CHAPTER 10.

Colposcopic examination of the abnormal cervix

To perform a useful colposcopic examination of the abnormal cervix, one should first be thoroughly familiar with the appearances of the normal cervix and with the current international standard nomenclature (see Annex 3).

Also, to maximize the examination, the colposcopist should use a standard reporting method so that self-audit and comparison with normal parameters of quality may be performed. The examination should always record the core findings listed in Table 10.1.

A large drawing or a video recording should always be made for future reference (see Annex 2). Fig. 6.2 shows some commonly used icons to document individual colposcopic features. Fig. 10.1a shows an example of a drawing with some of the patterns seen at a colposcopic examination.

Colposcopy is a dynamic process, not a single-image examination, and so documentation needs to describe findings at different times during the examination (before and after saline application, after acetic acid application, at low and high power, after Lugol's iodine application). A video recording is ideal but is not always available. Clear drawings on standard diagram templates are good substitutes.

After it is established that the examination is adequate (i.e. it is not compromised by any circumstances such as infection, bleeding, or scarring), the TZ type and size should be determined. In some colposcopy clinics, it is routine to examine the entire lower genital tract; in many others, the examination is confined to the cervix and upper vagina.
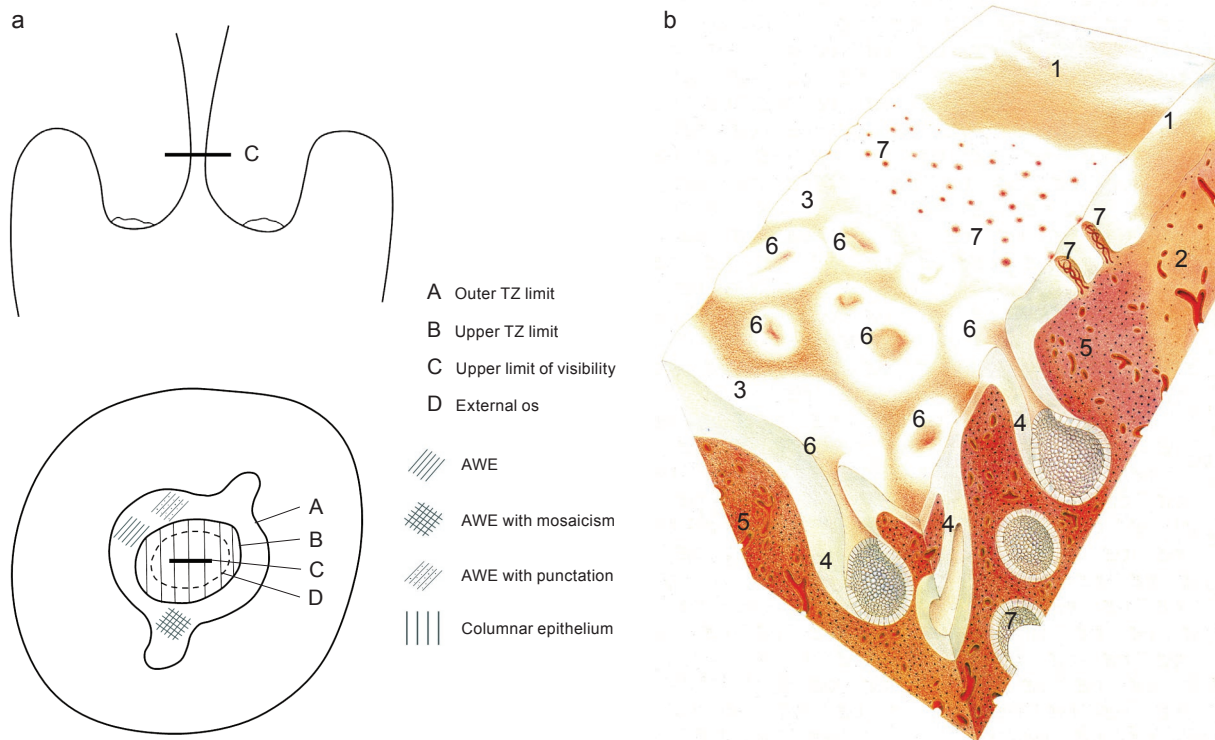
The diagnostic accuracy of colposcopy (see Section 1.6.3) relies on

image recognition skills to discriminate between different lesional characteristics. These characteristics are best assessed formally using a scoring system (Bowring et al., 2010; Reid and Scalzi, 1985; Strander et al., 2005). The Swede score (see

