VERRUCOUS PAPILLARY LESIONS OF ORAL MUCOSA- A REVIEW

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ABSTRACT:
A variety of verrucous and papillary lesions affect the oral mucosa. Papillary lesions of the oral mucosa are characterized by focal, multifocal or diffuse exophytic growths with cauliflower or verrucous surface irregularity. This article is an attempt to provide a comprehensive review on different verruco-papillary lesions affecting oral mucosa. We conclude by emphasizing on the need of microscopic examination in all instances and it must be coordinated with the clinical findings in order to allow for a definitive diagnosis.

Key words: Verrucous lesions, Papillary lesions, Oral mucosa

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2. Based on the number and appearance of lesion (Eversole and Papanicolaou, 1983)

- Focal Papillary and Verrucous Lesions of the Oral Mucosa
  - Squamous Papilloma
  - Verruca Vulgaris
  - Molluscum Contagiosum
  - Verruciform Xanthoma
  - Sialadenoma Papilliferum
  - Keratoacanthoma
  - Condyloma Acuminatum
  - Squamous Cell Carcinoma
  - Warty Dyskeratoma

- Multifocal papillary and verrucous lesions of the oral mucosa
  - Papillary Hyperplasia
  - Florid Papillomatosis
  - Nevis Unus Lateris
  - Verrucous Carcinoma
  - Papillary Exophytic Squamous Cell Carcinoma
  - Multiple Condylomata
  - Focal Epithelial Hyperplasia
  - Focal Dermal Hypoplasia Syndrome
  - Multiple Hamartoma Syndrome
  - Pyostomatitis Vegetans
  - Acanthosis Nigricans
  - Verruciform Leukoplakia
  - Keratosis Follicularis

3. Based on the involvement of HPV as an etiological factor. (Eversole, 2000)

- Human papilloma viruses and Head and Neck Lesions:

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- Papillary Oral Lesions without Known Viral Association
  - Papillary hyperplasia (Papillomatosis)
  - Verruciform Xanthoma
  - Cowden syndrome
  - Nevus unius lateris
  - Acanthosis Nigricans

4. Based on their malignant potential (Thomas and Barret, 2009).

- BENIGN
  - Viral papillomas:
    - Squamous papilloma; Verruca vulgaris; Condyloma acuminatum
  - Focal epithelial hyperplasia (Heck’s disease)
  - Fibro-epithelial polyps
  - Verruciform xanthoma
  - Papillary hyperplasia
  - Pyostomatitis vegetans
  - Sialadenoma papilliferum
  - Acanthosis nigricans
  - Darier’s disease

- POTENTIALLY MALIGNANT
  - Verrucous hyperplasia
  - Papillary dysplasia
  - Proliferative (verrucous) leukoplakia

- MALIGNANT
  - Verrucous carcinoma
  - Papillary carcinoma:
  - Non-invasive (synonymous with papillary dysplasia)
  - Invasive (essentially a conventional squamous cell carcinoma requiring treatment as such)
  - Carcinoma cuniculatum (essentially a conventional, well differentiated squamous cell carcinoma requiring treatment as such)

FOCAL PAPILLARY LESIONS:
Localized papillary growths are represented by viral and non-viral epithelial proliferations which may be pedunculated or sessile. Some of these lesions exhibit normal coloration while others are white. Rolled margins with a distinct collarette are observed in some of these lesions yielding a crateriform or umbilicated appearance while the umbilicated nodules are not always characterized by a surface papillary or verrucous appearance clinically, microscopic examination will disclose acanthotic in folding with keratin crypts. Figure 1 illustrates the salient microscopic architectural features of these focal papillary lesions.

SQUAMOUS PAPILLOMA
The squamous papilloma is a benign proliferation of stratified squamous epithelium, resulting in a papillary or verruciform mass. The squamous papilloma is the most common benign epithelial neoplasm of oral epithelium.

ETIOLOGY:
Presumably, this lesion is induced by the human papillomavirus (HPV). The exact mode of transmission is unknown. In contrast to other HPV induced lesions, the viruses in this lesion appear to have an extremely low virulence and infectivity rate. A latency or incubation period of 3 to 12 months has been suggested.

CLINICAL FEATURES:
The squamous papilloma occurs with equal frequency in both men and women. Some authors have asserted that it develops predominantly in children, but epidemiologic studies indicate that it can arise at any age and, in fact, is diagnosed most often in persons 30 to 50 years of age. Sites of predilection include the tongue, lips, and soft palate, but any oral surface may be affected. This lesion is the most common of the soft tissue masses arising from the soft palate. The squamous papilloma is a soft, painless, usually pedunculated, exophytic nodule with numerous fingers like surface projections that impart a "cauliflower" or wartlike appearance (Figure 2).
Projections may be pointed or blunted and the lesion may be white, slightly red, or normal in color, depending on the amount of surface keratinization. The papilloma is usually solitary and enlarges rapidly to a maximum size of about 0.5 cm, with little or no change thereafter. However, lesions as large as 3.0 cm in greatest diameter have been reported. It is sometimes difficult to distinguish this lesion clinically from verruca vulgaris, condyoma acuminatum, verruciform xanthoma or focal epithelial hyperplasia. In addition, extensive coalescing papillary lesions of the oral mucosa may be seen in several skin disorders, including nevus unius lateris, acanthosis nigricans, and focal dermal hypoplasia (Goltz Gorlin) syndrome. Laryngeal papillomatosis, a rare and potentially devastating disease of the larynx and hypopharynx, has two distinct types: (1) juvenile onset and (2) Adult onset. Hoarseness is the usual presenting feature, and rapidly proliferating papillomas in the juvenile-onset type may obstruct the airway. 

