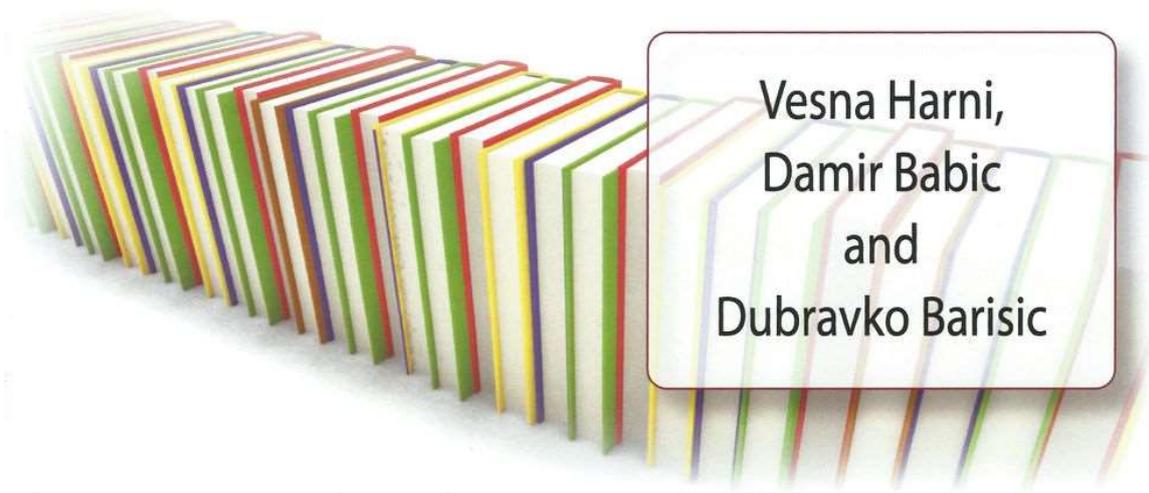


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"THREE RINGS VULVOSCOPY" **A NEW APPROACH TO THE VULVA**

Vesna Harni^{1*}, MD, Damir Babic², MD, PhD
and Dubravko Barisic³, MD, PhD

¹Gynecological Clinic Dr. Vesna Harni, Zagreb

²University Department of Obstetrics and Gynecology, Zagreb

³Department of Obstetrics and Gynecology, Villach

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INTRODUCTION

In the attempt to colposcopically examine the vulva, it is essential to know the histology of vulvar skin, since the complexity of the vulvar anatomy requires a different assessment of the seemingly same types of lesions in this area. Thickness of the vulvar skin affects the opacity; the vascular patterns are less marked and less reliable than with colposcopy of the cervix. Vascular aberrations, such as punctuations and mosaic, can be practically seen only on the inner portions of the labia minora where the keratin layer is thinner and vestibular epithelium does not contain a keratin layer [1].

The most recent classification of vulvar diseases by the International Society for Study of Vulvovaginal Disease (ISSVD) and the International Federation for Cervical Pathology and Colposcopy (IFCPC) from 2011 introduced a detailed description of vulvar lesions according to dermatological criteria, which includes various variables that characterize each lesion by its size, location, type, color and secondary morphology according to dermatological criteria [2, 3]. Implementation of these recommendations in daily gynecological practice results in further efforts to assess and plan the treatment of vulvar lesions.

* Corresponding address: Vesna Harni, MD, Ginekoloska poliklinika Dr. Vesna Harni, Bukovacka 1, HR-10000 Zagreb, Croatia. e-mail: vesna.harni@zg.t-com.hr

Vulvodynia is another issue, defined as vulvar discomfort, most often described as burning pain, occurring in the absence of relevant visible finding or a specific neurological disorder, which is diagnosed using Friedrich's criteria and "per exclusion" [4–7].

Symptoms that indicate disease of the vulva include burning, stinging, soreness, irritation, feeling as if being cut with a knife or paper, stabbing, sticking, itching, inflammation and pain [8]. Very often there are no differences in symptoms between vulvar dermatosis and vulvodynia.

This was the reason for testing a new concept of vulvoscopy adapted to the anatomy of the vulva, according to the differences in histological structure and embryological origin of the vulvar structures.