Table 10.1. Core findings of every colposcopic examination

Finding
Adequacy of examination
Transformation zone type
Transformation zone size
Swede score
Drawing of transformation zone and lesion(s)
Biopsy (if required) taken and from where
Management options
Details of treatment, if performed

Fig. 10.1. (a) Drawing of colposcopic findings; acetowhiteness and vessel patterns indicated in a type 1 transformation zone (TZ). Note that the upper margin of the TZ is outside the external os. The denseness of acetowhiteness and the coarseness of vessel patterns are recorded in the Swede score. AWE, acetowhite epithelium. (b) Illustration of some of the characteristics of dysplasia seen at colposcopy. Normal squamous epithelium (1) remains translucent after the application of acetic acid. It covers normally vascularized connective tissue (2). This part of the cervix is pink. Dysplasia, coagulated by acetic acid, has whitened (3). It occupies the neck of the glands (4). The connective tissue is congested (5), with numerous dilated vessels and dense leukocytic infiltration (black spots). Around the opening of the glands (6), very thick dysplastic epithelium completely masks the congestion and forms a white ring. In areas where the epithelium is thinner, congestion is visible and the cervix is red. At the summit of the vascular bundles, the vessels appear in the form of red dots (7).

a

b

A   Outer TZ limit

B   Upper TZ limit

C   Upper limit of visibility

D   External os

///   AWE

AWE with mosaicism

///   AWE with punctation

|||| Columnar epithelium

Annex 4) is a simple, user-friendly, and reliable scoring system and is to be recommended. It incorporates five different characteristics: acetowhiteness, margin status, vascular patterns, lesion size, and iodine uptake. Each is scored as 0, 1, or 2. It is a simpler and more user-friendly system than the Reid Colposcopic Index (also known as the Reid score), which did not include lesion size, and it appears to have good positive and negative predictive values.

This manual is not a comprehensive atlas of colposcopic images, but several are available. The IARC digital atlas of colposcopy (available from http://screening.iarc.fr/atlascolpo.php) is perhaps the most practical from a trainee's perspective and may be considered a sister publication to this manual.

Also, IARC and IFCPC have collaborated on a training course in colposcopy and cervical cancer prevention, which uses the atlas as one of its teaching modules (www.ifcpc.org). Finally, the interested reader is referred to one of several colposcopy atlases in book form (Cartier and Cartier, 1993; Mayeaux and Cox, 2011). Some of Cartier's classic illustrations of vascular abnormality are reproduced here.

The colposcopic determination of abnormality and its severity depends on the recognition and qualitative assessment of five, or perhaps six, characteristics, which are listed in Table 10.2. Five of the six are included in the Swede score.

10.1 Acetowhiteness

After the application of 3% or 5% acetic acid, the TZ epithelium will appear white to a differing degree across a range of conditions, many of which are normal. It will appear faintly white with most immature metaplastic change, with almost all

grades of CIN, with some inflammatory conditions, and with any kind of condylomatous change. In severe dysplastic lesions, the whiteness is often denser and is sometimes called oyster white. But acetowhiteness, by itself, is not a reliable discriminator between normal and abnormal or between a transient and a transforming HPV infection (HSIL-IN3). Also, the speed with which the epithelium becomes white and how quickly the whiteness fades may vary according to the degree of abnormality. Still images, of course, miss this feature, which is why they are not a thoroughly reliable means of assessing

the cervix or of comparing colposcopists' performance. Finally, the SCJ will often appear white, as Cartier's illustration (Fig. 10.2a) depicts. Fig. 10.2b–h reflects some of the different effects of acetic acid application that will present in colposcopic practice.