DIFFERENTIAL DIAGNOSIS:
The differential diagnosis of oral squamous papilloma, when solitary, includes verruciform xanthoma, papillary hyperplasia, and condyloma acuminatum. Verruciform xanthoma may resemble squamous papilloma, although this lesion has a distinct predilection for the gingiva and the alveolar ridge. A cause-and-effect relationship (e.g., lesion appearing under an ill fitting denture) should be evident for inflammatory papillary hyperplasia. The condyloma would be larger than the papilloma, would have a broader base, and would appear pink to red as a result of less keratinization. 

DIAGNOSIS: It is based on
• Clinical appearance
• Biopsy features

HISTOPATHOLOGY:
The papilloma is characterized by a proliferation of keratinized stratified squamous epithelium arrayed in finger-like projections with fibro vascular connective tissue cores (Figure 3). 

The connective tissue cores may show inflammatory changes, depending on the amount of trauma sustained by the lesion. The keratin layer is thickened in lesions with a whiter clinical appearance, and the maturation pattern. Occasional papillomas demonstrate basilar hyperplasia and mitotic activity, which can be mistaken for mild epithelial dysplasia. Koilocytes, virus-altered epithelial clear cells with small dark (pyknotic) nuclei, are sometimes seen high in the prickle cell layer. 

Dysplastic Oral Warts: Some oral papillomas in patients with acquired immunodeficiency syndrome (AIDS) exhibit microscopic changes that are dysplastic in appearance. The degree of dysplasia ranges from mild to severe. The outcome, or natural history, of these dysplastic warts is unknown, although invasive carcinoma has yet to be reported despite several years of follow-up. A wide variety of HPV subtypes, including 16 and 18, can be demonstrated in these lesions. 

TREATMENT AND PROGNOSIS:
Conservative surgical excision, including the base of the lesion, is adequate treatment for the oral squamous papilloma, and recurrence is unlikely. Frequently, lesions have been left untreated for years with no reported transformation into malignancy, continuous enlargement, or dissemination to other parts of the oral cavity. 

VERRUCA VULGARIS
Verruca vulgaris is a benign, virus-induced, focal hyperplasia of stratified squamous epithelium. One or more of the associated human papillomavirus (HPV) types 2, 4, 6, and 11 are found in virtually all examples. Verruca vulgaris is contagious and can spread to other parts of a person's skin or mucous membranes by way of autoinoculation. It infrequently develops on oral mucosa but is extremely common on the skin. 

CLINICAL FEATURES:
Verruca vulgaris is frequently discovered in children, but occasional lesions may arise even into middle age. The skin of the hands is usually the site of infection. When the oral mucosa is involved, the lesions are usually found on the vermilion border, labial mucosa, or anterior tongue. Typically, the verruca appears as a painless papule or nodule with papillary projections or a rough pebbly surface (Figure 4).
It may be pedunculated or sessile. Cutaneous lesions may be pink, yellow, or white; oral lesions are almost always white. Verruca vulgaris enlarges rapidly to its maximum size (usually less than 5 mm), and the size remains constant for months or years thereafter unless the lesion is irritated. Multiple or clustered lesions are common. On occasion, extreme accumulation of compact keratin may result in a hard surface projection several millimeters in height, termed a cutaneous horn or keratin horn. Other cutaneous lesions including seborrheic keratosis, actinic keratosis, and squamous cell carcinoma, may also create a cutaneous horn.

**DIFFERENTIAL DIAGNOSIS:**
- Focal epithelial hyperplasia
- Keratoacanthoma
- Papillary squamous carcinoma
- Squamous papilloma
- Condyloma acuminatum

**DIAGNOSIS:** It is based on
- Clinical appearance
- Microscopic findings
- Immunohistochemical demonstration of HPV common antigen

**Histopathology:**
The verruca vulgaris is characterized by a proliferation of hyperkeratotic stratified squamous epithelium arranged into fingerlike or pointed projections with connective tissue cores chronic inflammatory cells often infiltrate the supporting connective tissue (Figure 5).

**Figure 5:** Microscopic appearance

Elongated rete ridges tend to converge toward the center of the lesion, producing a "cupping" effect. A prominent granular cell layer (hypergranulosis) exhibits coarse, clumped keratohyaline granules. Abundant koilocytes are often seen in the superficial spinous layer. Koilocytes are HPV-altered epithelial cells with perinuclear clear spaces and small, dark nuclei (pyknosis). Eosinophilic intranuclear viral inclusions are often noted within the cells of the granular layer.

**TREATMENT AND PROGNOSIS:**
Skin verrucae are treated effectively by liquid nitrogen cryotherapy, conservative surgical excision or curettage, or topical application of keratinolytic agents (usually containing salicylic acid and lactic acid). Oral lesions are usually surgically excised, or they may be destroyed by laser, cryotherapy, or electrosurgery. Cryotherapy induces a keratinolytic agent (usually containing salicylic acid and lactic acid) that destruction or surgical treatments should extend to include the base of the lesion. Recurrence is seen in a small proportion of treated cases. Without treatment, verrucae do not transform into malignancy, and two thirds will disappear spontaneously within 2 years, especially in children.

**MOLLUSCUM CONTAGIOSUM**
Molluscum Contagiosum (MC) is a virus-induced epithelial hyperplasia produced by the molluscum contagiosum virus. At least 6% of the population (more in older age groups) has anti-bodies to this virus, although few ever develop lesions. After an incubation period of 14 to 50 days, infection produces multiple papules of the skin or, rarely, mucous membranes. These remain small for months or years and then spontaneously involute. During its active phase, the molluscum contagiosum virus is sloughed from a central core in each papule. Routes of transmission include sexual contact (in adults) and such nonsexual contacts (in children and teenagers) as sharing clothing, wrestling, communal bathing, and swimming. Lesions have a predilection for warm portions of the skin and sites of recent injury; florid cases have been reported in immunocompromised patients.