THREE VULVAR RINGS

A new technique of performing vulvoscopy is proposed, taking into account three different skin types and zones that are almost ring-shaped. Instead of a random or linear vulvoscopy, this is a circular purposeful observation of the vulva, hereinafter called "Three Rings Vulvoscopy" (Figure 1). The three vulvar rings – outer, middle and inner vulvar ring are described according to histology and embryology of the vulva.

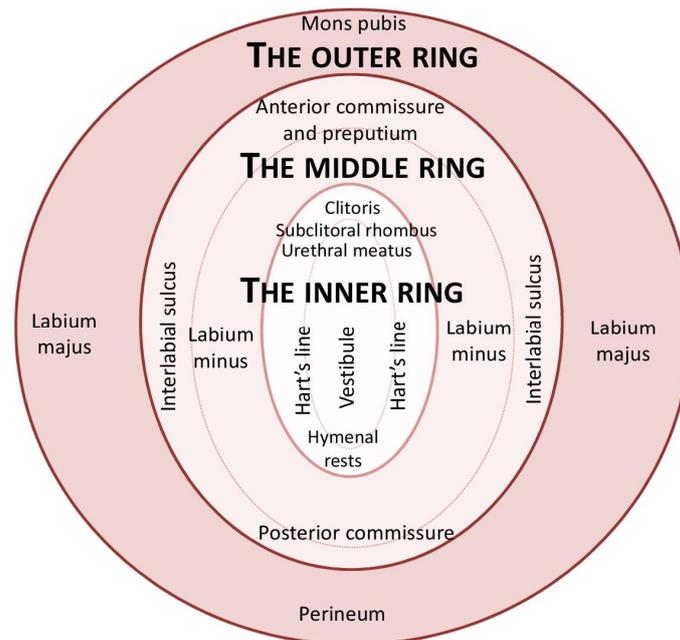


Figure 1. The three vulvar rings: outer, middle and inner vulvar ring [Reproduced from Gynaecology et Perinatology (2015), by courtesy of the authors and publisher]. The three vulvar rings are described according to histological and embryonic nature of the vulva. "The outer vulvar ring" includes the vulvar skin: the mons pubis, labia majora and the perineum. "The middle vulvar ring" encompasses the modified mucosa: the anterior commissure with the prepuce of the clitoris, interlabial sulci, labia minora and the posterior commissure (fourchette). "The inner vulvar ring" is glycogenated squamous mucosa of non-keratinized type: the clitoris, the sub-clitoral rhombus, the urethral meatus, hymenal remains, Bartholin's gland opening, Hart's line and the vestibule.

"THE OUTER VULVAR RING" includes the vulvar skin developed from the ectoderm, and is composed of hair-bearing, keratinized skin containing sebaceous, apocrine and eccrine glands, subcutaneous fat and blood vessels, which makes it a natural outer boundary of the vulva [9]. This includes the mons pubis, labia majora and the perineum.

"THE MIDDLE VULVAR RING" encompasses the modified mucosa of the ectodermal origin, which makes an intermediate circuit between the labia majora and the vestibule. It is covered with non-hair-bearing skin, but the only appendages found are sebaceous glands, without subcutaneous fat. This includes the anterior commissure, prepuce and frenulum of the clitoris, interlabial sulci, labia minora and the fourchette.

"THE INNER VULVAR RING" is glycogenated squamous mucosa of non-keratinized type, non-pigmented stratified squamous epithelium with a complete absence of skin appendages, which is of endodermal origin, except for a small area immediately anterior to the urethra. This includes the clitoris, sub-clitoral rhombus ("sulcus urethralis"), urethral meatus, hymenal remains, Bartholin's gland opening, Hart's line and the vestibule. The demarcation line between the inner and middle ring is marked by the junction of keratinized with non-keratinized epithelium on the inner aspects of the labia minora, which is referred to as the vestibular line of Hart.

The lower genital tract, in addition to the vulva, includes groins, the perianal region and the anus. The skin of the groin and perianal region is composed of the same tissue as the skin of the outer ring of the vulva and lesion may be described in the same manner as lesions of the outer ring of the vulva. Endoscopy or colposcopy of the anus is commonly known as "high-resolution anoscopy".

