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The Normal Vulva

The vulva is a complex organ, due to its embryologic derivation from the three germ layers belonging to the embryonic disc:

- ectoderm (squamous epithelium);
- mesoderm (connective epithelium);
- endoderm (vulval vestibule).

This embryological derivation is responsible for the different variants in morphology that occur during the development of the vulva.

A correct and thorough knowledge of the 'normal' vulva is vital for several reasons. Firstly, it is important in order to recognize some of the normal anatomical variants in order to differentiate them from pathological features. This will prevent unnecessary excision and treatment of normal areas. Secondly, it leads to a more specific and logical approach in treating vulval disorders. In some conditions, the normal anatomy of the vulva is altered and this can give diagnostic clues. It is important to note that the 'normal' vulva modifies itself during a woman's lifetime, depending on age, obstetrical and gynaecological history.

Normal Vulval Anatomy

The vulva may be considered as the combination of the mucosal, cutaneous, muscular and connective tissue structures that compose the lower part of the female genital tract. The peculiarity of this localization means that the vulva is in close association with urological structures (urethra and bladder), gynaecological structures (vagina), and intestinal structures (rectum and anus).

The borders of the vulva are: mons pubis anteriorly, perineal body posteriorly, genital crural folds laterally and hymen medially (Figure 1.1). In this triangular-shaped region, with naked-eye examination, five distinct structures clearly appear: the labia majora, the clitoris, the vestibule, the labia minora and the hymen (Figure 1.2 a, b).

There is usually a limited description of the internal structures of the vulva in gynaecological and dermatological textbooks. These structures reach the plane of the perineal fascia (or urogenital membrane) under the skin. A knowledge of the anatomy of these structures and planes then encompasses the clitoral body, the minor vestibular bulbs and glands, the urethral opening and the paraurethral glands, which are all part of the vulva. A good understanding of the anatomy, together with its embryological development, allows a comprehensive approach to vulval morphology and correct surgical dissection if required.

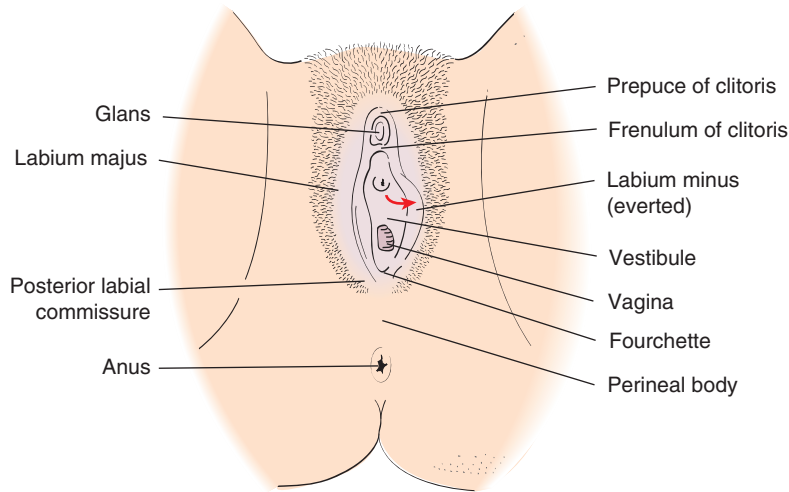


Figure 1.1 The vulva.

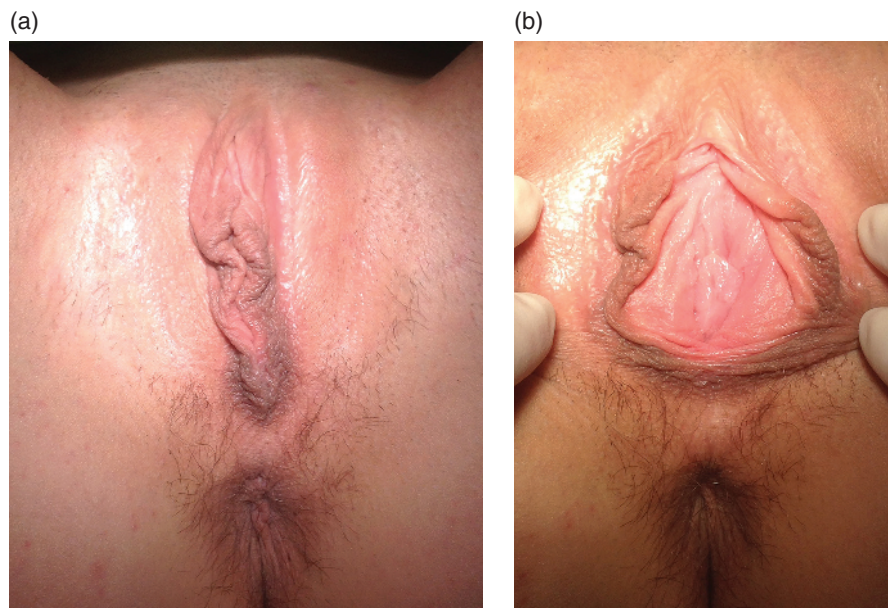


Figure 1.2 Normal vulva (a) – outer and (b) – inner vulva.