**ETIOLOGY:**
MC has no animal reservoir, infecting only humans, as did smallpox. However, there are different pox viruses that infect many other mammals. The infecting human MC virus is a DNA poxvirus called the molluscum contagiosum virus (MCV). There are four types of MCV, MCV-1 to -4; MCV-1 is the most prevalent and MCV-2 is seen usually in adults and often sexually transmitted.

**CLINICAL FEATURES:**
Molluscum contagiosum is usually seen in children and young adults. The papules almost always are multiple and occur predominantly on the skin of the neck, face (particularly eyelids), trunk, and genitalia. Infrequently, oral involvement occurs, usually on the lips, buccal mucosa, or palate. Lesions are pink, smooth surfaced, sessile, nontender, and nonhemorrhagic papules that are 2 to 4 mm in diameter (Figure 6).

**Figure 6:** Molluscum contagiosum. Multiple facial skin lesions in an HIV-positive subject

The classic wart of molluscum is a crateriform papule, a small normal colored skin nodule with a depressed central pit. When present, MC lesions tend to be multiple. Many show a small central indentation or keratin-like plug from which a curd-like substance can be expressed. Some are surrounded by a mild inflammatory erythema and may be slightly tender. Multiple papillary lesions in a child should arouse suspicion of sexual abuse, warranting investigation of persons in contact with that child.

**HISTOPATHOLOGY:**
Molluscum contagiosum appears as a localized lobular proliferation of surface stratified squamous epithelium (Figure 7a and b). The central portion of each lobule is filled with bloated keratinocytes that contain large, intra nuclear, basophilic viral inclusions called molluscum bodies (Figure 7c).
These bodies begin as small eosinophilic structures in cells just above the basal layer. As they approach the surface, these bodies increase so much in size that they frequently become larger than the original size of the invaded cells. A central crater is formed at the surface as stratum corneum cells disintegrate to release their molluscum bodies. These unique features make the diagnosis readily apparent.

**TREATMENT AND PROGNOSIS:**
In most cases of molluscum contagiosum, spontaneous remission occurs within 6 to 9 months; however, curettage and cryotherapy are effective treatments for papules removed electively. Podophyllotoxin and tretinoin therapies are popular but less effective, and topical imiquimod, an immuneresponse modifier, recently has been shown to be effective in reducing or eliminating the lesions. There is no apparent potential to transform into carcinoma, and the lesions tend not to recur after treatment.\(^1\)

**VERRUCIFORM XANTHOMA**
Verruciform xanthoma is a hyperplastic condition of the epithelium of the mouth, skin, and genitalia, with a characteristic accumulation of lipid-laden histiocytes beneath the epithelium. First reported by Shafer in 1971, it remains largely an oral disease; its cause is still unknown. Although verruciform xanthoma is a papillary lesion, human papillomavirus does not appear to play a role in its pathogenesis. The lesion probably represents an unusual reaction or immune response to localized epithelial trauma or damage. This hypothesis is supported by cases of verruciform xanthoma that have developed in association with disturbed epithelium (e.g., lichen planus, lupus erythematosus, epidermolysis bullosa, epithelial dysplasia, pemphigus vulgaris, warty dyskeratoma, graft-versushost disease).\(^19\)

Verruciform xanthoma is typically seen in whites, 40 to 70 years of age. There is a strong female predilection (a 1: 2 male-to-female ratio). Approximately half of the intraoral lesions occur on the gingiva and alveolar mucosa, but any oral site may be involved. The lesion appears as a well-demarcated, soft, painless, sessile, slightly elevated mass with a white, yellow-white, or red color and a papillary or roughened ( verruciform) surface (Figures 17a, b). Rarely, flat-topped nodules are seen without surface projections. Most lesions are smaller than 2 cm in greatest diameter; no oral lesion larger than 4 cm has been reported. Multiple lesions occasionally have been described. Clinically, verruciform xanthoma may be similar to squamous papilloma, condyloma acuminatum, or early carcinoma.\(^19\)

Zegarelli et al., (1975) introduced the concept that local trauma and inflammation lead to epithelial entrapment and the cause of accumulation of lipid-containing macrophages is epithelial degeneration. The products of epithelial breakdown elicit an inflammatory response, which is manifested by a predominant neutrophilic infiltrate in the epithelium and a subsequent release of lipid material through the epithelium that finally is scavenged by the macrophages. Several authors have supported this theory. Zegarelli et al. suggested a “local irritant” as the initiator of this process. Discussing the epithelial hyperplasia with elongation of the epithelial rete ridges, Mostafa et al., (1993), suggested that this elongation is illusory and is not a proliferation of epithelial cells with downward growth of the rete pegs, but rather results from the upward pushing effect of the accumulated macrophages towards the epithelium. This according to the authors reflects the thinning of the epithelium overlying the macrophages in the connective tissue papillae.\(^14\)

Xanthomas of skin are usually associated with hyperlipoproteinemia accompanying atherosclerotic vascular disease, diabetes mellitus and familial lipoprotein disorders. No correlation with high blood lipids has been uncovered with regard to oral verruciform xanthoma.
DIFFERENTIAL DIAGNOSIS:
A differential diagnosis for this entity would include squamous papilloma, papillary squamous carcinoma, and condyloma acuminatum.

HISTOPATHOLOGY
It demonstrates papillary, acanthotic surface epithelium covered by a thickened layer of parakeratin. On routine H & E staining, the keratin layer often exhibits a distinctive orange coloration. Clefs or crypts between the epithelial projections are filled with parakeratin, and rete ridges are elongated to a uniform depth. The most important diagnostic feature is the accumulation of numerous large macrophages with foamy cytoplasm, which typically are confined to the connective tissue papillae (Figure 9). These foam cells, also known as xanthoma cells, contain lipid and periodic acid-Schiff (PAS) positive, diastase resistant granules. Immunohistochemically it is CD68 positive.