THREE RINGS VULVOSCOPY

During the last two years, "Three Rings Vulvoscopy" has been used in Gynecological Clinic Dr. Vesna Harni, Zagreb (Croatia) to examine vulvar lesions related to the vulvar rings in around 400 consecutive patients with vulvar discomfort and in the asymptomatic patients [10]. In the course of this, certain regularities have been noticed in the occurrence of vulvoscopy lesions in relation to the vulvar rings, both in symptomatic and asymptomatic women.

After exclusion of patients with incomplete medical records, vulvar infection, benign tumors and pre-/malignancy, a retrospective observational study analyzed the results of the "Three Rings Vulvoscopy" in a total of 108 gynecological patients with and 108 patients without vulvar discomfort. Vulvar discomfort and colposcopic changes of the vulva were documented according to their specificity and localization using ISSVD Vulvodysnia Pattern Questionnaire. In addition to the vulvoscopy, cotton-swab test, inspection of the vagina, vaginal pH measurement and microscopy of vaginal discharge were done in all patients. Based on the specificity of vulvoscopy findings, lesions were classified as "specific" and "non-specific".

"Specific lesions" were defined as the finding of eczematous inflammation with thickened, excoriated skin in lichen simplex chronicus; hypopigmented or white lesions, fusion or resorption of the labia minora and clitoral hood, loss of vulvar architecture and sclerotic changes in lichen sclerosus; white reticular pattern to extensive erosion with agglutination or resorption of the labia in lichen planus and psoriatic erythematous papules

with silver, scaly plaques [11]. The diagnosis of vulvar dermatosis was confirmed histopathologically in all patients with specific lesions (n = 33).

"Non-specific findings" included non-specific erythema in the absence of infection in any part of the vulva; punctuations and papillae in the area of labia minora, Hart's line and the vestibule; the paleness and the smoothness of the sub-clitoral rhombus and the vestibule and excoriations in the absence of vulvar dermatosis [11–12].

Diagnosis of vulvodynia was based on medical history data with the determination of the index of dyspareunia, and clinical examination where signs of vulvar specific disease ("diagnosis per exclusion") were absent, in combination with positive cotton-swab test according to the actual guidelines. Non-specific findings in patients diagnosed with vulvodynia, were not relevant for the diagnosis of vulvodynia (Figure 2).

A Keyes punch biopsy was done in 21 patients with non-specific vulvoscopy finding, in all cases a specific diagnosis was excluded. Diagnostic biopsy was not performed in any asymptomatic patient, or in patients with vulvodynia and discrete skin changes not relevant for the diagnosis, following the ethical principles in the Declaration of Helsinki.

The analysis of the results of "Three Rings Vulvoscopy" revealed four groups of patients, as shown in Table 1.

Table 1. Distribution of patients depending on the symptoms and vulvoscopy findings

SPECIFICITY OF VULVOSCOPY LESIONS			
VULVAR SYMPTOMS	Symptomatic patients (n = 108)	A/ Specific findings (n = 33) VULVAR DERMATOSIS: 5 Lichen simplex chronicus, 23 Lichen sclerosus, 3 Lichen planus, 1 Dermatitis psoriasiformis 1 Pemphigus familiaris	B/ Non-specific findings (n = 75) VULVODYNIA*
	Asymptomatic patients (n = 108)	A/ Normal findings (n = 54) NORMAL VULVA	B/ Non-specific findings (n = 54) IMPAIRED VULVAR SKIN

* = Non-specific findings in these patients were not relevant for the diagnosis of vulvodynia.

Asymptomatic patients without visible vulvoscopy changes were labeled as patients with the "normal vulva".

As the previous data suggest the importance of maintaining the integrity of the barrier function of the skin to prevent the activation of inflammatory mediators on exogenous or endogenous path and psychological stress [13], we assumed that these mechanisms may play a role in the occurrence of non-specific lesions in asymptomatic patients, and called this group "impaired vulvar skin" [7].