10.2 Vascular patterns

10.2.1 Classic patterns

The classic vascular patterns associated with dysplasia are mosaicism, punctation, and atypical vessels. The degree of coarseness of these

Table 10.2. Characteristics to be recognized for colposcopic determination of abnormality

Characteristic
Acetowhiteness
Vascular pattern
Margin status
Lesion size
Iodine uptake
Surface contour/tissue friability

Fig. 10.2. (a) Illustration of acetowhiteness at the squamocolumnar junction: (1) normal squamous epithelium laden with glycogen; (2) small area of squamous epithelium lacking glycogen and corresponding to the white margin; (3) papillae of glandular mucosa; (4) connective tissue. (b) Mild or faint acetowhiteness on the posterior lip of a low-grade/normal lesion. (c) Faint acetowhiteness in LSIL. (d) Acetowhite epithelium in the endocervical part of an abnormal transformation zone (TZ). (e) Faint acetowhiteness throughout the anterior lip of the cervix but denser whiteness at the 9 o'clock position. (f) Large TZ with HSIL. The acetowhiteness in this case varies throughout the TZ from faint to dense. (g) Dense acetowhiteness is evident in much of this HSIL. (h) Blood obscures assessment of much of this cervix, but between the 7 o'clock and 10 o'clock positions there is very dense acetowhiteness.
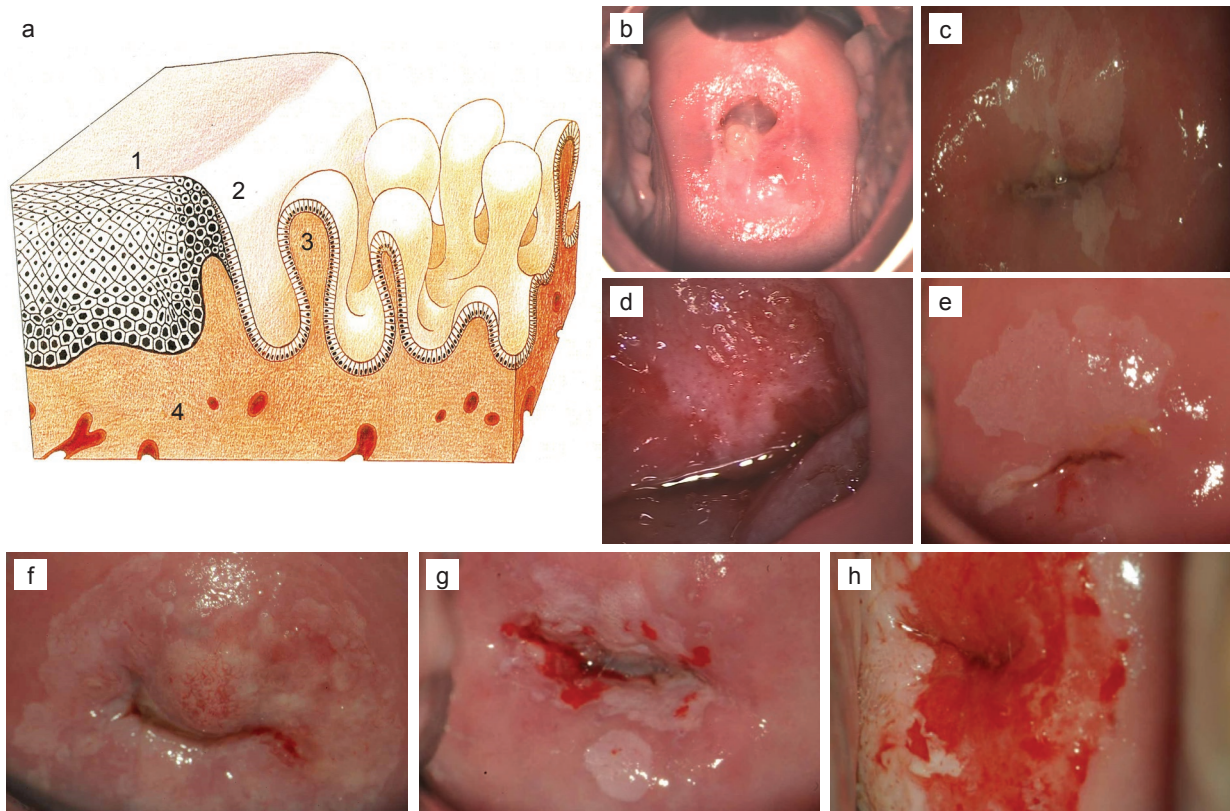
patterns relates to the likelihood of there being high-grade intraepithelial disease, i.e. the finer the pattern, the less likely, and the coarser the pattern, the more likely. With the green (or blue) filter before the application of acetic acid and with a high-power magnification view, even subtle vessel changes may be identified.