Figure 9: Photomicrograph showing bubbly foam or xanthoma cells in the connective tissue papillae between epithelial cells.

TREATMENT AND PROGNOSIS:
The verruciform xanthoma is treated with conservative surgical excision. Recurrence after removal of the lesion is rare, and no malignant transformation has been reported. However, two cases have been reported in which a verruciform xanthoma occurred in association with carcinoma in situ or squamous cell carcinoma. This does not necessarily imply that verruciform xanthoma is a potentially malignant lesion; however, it may indicate that hyperkeratotic or dysplastic oral lesions can undergo degenerative changes to form a verruciform xanthoma.

SIALADENOMA PAPILLIFERUM
Abrams and Finck first used the term sialadenoma papilliferum in 1969 to describe 2 cases of an unusual neoplastic salivary gland proliferation. Slightly more than 50 cases have been reported in the English-language literature. Grossly, the neoplasm is a well-circumscribed, round-to-oval excrecence of the mucosal surface.

CLINICAL FEATURES:
A benign neoplasm of excretory salivary duct epithelium, sialadenoma papilliferum resembles both clinically and histologically the eccrine skin tumor syringocystadenoma papilliferum. This rare salivary tumor is most often seen among elderly males on the palate and buccal mucosa. Clinically, the lesion is well demarcated and papillary with palpable indurations of the underlying sub-mucosa.

HISTOPATHOLOGY
Histologically, collections of duct like spaces underlying a verrucous-like proliferation of squamous epithelium are seen. The ducts like structures are composed of tall columnar cells, and although they are the major cell type lining these ducts like spaces, goblet cells are also identified. It shows branching ductal structures that extend into the papillary mucosa above the level of the adjacent mucosa (Figure 11).

Figure 10: In preoperative MRI view, well demarcated firm mass was observed under the palatal mucosa (white arrow).

Figure 11: High magnification image of a region showing papillary projection. Papillary fronds were lined by a double row of cells composed of luminal columnar cells and short cuboidal or basaloid cells. (Original magnification x200)

TREATMENT
Surgical excision is the treatment of choice and the margins must be wide enough to include the underlying deep extensions.

KERATOACANTHOMA
Keratoacanthoma is a self-limiting, epithelial proliferation with a strong clinical and histopathologic similarity to well-differentiated squamous cell carcinoma. In fact, some authorities consider it to represent an extremely well-differentiated form of squamous cell carcinoma. Cutaneous lesions presumably arise from the infundibulum of hair follicles. Intraoral lesions have been reported, but they are rare and, in fact, some authorities do not accept keratoacanthoma as an intraoral disease. The cause of this lesion is unknown, but sun damage and human papillomavirus (HPV), possibly subtypes 26 or 37, have been proposed. The association with sun damage is suggested by the fact that most solitary lesions are found on sun-exposed skin, predominantly in the elderly. There appears to be a hereditary predisposition for multiple lesions, and the lesions occur with
increased frequency in immunosuppressed patients and those with **Muir-Torre syndrome** (sebaceous neoplasms, kerato-acanthomas, and gastrointestinal carcinomas).14

**CLINICAL FEATURES**

Keratoacanthoma rarely occurs in patients before 45 years of age and shows a male predilection. Almost 95% of solitary lesions are found on sun-exposed skin, and 8% of all cases are found on the outer edge of the vermilion border of the lips, with equal frequency on both the upper and lower lips.11 Keratoacanthoma appears as a firm, nontender, well-demarcated, sessile, dome-shaped nodule with a central plug of keratin (Figures 12), although lesions reported as intraoral keratoacanthoma usually have lacked the central plug. The outer portion of the nodule has a normal texture and color but may be erythematous. The central keratin plug is yellowish, brown, or black and has an irregular, crusted, often verruciform surface.23

**Figure 12:** Keratoacanthoma. This lesion, which is located at the outer edge of the vermilion border of the lip, demonstrates a prominent core or plug of keratin11

The brown appearance is caused by extrinsic pigments that become incorporated with the excessive keratin. Intraoral KAs are generally nonpigmented. The peripheral mounded borders show an abrupt transition into normal skin or mucosa, both clinically and histologically.1 Rapid enlargement is typical, with the lesion usually attaining a diameter of 1 to 2 cm within 6 weeks. This critical feature helps to distinguish it from the more slowly enlarging squamous cell carcinoma. Most lesions regress spontaneously within 6 to 12 months of onset, frequently leaving a depressed scar in the area. Occasional patients demonstrate large numbers of keratoacanthomas. One multiple-lesion variant, the Ferguson Smith type, manifests in early life and appears to be hereditary; the lesions are not likely to involute spontaneously. Another variant manifests as hundreds of small papules of the skin and upper digestive tract (eruptive Grzybowski type) and may be associated with internal malignancy.24

**DIFFERENTIAL DIAGNOSIS**11

- Squamous cell carcinoma
- Molluscum contagiosum
- Warth dyskeratoma
- Verruca vulgaris
- Pilomatricoma
- Condyloma acuminatum

**DIAGNOSIS**

- Clinical evaluation, follow-up
- Histopathology

**HISTOPATHOLOGY**24

Keratoacanthoma of the skin and lip vermilion warrants excisional or large incisional biopsy with inclusion of adjacent, clinically normal epithelium for proper histopathologic interpretation; this is because the overall pattern of the tumor is diagnostically more important than the appearance of individual cells. The cells appear mature, although considerable dyskeratosis (abnormal or premature keratin production) is typically seen in the form of deeply located individually keratinizing lesional cells and keratin pearls similar to those found in well differentiated squamous cell carcinoma.