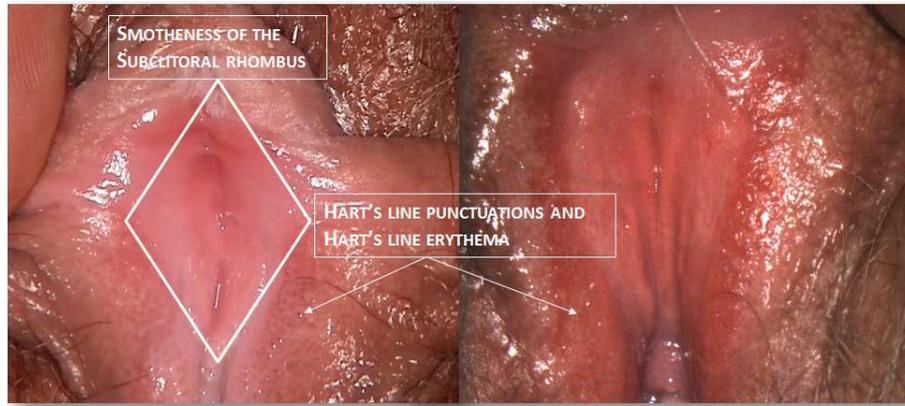


Figure 2. The smoothness of the sub-clitoral rhombus, Hart's line punctuations and Hart's line erythema in patient with vulvodynia. The smoothness of the sub-clitoral rhombus, the paleness of the urethral meatus as well as Hart's line punctuations and Hart's line papillae in the inner ring of the vulva were more often present in the patients with vulvodynia and impaired vulvar skin. Non-specific finding in patients diagnosed as vulvodynia were not relevant for the diagnosis of vulvodynia.

VULVOSCOPY FINDINGS IN THE OUTER VULVAR RING

Specific vulvoscopy findings in the outer vulvar ring were present in 93.9% of patients with vulvar dermatosis. Furthermore, vulvar dermatosis was characterized by the significantly more frequent ($p < 0.001$) presence of specific lesions in all three vulvar ring (Figure 3).

Diagnosis of non-specific vulvoscopy findings in the outer vulvar ring was also significantly more frequent ($p < 0.001$) in the patients with vulvar dermatosis compared to the other groups.

Non-specific findings were found in 13.3% of patients with vulvodynia and 3.7% of patients with impaired vulvar skin. These changes of the vulva in patients diagnosed as vulvodynia, were not relevant for the diagnosis of vulvodynia.

VULVOSCOPY FINDINGS IN THE MIDDLE VULVAR RING

Diagnosis of specific vulvoscopy lesions in the middle vulvar ring was significantly more frequent ($p < 0.001$) in the patients with vulvar dermatosis compared to the other groups.

The presence of non-specific lesions in the middle vulvar ring, specifically the erythema of interlabial sulci and the fourchette did not differ between the groups, but the incidence of the erythema ($p = 0.039$) and the smoothness ($p = 0.019$) of the anterior commissure and the prepuce, and the incidence of the excoriations in the fourchette ($p < 0.001$), were significantly higher in the patients with vulvar dermatosis.

VULVOSCOPY FINDINGS IN THE INNER VULVAR RING

Finding of specific lesions of the clitoris, sub-clitoral rhombus, Hart's line and in the vestibular area were significantly more likely ($p < 0.001$) in the group with vulvar dermatosis.

There was a significant difference ($p = 0.046$) in the presence of any vulvoscopy findings, primarily non-specific lesions in the inner ring of the vulva in patients with vulvodynia and impaired vulvar skin compared to patients with vulvar dermatosis, and in all groups compared to a normal vulva.

Non-specific findings in the patients diagnosed as vulvodynia were not relevant for the diagnosis of vulvodynia.

The smoothness of the sub-clitoral rhombus was significantly more frequent ($p = 0.003$) in the group of vulvodynia, whereas the paleness of the urethral meatus ($p = 0.030$), as well as Hart's line punctuations ($p < 0.001$) and Hart's line papillae ($p = 0.006$), were significantly higher in the groups with vulvodynia and impaired vulvar skin in relation to the vulvar dermatosis and the normal vulva.

There was no difference in the appearance of non-specific lesions of the clitoris, hymenal rests, Bartholin's gland opening and in the vestibular area between the two groups, except in relation to the normal vulva ($p < 0.001$).