The *labia majora* are two cutaneous folds, even and symmetrical, arising from the lateral portions of the mons pubis and extending to the posterior triangle of the perineum. Laterally they terminate on the genito-crural fold, and medially continue to the external aspects of the labia minora, forming the interlabial sulci. On the outer surface, they are covered by hair-bearing skin. The hair follicles are lost on the inner surface but many sebaceous glands remain.

The *labia minora* are two thin structures that are connected anteriorly to form the clitoral hood and, below the clitoral body, form the frenulum. Posteriorly the labia minora unite to define the

fourchette The epithelium starting from the internal side of the fourchette to the hymen is called the navicular fossa. The labia minora do not have hair follicles but they are covered by numerous sebaceous glands and sweat glands.

The **clitoris** develops from an outgrowth in the embryo called the genital tubercle. It contains trabeculated erectile tissue, similar to the male penis, and is composed of the body (the shaft and the glans) and the crura. The glans is covered by the clitoral hood, formed by the fusion of the anterior portions of the labia minora. The body of the clitoris continues in each crus (singular form of 'crura'), attached to the corresponding ischial ramus, beneath the descending pubic rami. Hence only about 30% of the clitoris is visible (Figure 1.3).

The **vestibule** is the space between the hymenal ring and the internal aspect of labia minora. Its boundaries are the clitoris anteriorly, the fourchette posteriorly and the 'Hart's line' laterally, which runs down the internal side of the labia minora. It represents the junction between the mucosal epithelium and the keratinized skin of the vestibule (Figure 1.4). Some authors define the lateral extension of the vestibule as the free edge of labia minora, therefore including the two types of epithelium (mucosa and skin).

Several structures open into the vestibule. The urethral opening is clearly seen with the paraurethral Skene's glands laterally. The ducts of the Bartholin's glands and the lesser vestibular glands open into the lower third of the vaginal introitus.

The bulb of the vestibule is located deeply and, as aggregations of erectile tissue, this may be considered as an internal part of the clitoris.

The **hymen** is an elastic ring-shaped structure, covered by mucosal epithelium that separates the vagina from the vulval vestibule. After the first penetrative sexual intercourse it can be torn apart, leaving one or more scars on its surface. Very rarely the hymen may be septate or cribriform.

The **mons pubis** lies in front of and above the upper part of the symphysis pubis. A thick cushion of subcutaneous fat is covered by hair-bearing keratinized epithelium.

The vulva obtains its blood supply from the internal pudendal artery and drains via the external pudendal vein. The nerve supply is from branches of the perineal nerve but the clitoris is supplied by the dorsal nerve of the clitoris, a branch of the pudendal nerve. Lymphatic drainage is to the inguinal and internal iliac nodes.

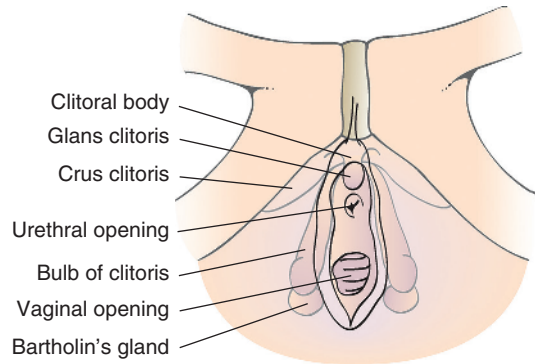


Figure 1.3 The clitoris.



Figure 1.4 Hart's line.

Normal Vulval and Vaginal Flora

The vagina is colonized by several strains of bacteria. At puberty, lactobacilli increase and the glycogen metabolized by them produces lactic acid, giving a normal vaginal acidic pH of 4.5 or less. A change in the normal discharge can occur if levels of *Candida albicans* or *Streptococcus agalactiae* (beta haemolytic streptococcus) increase but this does not necessarily require any treatment.

Further Reading

- Andrikopoulou, M., Michala, L. and Creighton, S. M. (2013) The normal vulva in medical textbooks. *Journal of Obstetrics and Gynaecology* **33**, 648–650.
- Lloyd, J., Crouch, N. S., Minto, C. L. *et al.* (2005) Female genital appearance: ‘normality’ unfolds. *British Journal of Obstetrics and Gynaecology* **112**, 643–646.
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Normal Anatomical Variants

The shape and morphology of the vulva depend on the appearance of all the structures involved. The differences in the developmental process and integration into the whole of each structure render the vulva a unique organ. For this reason it is usual to find some variants; that should be considered normal. However, these can cause great worry to a woman when she first looks at her vulva. In addition, the explosion in cosmetic surgery for the external genitalia in recent years in order to reach a ‘perfect vulva’ has greatly increased the focus of attention on vulval appearance. As a consequence, aesthetic vulval surgery is performed, modifying structures that are normal, without any pathological reason.