The surface epithelium at the lateral edge of the tumor appears normal; at the lip of the central crater, however, a characteristic acute angle is formed between the overlying epithelium and the lesion. The crater is filled with keratin, and the epithelium at the base of the crater proliferate downward (Figure 13).

**Figure 13:** Keratoacanthoma. Low-power microscopic view showing extensive epidermal proliferation with a central keratin24

This action often elicits a pronounced chronic inflammatory cell 36 responses. Downward proliferation does not extend below the level of the sweat glands in skin lesions or into underlying muscle in vermilion lesions. Late-stage lesions show considerably more keratinization of the deeper aspects of the tumor than do early lesions.24

**TREATMENT AND PROGNOSIS**14

Despite the propensity of keratoacanthoma to involute of its own accord, surgical excision of large lesions is indicated for optimal aesthetic appearance because significant scarring may otherwise occur. After excision, 2% of treated patients experience recurrence. Aggressive behavior and malignant transformation into carcinoma have been reported in a small proportion of keratoacanthomas.

**CONDYLOMA ACUMINATUM**

Condyloma acuminatum is a virus-induced proliferation of stratified squamous epithelium of the genitalia, perianal region, mouth, and larynx. One or more of the HPV types 2, 6, 11, 53, and 54 are usually detected in the lesion. However, the high-risk types 16 and 18 also found with frequency, especially in anogenital lesions Condyloma is considered to be a sexually transmitted disease (STD), with lesions developing at a site of sexual contact or trauma.25 This lesion represents 20% of all STDs diagnosed in STD clinics and may be an indicator of sexual abuse when diagnosed in young children. It is not unusual for oral and anogenital condylomata to be present concurrently. The incubation period for a condyloma is 1 to 3 months from the time of sexual contact. Once present, auto-inoculation to other mucosal sites is possible.25

**CLINICAL FEATURES**11

Condylomata are usually diagnosed in **teenagers and young adults**, but people of all ages are susceptible. Oral lesions most frequently occur on the labial mucosa, soft palate, and lingual frenum. The typical condyloma appears as a sessile, pink, well-demarcated, nontender, exophytic mass with short, blunted surface projections (Figure 14).
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The condyloma tends to be larger than the papilloma and is characteristically clustered with other condylomata. The average lesion size is 1.0 to 1.5 cm, but oral lesions as large as 3 cm have been reported.

DIFFERENTIAL DIAGNOSIS
Condyloma acuminatum may resemble focal epithelial hyperplasia in some cases. Multiple intraoral warts (verruca vulgaris) may be a consideration and indeed represent the same type of infection. Although condylomas tend to show more parakeratosis and acanthosis than verruca vulgaris, there are no universally accepted microscopic features that can be used to reliably separate the two.

DIAGNOSIS
• Location and appearance
• Demonstration of koilocytic cellular changes on biopsy
• In situ hybridization or polymerase chain reaction reveals specific HPV subtype
• Electron microscopy demonstrates intranuclear virions

HISTOPATHOLOGY
Condyloma acuminatum appears as a benign proliferation of acanthotic stratified squamous epithelium with mildly keratotic papillary surface projections (Figure 15).

Figure 15: Condyloma acuminatum appears as a benign proliferation of acanthotic stratified squamous epithelium with mildly keratotic papillary surface projections

Thin connective tissue cores support the papillary epithelial projections, which are more blunted and broader than those of squamous papilloma and verruca vulgaris, imparting an appearance of keratinfilled crypts between prominences. The covering epithelium is mature and differentiated, but the prickle cells often demonstrate pyknotic nuclei surrounded by clear zones (koilocytes), a microscopic feature of HPV infection (Figure 15).  

TREATMENT AND PROGNOSIS
The oral condyloma is usually treated by conservative surgical excision. Laser ablation also has been used, but this treatment has raised some question as to the airborne spread of HPV through the aerosolized micro-droplets created by the vaporization of lesional tissue. Regardless of the method used, a condyloma should be removed because it is contagious and can spread to other oral surfaces and to other persons through direct (usually sexual) contact.

WARTY DYSKERATOMA
INTRODUCTION:
The warty dyskeratoma is a distinctly uncommon solitary lesion that can occur on skin or oral mucosa. It is histopathologically identical to Darier's disease. For this reason, the lesion has been termed isolated Darier's disease. The lesion is not otherwise related to Darier's disease, however, and its cause remains unknown.

CLINICAL FEATURES
It typically appears as a solitary, asymptomatic, umbilicated papule on the skin of the head or neck of an older adult. The intraoral lesion also develops in patients older than age 40, and a slight male predilection has been identified. The intraoral warty dyskeratoma appears as a pink or white, umbilicated papule located on the keratinized mucosa, especially the hard palate and the alveolar ridge. A warty or roughened surface is noted in some lesions. Most warty dyskeratomas are smaller than 0.5 cm in diameter.

HISTOPATHOLOGY
It appears very similar to keratosis follicularis. Both conditions display dyskeratosis and a suprabasilar cleft. It is a solitary lesion, however, and the formation of corps, ronds and grains is not a prominent feature.

TREATMENT AND PROGNOSIS
Treatment of the warty dyskeratoma consists of conservative excision. The prognosis is excellent; these lesions have not been reported to recur, and they have no apparent malignant potential. Careful histopathologic evaluation of the tissue should be performed because some epithelial dysplasias may show a marked lack of cellular cohesiveness, resulting in a similar acantholytic appearance microscopically.

MULTIFOCAL PAPILLARY LESIONS
Multifocal papillary and verrucous lesions of the oral mucosa are characterized by multiple lesions with intervening zones of normal appearing mucosa. Diffuse papillary lesions may be localized to a given site or fields yet are extensive and may, for example, cover the entire palate or extend across the entire mucobuccal fold in the quadrant. Multiple polyoid lesions represent large papules or nodules and may or may not be distributed over zones of normal appearing mucosa (Figure 16).
The disease entities manifesting these clinical signs are represented by neoplastic, reactive and genetic processes, some of which are associated with dermal or enteric concomitant inflammatory or neoplastic processes thereby representing oral mucosal markers of internal illness. The diseases included in this group are enumerated as follow.

