light
  - **Age**
    - **> 40 years old women had significantly more genital submucosal hemorrhages (white light p<0.001, UV p=0.004)**
      - Maguire 2009, Sugar 2004
    - **30-39 year old had no submucosal trauma after consensual intercourse**
  - White light
    - **Submucosal hemorrhages were significantly more common w/prostagen contraception (p=0.035)**

minna.joki-erkkila@pshp.fi

Positive acute findings in anogenital area and the duration from the consensual intercourse

ID number	Submucosal haemorrhage in white light (positive/negative)	Submucosal hemorrhage in UV-light (positive/negative)	Examination time from the intercourse (hours)
3013	+	+	13.5
3093	+	+	33
3010	+	+	54
3037	+	+	58.75
3067	+	+	129.33
3089	+	+	133.25
3054	-	+	1.5
3014	-	+	9.75
3025	-	+	20
3046	-	+	39.25
3079	-	+	103.5

minna.joki-erkkila@pshp.fi

Submucosal hemorrhages were observed

- 5.5. days with white light
- 4.3 days with UV-light

- McCann et al 2007
  - Healing for hymenal injuries in adolescents
    - 7 days For small submucosal hemorrhages

minna.joki-erkkila@pshp.fi

After consensual intercourse..

- ***Mucosal redness, abrasion*** *and* ***condyloma*** were not highlighted with UV light
- No bruises, ecchymosis or acute hymenal lacerations were documented
- No injuries in the anal area were documented

minna.joki-erkkila@pshp.fi

Possible factors influencing mucosal findings

- Mean ***coital durance*** was 15 minutes (range 1-60)
  - In both white and UV-light, there were no acute findings if the intercourse lasted more than twenty minutes
- ***Coital frequency*** did not have an effect on acute mucosal findings even when the age was considered
- With ***lubricants*** (9%), no acute physical findings

minna.joki-erkkila@pshp.fi

Scars

- In white light scars in mucosal tissue and skin can be seen in different colours;
  - white
  - darker than the mucosa or skin
  - same colour as the mucosa or skin or
  - in combination of these in the genitoanal area
- In UV-light scars were seen either white or darker than the mucosal or skin tissue.

minna.joki-erkkila@pshp.fi

36 scars were documented in UV light

- 13 scars in white light
- 23(63.9 %) scars would have been missed without the UV-light
- 15 suspicious for a scar in white light because of the irregularity of the mucosal surface
  - Regular mucosal surface in all nulliparous
  - 6/28 (21.4%) with episiotomy in delivery had regular mucosal surface
  - 3/8 with no episiotomy had irregular surface (all had rupture of vaginal outlet wall during delivery)

minna.joki-erkkila@pshp.fi

volunteers reported previous genital trauma with bleeding

- In 14.9 % (13/87)
  - Two had cycling trauma
  - one straddle injury
  - one coital injury
  - one rape
  - others didn't specify the cause of the trauma
  - 6/13 had scarring and irregular mucosal surface
  - 1/6 with genital scarring in this group didn't have delivery and didn't answer the question about sexual abuse
    - 7/87 (8%) had former sexual victimization

minna.joki-erkkila@pshp.fi

Consider also other possible reasons for the physical finding in UV

- A shadow
- A mole
- Venous enlargement
- Healed or a healing infection (e.g. varicella)

minna.joki-erkkila@pshp.fi

Conclusion

- UV-light may provide additional help in
  - documenting some old scars that can't be seen in white light
  - visualization hemorrhages in anogenital area
  - documenting the finding after sexual event
- The study supports the enormous ability of the mucosal or skin tissue to heal even after a major trauma

minna.joki-erkkila@pshp.fi

Thank You for Your Attention!

minna.joki-erkkila@pshp.fi

minna.joki-erkkila@pshp.fi