The afferent and efferent capillaries within the villi (Fig. 8.4) of columnar epithelium become compressed during the normal metaplastic process and are not incorporated within the newly formed squamous epithelium. Instead, they form a fine network below the basement membrane. When CIN develops as a result of HPV infection and atypical metaplasia, the afferent and efferent capillary system may be trapped (incorporated) into the diseased dysplastic epithelium through several elongated stromal papillae (Figs. 10.3a and 10.4a), and a thin layer of epithelium may remain on top of these vessels. This forms the basis of the punctate and mosaic blood vessel patterns (Figs. 10.3 and 10.4). The terminating vessels in the stromal papillae underlying the thin epithelium may appear as black points in a stippling pattern in an end-on view under the colposcope, making what are called punctate areas (Fig. 10.4b and d). The interconnecting blood vessels in the stromal papillae surrounding the rete pegs of the epithelium, running parallel to the surface, may be observed colposcopically as cobbled areas similar to a mosaic pattern (Fig. 10.3). In mosaic areas,

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Fig. 10.3. (a) Illustration of mosaicism: (1) cobbles of mosaic, unequal and separated by a red interval, which corresponds to the areas where the epithelium is very thin; (2) epithelial buds dip in and become ramified in the connective tissue; (3) connective tissue: (4) deep surface of the epithelium without connective tissue (note the shape of the digital processes of the squamous epithelium and their ramification). (b) Coarse mosaic pattern seen centrally in a case of HSIL. (c) Coarse mosaic pattern between the 1 o'clock and 3 o'clock positions. Proximal to this are some pollarded vessels. Suspicion of CIN3 or microinvasion. (d) High-power view of both mosaic and punctate vessel pattern. (e) Higher-power view of coarse mosaic and punctate pattern. Also, an innocent normally branching blood vessel is seen stretched over a nabothian follicle at about the 11 o'clock position. (f) Low-power view of HSIL. Coarse mosaicism is seen developing quickly after the application of acetic acid. The upper limit of the transformation zone is not seen in this image, and it is not possible to say whether it is a type 2 or type 3 transformation zone. (g) Higher-power view of the same case of HSIL as in (f). The acetowhiteness has intensified, and the mosaic pattern is more evident. The lesion has a relatively sharp margin anteriorly.
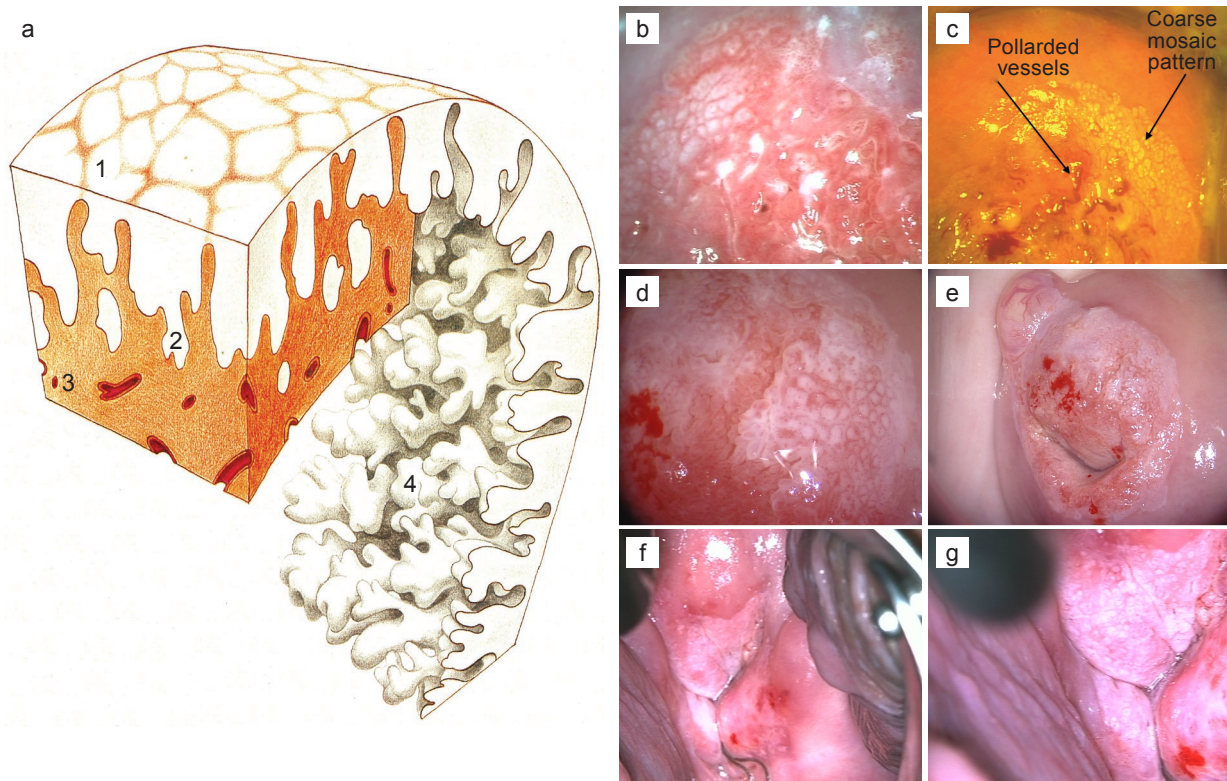
the epithelium appears as individual blocks: small or large, round or polygonal, and regular or irregular. Punctation and mosaic areas may be classified as either fine or coarse. Coarse vascular changes tend to be associated with more severe degrees of abnormality (CIN2 or greater including microinvasion). When both punctation and mosaic patterns are found to coexist, the same evaluation criteria for colposcopic prediction of disease are used as when they exist separately.