- Papillary Hyperplasia (Figure 16A)
- Florid Papillomatosis (Figure 16B)
- Nevus Unis Lateris (Figure 16C)
- Verrucous Carcinoma (Figure 16D)
- Papillary Exophytic Squamous Cell Carcinoma (Figure 16E)
- Focal Epithelial Hyperplasia (Figure 16G)
- Focal Dermal Hypoplasia Syndrome (Figure 16H)
- Multiple Hamartoma Syndrome (Figure 16I)
- Pyostomatitis Vegetans (Figure 16J)
- Acanthosis Nigricans (Figure 16K)
- Verruciform Leukoplaikia (Figure 16L)
- Keratosis Follicularis (Figure 16M)

PAPILLARY INFLAMMATORY HYPERPLASIA

CLINICAL FEATURES:
The lesional tissue may be pink or erythematous and is confined to the palatal vault without extension onto the alveolar crest (Figure 17).

Figure 17: Denture inflammatory papillary hyperplasia (papillomatosis)

The lesions evolve in response to irritation from an ill-fitting denture which usually fails to exhibit direct contact with the tissue thereby creating negative pressure (O’Driscoll 1965). The individual polyps are easily separated with a dental explorer (Eversol, 2000). They are not hyperkeratotic, and for this reason their coloration is that of normal mucosa. The lesion is often secondarily infected with Candida microorganisms. The lesion is not precancerous. It may be noted in habitual mouth breathers (nondenture wearers).

DIFFERENTIAL DIAGNOSIS

The range of possibilities in the differential diagnosis of papillary hyperplasia of hard palate is rather narrow because this particular entity is seldom confused with other forms of pathology. The chief lesion to be separated from papillary hyperplasia is nicotine stomatitis involving the hard palate; however, nicotine stomatitis does not occur on the hard palate of those who wear complete maxillary removable appliances. Also, nicotine stomatitis tends to be more keratinized and usually demonstrates the presence of a small red dot or punctum in the center of each nodular excrescence, which represents the orifice of the subjacent minor salivary gland duct. Rarely, in Darier’s disease, the mucosa of the palate may demonstrate numerous papules. Numerous squamous papillomas may occur on the palate; however, these lesions tend to be more keratinized with more delicate projections.

In the so-called malignant form of acanthosis nigricans, oral lesions are papillary in nature and may regress relative to the treatment response of the underlying distant malignancy. Finally, in the multiple hamartoma syndrome (Cowden’s syndrome) the oral mucosa may exhibit numerous papillary mucosal nodules. These nodules, composed of benign fibro epithelial proliferations, may impart a cobblestone appearance, but usually to the tongue, buccal mucosa, and gingiva.

DIAGNOSIS

- Clinical appearance
- Biopsy results show fibrous and epithelial papillary hyperplasia; may note pseudoepitheliomatous hyperplasia

HISTOPATHOLOGY:

Histologically multiple rounded polyloid excrescences are observed with a parakeratin layer of variable thickness. Submucosal papillae support these dome-shaped epithelial polyps and the base shows acanthosis with pseudoepitheliomatous hyperplasia. A diffuse mononuclear inflammatory infiltrate lies in juxtaposition to the papillary epithelial layer with transmigration into the lower spinous layer (i.e. epidermitis, chronic) (Figure 18).

Figure 18: (a) Photomicrograph of the lesion showing multiple papillary epithelial projections with fibrovascular connective tissue cores (H&E, 4x). (b) Lesion showing koilocytes (arrows) in the epithelium. Koilocytes display a hyperchromatic shrunken nucleus with clear cytoplasm (perinuclear halo) (H&E, 10x).
TREATMENT AND PROGNOSIS\(^{16}\):
Surgical removal is indicated before a denture is reconstructed for the patient. The actual surgical method is often a matter of individual preference and may include curettage, cryosurgery, electrosurgery, mucoabrasion, or laser ablation. Removal of appliances at bedtime and soaking in a weak disinfecting or antifungal medium, as well as maintenance of good oral hygiene coupled with topical antifungal therapy, may significantly reduce the intensity of lesions. In mild cases the use of soft tissue conditioning agents and liners, with frequent changing of the lining material, can produce sufficient resolution to preclude surgery. Topical antifungal ointment, either alone or mixed with a corticosteroid ointment, may also help reduce the size and intensity of the lesions. (Neville et al., 2005)

ORAL FLORID PAPILLOMATOSIS
This is an extremely rare disorder. Florid papillomatosis can involve both oral and laryngeal mucosa. It appears as a cobblestone diffuse lesion with superimposed pedunculated papillomas which may diffusely involve the entire oral cavity. Very little information is available on this entity. Now a day it is said that both proliferative verrucous leukoplakia and verrucous carcinoma may have been reported in the past by the name of florid papillomatosis.\(^{14}\)

Verrucous carcinoma represents 1% to 10% of all oral squamous cell carcinomas, depending on the local popularity of sp it tobacco use. Many verrucous carcinomas arise from the oral mucosa in people who chronically use chewing tobacco or sniff, typically in the area where the tobacco is habitually placed. Cases also may occur in nonusers, but the exact figure is difficult to assess because patients will often deny the tobacco habit. In spit tobacco users, a regular squamous cell carcinoma is 25 times more likely to develop than this low-grade variant. (Neville et al., 2005)

DIFFERENTIAL DIAGNOSIS\(^{33}\)
1. Conventional squamous cell carcinoma
2. Leukoplakia; proliferative verrucous leukoplakia (PVL)
3. Traumatic lesion, factitial (self-induced) injury
4. Smokeless tobacco keratosis
5. Squamous papilloma, verra vulgaris
6. Verrucous hyperplasia

In well-developed cases of verrucous carcinoma, the clinical pathologic diagnosis is relatively straightforward. However, in less than obvious 50 situations, leukoplakia might be a clinical consideration. A differential diagnosis would also include papillary squamous carcinoma, which may be distinguished from verrucous carcinoma by its more infiltrative nature, its greater degree of cyto logical atypia, and its more rapid growth. Verrucous carcinoma may develop from preexisting (and usually multiple) leukoplakia, representing part of the spectrum of proliferative verrucous leukoplakia.

