

Pathophysiology of the Transformation Zone

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Normal transformation zone

Diagram showing the location of the transformation zone and the physiologic squamocolumnar junction. From Burke L et al: *Text and atlas: colposcopy*, Norwalk, Conn, 1991, Appleton Lange.

[Click to enlarge.](#) Transformation zone with residual island of columnar epithelium. From Burghardt E et al: *Text and atlas: colposcopy—cervical pathology*, New York, 1991, Thieme.

[Click to enlarge.](#) Partial transformation. From Burghardt E et al: *Text and atlas: colposcopy—cervical pathology*, New York, 1991, Thieme. The transformation zone (TZ) represents an area of dynamic, transformed epithelium that evolves early in a woman's life. At puberty hormonal changes and the establishment of lactobacilli (producing H₂O₂ and H⁺ ions) lead to the formation of an acidic vaginal ecosystem. This process does not seem to alter the multicell layered squamous epithelium but appears to traumatize the thin, fragile columnar epithelium. This cellular injury leads to defensive metaplasia—a multicell layer, much like the squamous epithelium. Components of the normal TZ may be islands of columnar epithelium surrounded by mature and immature metaplastic squamous epithelium, gland openings, and Nabothian cysts. In the normal TZ there are no colposcopic findings suggestive of cervical neoplasia.

Schematic representation of squamous metaplasia and reserve cell hyperplasia. From Burke L et al: *Text and atlas: colposcopy*, Norwalk, Conn, 1991, Appleton Lange.

[Click to enlarge.](#) Cervical intraepithelial neoplasia: the distribution of disease with age. From Wright VC et al: *Basic and advanced colposcopy: a practical handbook for diagnosis and treatment*, ed 2, Komoka, Ont, Canada, 1995, Biomedical Communications.

[Click to enlarge.](#) The transformation zone: cervical topography and the area of susceptibility. From Wright VC et al: *Basic and advanced colposcopy: a practical handbook for diagnosis and treatment*, ed 2, Komoka, Ont, Canada, 1995, Biomedical Communications. Juvenile transformed epithelium is known as immature metaplasia and adjoins the squamocolumnar junction (SCJ). Initially this tissue appears colposcopically as a transient acetowhite color on the tips of the columnar villi. Later the metaplastic epithelium fuses to adjoining villi and then forms an opalescent sheet of acetowhite epithelium that extends as a tongue-like projection toward the cervical os. The TZ process is episodic and progressive, starting in the periphery of the cervix, concentrically advancing to the os, and progressing up the endocervical canal in later life. Maximal TZ activity is seen in neonates, pregnant women, and oral contraceptive users. Immature metaplasia can be described as the nursery for cervical neoplasia.

Nabothian cysts with normal overlying blood vessel arborization. From Burghardt E et al: *Text and*

atlas: colposcopy—cervical pathology, New York, 1991, Thieme. Mature metaplasia is present between immature metaplasia and the *original* SCJ. It closely resembles squamous epithelium except for the unique presence of gland openings, which when occluded may give rise to Nabothian cysts. Nabothian cysts appear amber yellow and are often covered by impressive, coarsely dilated blood vessels, which follow a normal arborized branching pattern.

Atypical transformation zone In addition to understanding the pathophysiology regarding the normal transformation zone, the colposcopist needs to be able to identify the atypical or abnormal transformation zone. The human papilloma virus (HPV) plays a vital role in the pathogenesis of cervical disease. [Click here](#) to learn more about HPV. The following characteristics are important in describing the abnormal or atypical TZ: Vascular pattern (punctation, mosaicism, atypical vessels) Intercapillary distance (it increases with the severity of the lesion) Color tone (increased whiteness indicates more nuclear activity) Surface contour (advanced lesions have more irregular surfaces) Character of the border between normal and abnormal epithelium (severe lesions have sharper borders) One or more of the following features are usually present in the atypical TZ: Acetowhite epithelium Punctation Mosaicism Leukoplakia or hyperkeratosis Atypical blood vessels ([Ferris, Shier](#)) The epithelial characteristics provide the basis for the colposcopic diagnosis. However, correlation among the colposcopic diagnosis, histology, and cervical cytology is necessary to confirm the findings. [Click here](#) for a further description of the present cytologic classification system. The terminology used to describe the normal and abnormal TZ features can be found in the section on the [New Colposcopic Terminology](#).