Common normal vulval variants are considered here.



Figure 1.5 Bifid labium minus.

- **Agenesis of the labia minora.** This is a normal finding in women but should not be confused with labial adhesion. The latter condition is an acquired disease, more frequent in girls under 2 years due to several predisposing factors such as oestrogen deprivation, inadequate personal care, local irritants, infections or previous trauma. This situation may mimic labial reabsorption in lichen sclerosus but generally resolves spontaneously.
- **Asymmetry of the labia minora.** There is great variability in the size and shape of the labia minora. In one study, the length and width of the labia minora were examined in 50 women aged from 18 to 50. The length varied from 20 to 100 mm and the width from 7 to 50 mm. Sometimes a duplication of the labia minora may occur, without any pathological consequence (Figure 1.5). The edge of the labia minora may become rugose and the rim is often pigmented.

- **Sebaceous glands.** The vulva is rich in sebaceous glands (Fordyce spots) that can appear as little yellow spots spread on the vestibule and labia minora (Figure 1.6). In some cases, hypertrophic and inflamed sebaceous glands may upset the normal surface anatomy of the labia. This condition is known as Fox–Fordyce disease.
- **Vestibular papillomatosis.** Often misdiagnosed and treated as HPV condylomata, this condition is characterized by papillary growths of the vestibular mucosa located within Hart’s line. On naked eye examination, they are finger-like projections and each has a solitary base (Figure 1.7).
- **Vestibular erythema.** Located in the vestibule at the opening of the Bartholin glands, this physiological erythema is found, in observational studies, in more than 40% of asymptomatic women. Previously associated with localized provoked vestibular pain, it is now to be considered a normal variant.
- **Paraurethral cysts and vestibular cysts.** Cysts of Skene’s glands or paraurethral cysts are a normal finding and are often asymptomatic. In case of excessive growth, surgical excision may be indicated. These conditions may mimic vulval cancer but the regular shape, the softness on palpation and the normal lining should lead to a correct diagnosis.
- **Membranous fourchette (membrane like).** Occasionally, where the posterior labia minora join (fourchette) this can be thinned and looks like a thin band of mucous membrane. This is a normal finding, usually causing no problems during intercourse or gynaecological examination. In some cases, however, particularly after the menopause or in some oestrogen-depleted states with atrophy, the membranous fourchette may become symptomatic, especially during intercourse, requiring topical oestrogens or surgical therapy.
- **Clitoral hood.** The shape and the size of the clitoris and clitoral hood have a great variability. Sometimes the hood is covered by transitional epithelium, rendering this structure more sensitive (it is estimated to have more than 8000 sensory nerve endings).
- **Hair distribution.** The distribution of pubic hair has a wide spectrum, depending on race and age. It varies in colour and in distribution, tending to become thinner in older age. In young women, pubic hair removal may cause irritation, mimicking candida infection, or cause folliculitis. If hair is absent at any age, the differential diagnosis is alopecia and needs further investigation.
- **Colour of the vulva.** The genital area is characterized by an increased number of melanocytes in comparison to other areas of the body. A darker



Figure 1.6 Fordyce spots.



Figure 1.7 Vestibular papillomatosis.



Figure 1.8 Angiokeratomata.



Figure 1.9 Vulval varicosities.

skin of the vulva, particularly localized in the labia minora and clitoral hood, is normal.

- **Angiokeratomas.** These are very common small vascular papules usually seen on the labia majora (Figure 1.8). They are asymptomatic and should not be diagnosed and managed as genital warts or cancer. No biopsy is required. They may disappear with gentle digital pressure.
- **Vulval varicosities.** Varicosities of the labial veins may be unilateral or bilateral and are seen on the outer labia majora (Figure 1.9). They may appear in pregnancy.

Normal Changes Over the Lifetime

Childhood

In the infant, the labia minora are poorly developed and the vestibule is more exposed. No hair is seen. At puberty, the labia majora and mons pubis become more prominent due to the deposition of fat. Pubic hair growth develops the adult pattern between the ages of 12 and 17.

Pregnancy

Increased progesterone predisposes to venous distension and hence the development of vulval varicosities. Increased pigmentation is common, especially in darker skin types. Immune dysregulation may lead to an increased incidence of infection such as candidiasis.

Menopause

The density of hair growth is reduced and the labia majora become less prominent due to a reduction in subcutaneous fat. The loss of oestrogen leads to a thinning of the epithelium with consequent dryness and increased fragility. Associated urinary incontinence can cause significant problems with irritancy.

Further Reading

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