HISTOPATHOLOGY
Verrucous carcinoma (VC) has a deceptively benign microscopic appearance. It is characterized by wide and elongated rete ridges that appear to "push" into the underlying connective tissue (Figure 20). VC invades the stroma with a pushing, rather than infiltrating border. Dense lymphoplasmacytic host response is common. Intraepithelial microabscesses are seen, and the abundant keratin may evoke a foreign body reaction.\(^{14}\)

Figure 19: Clinical manifestation of Verrucous carcinoma\(^{14}\)
Lesions are typically white but also may appear erythematous or pink. The color depends on the amount of keratin produced and the degree of host inflammatory response to the tumor. Leukoplakia or tobacco pouch keratosis may be seen on adjacent mucosal surfaces, and verrucous carcinoma is a lesion that may develop from the high-risk precancer, proliferative verrucous leukoplakia (PVL). Both PVL and verrucous carcinoma may have been reported in the past by the name oral florid Papillomatosis.\(^{14}\)}
A downward dipping of epithelium often “cups” the VC periphery, and is the ideal site for deep biopsy. Lesions usually show abundant keratin (usually parakeratin) production and a papillary or verruciform surface. Parakeratin typically fills the numerous clefts or crypts (parakeratin plugs) between the surface projections. These projections may be long and pointed or short and blunted. The lesional epithelial cells generally show a normal maturation pattern with no significant degree of cellular atypia (Figure 20). There is frequently an intense infiltrate of chronic inflammatory cells in the subjacent connective tissue. The histopathologic diagnosis of verrucous carcinoma requires an adequate incisional biopsy. Because the individual cells are not very dysplastic the pathologist must evaluate the overall histomorphologic configuration of the lesion to arrive at an appropriate diagnosis. Adequate sampling also is important because as many as 20% of these lesions have a routine squamous cell carcinoma developing concurrently within the verrucous carcinoma.

TREATMENT AND PROGNOSIS
Because metastasis is an extremely rare event in verrucous carcinoma, the treatment of choice is extensive surgical excision without radical neck dissection. The surgery generally need not be as extensive as that required for routine squamous cell carcinoma of a similar size. With this treatment, 90% of patients are disease free after 5 years, although some patients will require at least one additional surgical procedure during that time. The treatment failures usually occur in patients with the most extensive involvement or in those unable to tolerate extensive surgery because of unrelated systemic diseases. An additional cause of treatment failure is the initial inability to identify a focal squamous cell carcinoma arising concurrently within the less aggressive lesion. Radiotherapy is effective, but has been less popular because of published reports of poorly differentiated or anaplastic carcinoma developing within the lesion after radiotherapy. A recent analysis suggests that this threat is seriously over exaggerated, and that similar dedifferentiation can occur in verrucous carcinomas treated surgically. Chemotherapy may temporarily reduce the size of verrucous carcinoma, but it is not considered a definitive, stand-alone treatment.

EXOPHYTIC PAPILLARY SQUAMOUS CELL CARCINOMA
Papillary squamous cell carcinoma (PSCC) is a distinct variant of SCC characterized by an exophytic, papillary growth, and a favorable prognosis. This is rarely recognized in the oral cavity and oropharynx other than as a component of a large SCC. It is usually associated with the tumors of the hypopharynx, larynx and trachea. Occasionally, invasive squamous cell carcinoma will present as a papillary or verrucous lesion mimicking verrucous carcinoma. An exophytic lesion typically has a surface that is irregular, fungating, papillary, or verruciform, and its color may vary from normal to red to white, depending on the amount of keratin and vascularity (Figures 21). The surface is often ulcerated, and the tumor feels hard (indurated) on palpation. Microscopically, a polyoid or papillary architecture is observed. In contradistinction to verrucous carcinoma, spinous layer keratinocytes display cytological atypia. Pearl formation is observed and an invasive pattern of growth is witnessed at the inferior margin. The neck should be palpated for nodal enlargement.

TREATMENT
Treatment includes standard treatment for squamous cell carcinoma.

Figure 21: An exophytic lesion of the posterior lateral tongue demonstrates surface nodularity and minimal surface keratin production

MULTIPLE CONDYLOMATA
The clinical and microscopic features for condyloma acuminatum have been detailed under focal lesions. Suffice it to mention here that oral venereal warts frequently occur in groups and clusters separated from one another by intervening zones of normal appearing mucosa. Since the lesion is virally transmitted, seeding can occur with development of multiple adjacent lesions.

Focal Epithelial Hyperplasia
Heck's Disease; Multifocal Papilloma Virus Epithelial Hyperplasia
Multiple oral papillomas induced by HPV
Focal epithelial hyperplasia is a virus-induced, localized proliferation of oral squamous epithelium that was first described in Native Americans and Inuits (Eskimos). It is confined to oral mucosa (i.e., there are no genital or cutaneous foci of involvement). The lesions are more common in central and South America than in other areas, currently, it is known to exist in many populations and ethnic groups and is apparently produced by the human papillomavirus type 16 and possibly 18. The frequency of this disease is variable with wide range from 0.002 to 35% depending on the population studied and geographic region.