Vessels exhibiting punctation and mosaics are usually more strikingly obvious than the normal stromal vessels because these vessels penetrate into the epithelium and are thus closer to the surface. When acetic acid is applied, these abnormal vascular patterns are usually confined to the acetowhite areas.

"Fine punctation" refers to looped capillaries – viewed end-on – that appear to be of fine calibre and located close to one another, producing a delicate stippling effect (Fig. 10.4b). Fine mosaics are a network of fine-calibre blood vessels that appear in close proximity to one another, as a mosaic pattern, when viewed with the colposcope. These two vascular appearances may occur together and may be found in low-grade (CIN1) lesions. The patterns do not necessarily appear throughout the whole lesion.

Coarse punctation (Fig. 10.4d) and coarse mosaics (Fig. 10.3b–d, g, and h) are formed by vessels of larger calibre and with larger intercapillary distances, in contrast to the corresponding fine changes. Coarse punctation and mosaicism tend to occur in more severe neoplastic lesions, such as CIN2 and CIN3 lesions and early preclinical invasive cancer. Sometimes, the two patterns are superimposed in an area so that the capillary loops occur in the centre of each mosaic "tile". This appearance is called umbilication (Fig. 10.3e).

Coarse mosaicism or coarse punctation scores 2 in the Swede score.

10.2.2 Atypical patterns

Abnormal vessel patterns that do not appear mosaic or punctate include corkscrew vessels, comma-like vessels, and character-writing-type vessels. These are associated with high-grade lesions or microinvasive and invasive disease. Character-writing-type vessels are particularly associated with adenocarcinoma in situ or invasive adenocarcinoma (Fig. 10.4e).

A pollarded branch refers to one that is cut off at the trunk (see Fig. 13.5b), and in colposcopic vessel terminology this refers to a vessel that does not appear to branch but seems cut off. A pollarded vessel is seen in Fig. 10.5c and d.