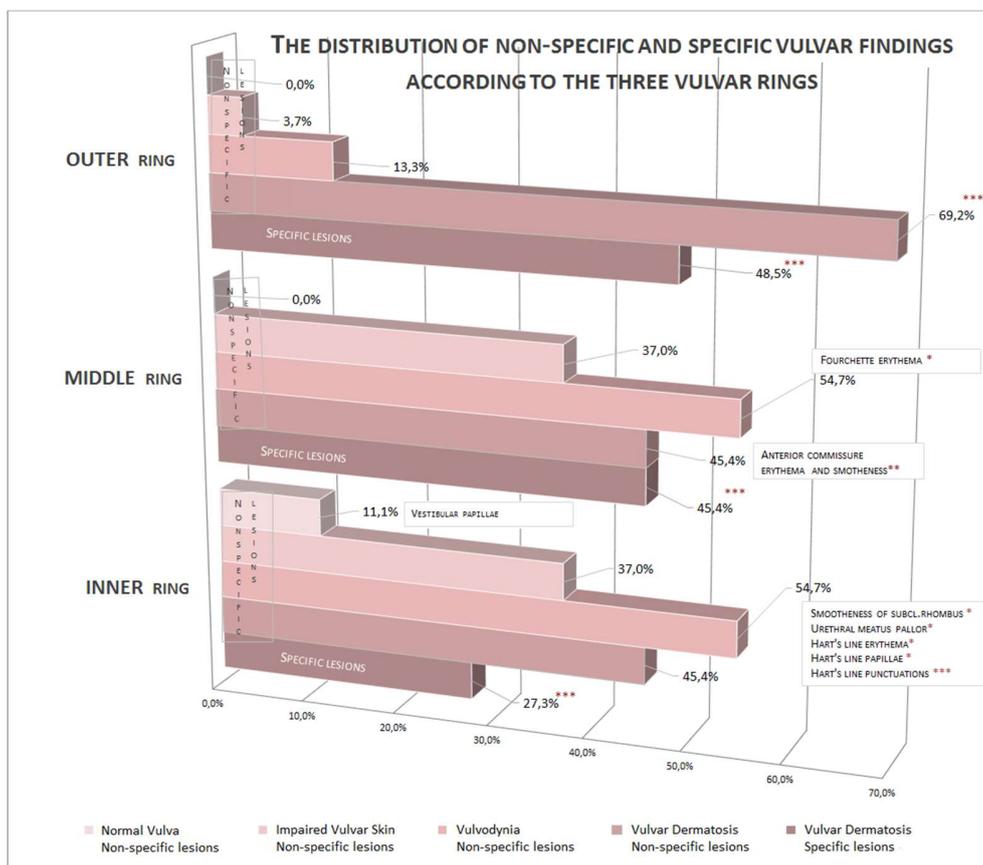


Figure 3. The distribution of non-specific and specific vulvoscopy findings according to the three vulvar rings. * = $p < 0.05$; ** = $p < 0.01$; *** = $p < 0.001$. Vulvar dermatosis was characterized by the significantly more frequent presence of specific lesions in all three vulvar ring. Patients with vulvodynia and impaired vulvar skin had significantly higher incidence of non-specific lesions in the inner ring of the vulva. Non-specific finding in patients diagnosed as vulvodynia were not relevant for the diagnosis of vulvodynia.

CONCLUSION

We described an original technique for performing colposcopy of the vulva called "Three Rings Vulvoscopy", taking into account three different skin types and zones, which are approximately ring-shaped, as well as morphological evaluation of lesions according to their specificity (non-specific and specific lesions). The new vulvoscopy technique seems to be promising in the differential diagnosis of vulvar discomfort.

The vulvoscopy results suggests the importance of maintaining the integrity of the skin of the vulva. Vulvar care guidelines are successful for the management of vulvar complaints, and previous research has shown a decrease in mean score for dyspareunia, burning after intercourse, vulvar burning, vulvar itching and vulvar pain [4,7,14]. Given that the fundamental difference between the patients with vulvodynia and impaired vulvar skin is the presence of vulvar symptoms, this study could open the debate on whether the patients with impaired vulvar skin without vulvar discomfort are a possible target population for the prevention of vulvodynia.

These data raised the question whether the vulvar care measures should also be recommended to asymptomatic women with impaired vulvar skin.

"Three Rings Vulvoscopy" is being proposed in order to encourage others to adopt it and prove it in clinical practice.

AUTHOR DISCLOSURE

Nothing to disclose.

PUBLISHABLE CONFLICT OF INTEREST STATEMENT

No conflict of interest.

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