Fig. 10.4. (a) Illustration of punctation: (1) red dots visible on colposcopy; (2) vascular bundles – at the summit of each papilla, the squamous epithelium is very thin, allowing the vessels to show through; (3) connective tissue; (4) the deep surface of the epithelium is flat, and the points of depression corresponding to each vascular bundle are visible. (b) Faint and fine punctation seen in a case of LSIL. (c) Low-power magnification image of the anterior lip of a dysplastic transformation zone with acetowhite epithelium in which there are many gland openings. (d) Coarse punctation in a high-grade lesion. (e) Atypical "character writing" vessel patterns, sometimes seen with severe glandular dysplasia or early adenocarcinoma.
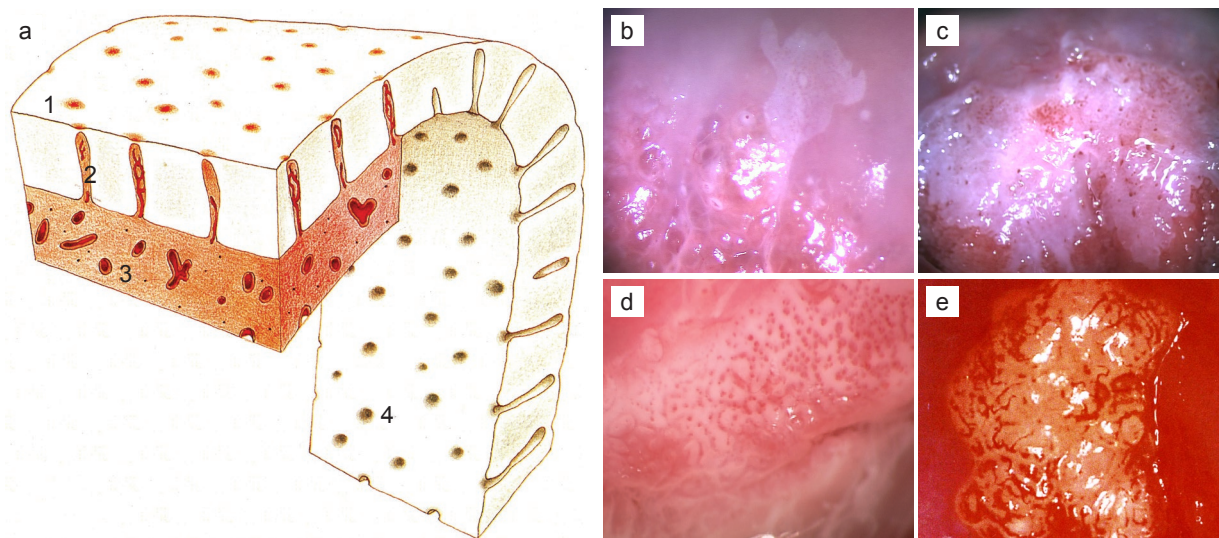
Bizarre vessels are a sign that a high-grade or microinvasive lesion may be present. Bizarre vessels are completely irregular, with no discernible decrease or branching pattern.

10.3 Other markers of abnormality

No single colposcopic characteristic is uniquely diagnostic of a high-grade lesion or of early invasive cancer. Also, some patterns may be found in both low-grade and high-grade lesions (mosaic and punctate vascular patterns) and vary in coarseness with the grade, but they are not reliable parameters of HSIL. Intercapillary distance has been reported as increasing with the degree of abnormality. Acetowhiteness is even less discriminatory. A less common marker of intraepithelial neoplasia is gland cuffing, which is an exaggerated whiteness around the meatus of gland openings and is thought to reflect dysplasia continuing into the gland epithelial lining (Fig. 10.5a).

10.4 Margin status

The sharpness of a lesion's margin is also an indicator of severity. In Fig. 10.5a, the low-grade lesion margin is irregular, whereas in Fig. 10.5b and c, there is a sharp margin associated with a high-grade lesion.

10.5 Leukoplakia (hyperkeratosis)

Leukoplakia or hyperkeratosis (Fig. 10.5j) is a white, well-demarcated area on the cervix that may be apparent to the unaided eye before the application of acetic acid. The white colour is due to the presence of keratin and is an important observation. Usually leukoplakia is idiopathic, but it may also be caused by chronic foreign-body irritation, HPV infection, or squamous neoplasia.

No matter where the area of leukoplakia is located on the cervix, it should be biopsied to rule out high-grade CIN or malignancy. It is not usually possible to colposcopically evaluate the vasculature beneath such an area.

10.6 Condylomata

Condylomata (Fig. 10.5k–m) are multiple, exophytic lesions, which are more frequently found in the vagina or on the vulva. Depending on their size, they may be obvious to the naked eye. They present as soft pink or white vascular growths with multiple, fine, finger-like projections on the surface, before the application of acetic acid. Under the colposcope, condylomata have a typical appearance, with a vascular papilliferous or frond-like surface, each element of which contains a central capillary. Occasionally, the surface of a condyloma may have a whorled, heaped-up appearance with a brain-like texture, known as an encephaloid pattern. Often, the surface of the lesion may be densely hyperplastic. These lesions may be located inside the TZ but are more often found outside the TZ. After the application of acetic acid, there is blanching of the surface, with acetowhite change persisting for some time. A condyloma at the SCJ can sometimes be confused with a prominent area of columnar epithelial villi. Both tend to be acetowhite, but a condyloma is whiter. It is sometimes prudent to obtain a biopsy to confirm the diagnosis of a condylomatous lesion and to rule out malignancy or CIN underneath the condyloma. Condylomatous lesions may not take up iodine stain or may stain only partially brown.

10.7 Lesion size and site

The size of a lesion is also related to severity (Ferris and Litaker, 2006;

Kierkegaard et al., 1995; Shafi et al., 1991). In Fig. 10.5e, a small geographical lesion with some mosaic pattern is seen in a case of LSIL, which regressed over time to normality. In Fig. 10.5f, a relatively large lesion is seen in a small TZ, i.e. the lesion is relatively large, occupying all four quadrants of the TZ, whereas in Fig. 10.2f a large lesion is seen, which is large relative to the size of the cervix.

The site of a lesion is also important; one that is inside the TZ is more likely to be HSIL than one outside the TZ (Hammes et al., 2007).

10.8 Iodine uptake

Iodine uptake is related to glycogen content in the cytoplasm of squamous cells. Where this is reduced or where the nuclear content is relatively increased, there will be less iodine uptake, for example in immature metaplasia, atrophic states, CIN (Fig. 10.5g), or even HPV infection. relatively increased, there will be less iodine uptake, for example in immature metaplasia, atrophic states, CIN (Fig. 10.5g), or even HPV infection.

10.9 Summary

Acetowhite staining is not specific for CIN; it may also occur, and usually does to a lesser degree, in immature squamous metaplasia, the congenital TZ, and inflammation, as well as in healing and regenerative epithelium. However, acetowhite changes associated with CIN are most often found localized in the TZ, abutting the SCJ and well demarcated from the surrounding epithelium. Low-grade lesions tend to be thin, less dense, and less extensive, with irregular, feathery, geographical, or angular margins and with fine punctation and/or mosaic. Sometimes, low-grade lesions may be detached from the SCJ. Atypical vessels are

seldom observed in low-grade lesions. In contrast, high-grade lesions are associated with dense, opaque, grey-white, acetowhite areas with coarse punctation and/or mosaic and with regular and well-demarcated borders. These lesions often involve both lips and may occasionally harbour atypical vessels. CIN3 lesions tend to be complex, involving the os.

Fig. 10.5. (a) Occasional cuffed gland openings are seen on the posterior lip of this case of HSIL. (b) Sharp margin of an HSIL seen at the 5 o'clock position on the posterior lip of the cervix at low-power magnification. (c) Higher-power view of the same case as in (b), which again reveals a sharp lesion margin and a pollarded vessel. (d) A pollarded vessel is seen at the 11 o'clock position in this case of HSIL. (e) A small lesion in an otherwise normal transformation zone (TZ) in the presence of a mild smear which regressed to normal without intervention. (f) A large lesion relative to the size of the TZ, i.e. the lesion occupies all four quadrants of the small TZ. (g) Low-power view of the same case of HSIL as in (a) after the application of Lugol's iodine. (h) The ridge sign. The arrow points to an opaque protuberance within a white lesion within the TZ. (i) The inner border sign. The arrow points to a sharp demarcation between thin and dense acetowhite areas in a large TZ. (j) Leukoplakia (labelled a). This white lesion is apparent before acetic acid is applied. Leukoplakia prevents adequate examination of the underlying epithelium and frequently warrants biopsy. (k) Colposcopic view of cervical condyloma at low-power magnification. (l) Colposcopic view of the same cervical condyloma at high-power magnification. (m) Colposcopic view of the same cervical condyloma after the application of Lugol's iodine, showing partial uptake of iodine.
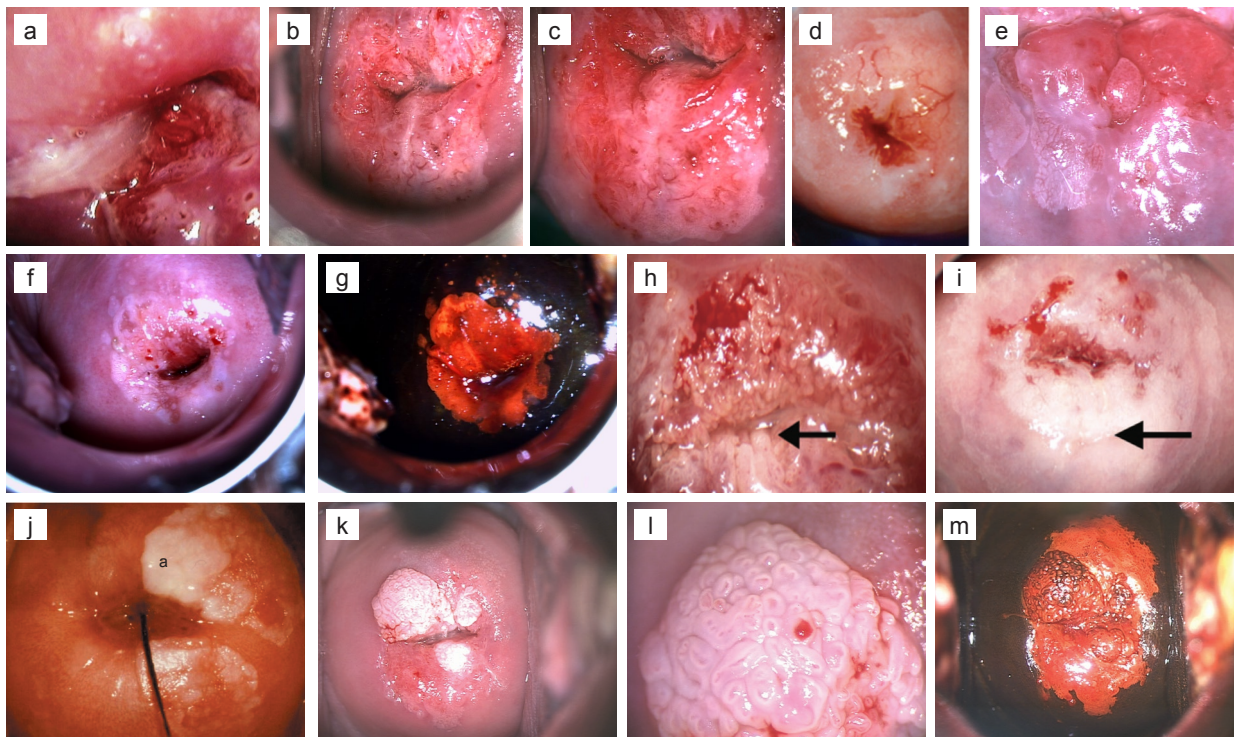
Key points

- Colposcopic examination is a dynamic process, which should be performed systematically.

- Recognition of abnormality will be improved if specific image characteristics are documented at each examination. Scoring the individual components of the Swede score is more likely to provide an accurate diagnosis. These are acetowhiteness, margin status, vascular patterns, lesion size, and iodine uptake.

- Beware the leukoplakic epithelium, because it is not possible to see the underlying epithelium, which may or may not be innocent.

- Microinvasive lesions usually exhibit more pronounced characteristics of high-grade disease.