CLINICAL FEATURES
Usually a childhood condition, focal epithelial hyperplasia occasionally affects young and middle-aged adults. There is no gender bias. Sites of greatest involvement include the labial, buccal, and lingual mucosa, but gingival and tonsillar lesions also have been reported. This disease typically appears as multiple soft, non-tender, flattened or rounded papules, which are usually clustered and the color of normal mucosa, although they may be scattered, pale, or rarely white (Figure 22).
Occasional lesions show a slight papillary surface change. Individual lesions are small (0.3 to 1.0 cm), discrete, and well demarcated, but they frequently cluster so closely together that the entire area takes on a cobblestone or fissured appearance. (Tan et al., 1995)

**DIFFERENTIAL DIAGNOSIS**
A differential diagnosis would include verruca vulgaris and multiple squamous papillomas. The oral mucosal lesions of Cowden's (multiple hamartoma) syndrome may present similarly and should be ruled out. In addition, oral manifestations of Crohn's disease and Pyostomatitis Vegetans might be considered.

**HISTOPATHOLOGY**

The hallmark of focal epithelial hyperplasia is an abrupt and sometimes considerable acanthosis of the oral epithelium (Figure 23).

![Figure 23: Squamous epithelium with parakeratosis, acanthosis and marked papillomatosis (x100)](image)

Because the thickened mucosa extends upward, not down into underlying connective tissues, the lesional rete ridges are at the same depth as the adjacent normal rete ridges. The ridges themselves are widened, often confluent, and sometimes club shaped. Some superficial keratinocytes show a koilocytes change similar to that seen in other HPV infections. Others occasionally demonstrate an altered nucleus that resembles a mitotic figure (mitosoid cell). Virus like particles have been noted ultra-structurally within both the cytoplasm and the nuclei of cells within the prickle cell layer, and the presence of HPV has been demonstrated with both DNA in situ hybridization and immunohistochemical analysis.

**TREATMENT AND PROGNOSIS**

Spontaneous regression of focal epithelial hyperplasia has been reported after months or years and is inferred from the rarity of the disease in adults. Conservative surgical excision of lesions may be performed for diagnostic or aesthetic purposes. The risk of recurrence after this therapy is minimal, and there seems to be no malignant transformation potential.

**FOCAL DERMAL HYPOPLASIA**

Multiple defects are observed in focal dermal hypoplasia or the Goltz-Gorlin syndrome. This hereditary disease is observed in children who present with puffy-like pigmented nodular lesions of extremity skin in which subcutaneous fat has herniated through defective dermal connective tissue. Oral and labial multifocal papillomas are observed appearing as pedunculated racemose clusters with intervening normal mucosa. These children often manifest mental retardation, iridial sometimes considerable acanthosis, appearing as pedunculated racemose clusters with intervening normal mucosa. These children often manifest mental retardation, iridial

**MULTIPLE HAMARTOMA SYNDROME**

Cowden Syndrome

Multiple hamartoma syndrome is a rare condition that has important implications for the affected patient, because malignancies, in addition to the benign hamartomatous growths, develop in a high percentage of these individuals. This is a multisystem disease. Usually, the syndrome is inherited as an autosomal dominant trait showing a high degree of penetrance and a range of expressivity. The gene responsible for this disorder has been mapped to chromosome 10, and a mutation of the *PTEN* (phosphatase and tensinhomolog deleted on chromosome 10) gene has been implicated in its pathogenesis. Over 170 affected patients have been described in the literature.

**CLINICAL FEATURES**

Cutaneous manifestations are present in almost all, usually developing during the second decade of life. The majority of the skin lesions appear as multiple, small (less than 1 mm) papules, primarily on the facial skin, especially around the mouth, nose, and ears. Microscopically, most of these papules represent hair follicle hamartomas called trichilemmomas. Other commonly noted skin lesions are acral keratosis, a warty-appearing growth that develops on the dorsal surface of the hand, and palmoplantar keratosis, a prominent callus like lesion on the palms or soles. Cutaneous hemangiomas, xanthomas, and lipomas have also been described. Other problems can appear in these patients as well. Thyroid disease usually appears as either a goiter or a thyroid adenoma, but follicular adenocarcinoma may develop. In women, fibrocystic disease of the breast is frequently observed. Unfortunately, breast cancer occurs with a relatively high frequency (20% to 36%) in these patients. The mean age at diagnosis of breast malignancy is 40 years, which is much younger than usual. In the gastrointestinal tract, multiple benign hamartomatous polyps may be present. In addition, several types of benign and malignant tumors of the female genitourinary tract occur more often than in the normal population. The oral lesions vary in severity from patient to patient and usually consist of multiple papules affecting the gingiva, dorsal tongue, and buccal mucosa (Figures 24).

![Figure 24: Multiple, irregular fibroepithelial papules involve the tongue (center) and alveolar ridge mucosa](image)

These lesions have been reported in more than 80% of affected patients and generally produce no symptoms. Other possible oral findings include a high-arched palate, periodontitis, and extensive dental caries, although it is unclear whether the latter two conditions are significantly related to the syndrome. (Neville et al., 2005)

**DIAGNOSIS**

The diagnosis is based on the finding of two of the following three signs:

- Multiple facial trichilemmomas
- Multiple oral papules
- Acral keratoses

A positive family history is also helpful in confirming the diagnosis.
HISTOPATHOLOGY:
The histopathology of the oral lesions is rather nonspecific, essentially representing fibroepithelial hyperplasia. Other lesions associated with this syndrome have their own characteristic histopathologic findings, depending on the hamartomatous or neoplastic tissue origin.

TREATMENT AND PROGNOSIS:
Treatment of multiple hamartoma syndrome is controversial. Although most of the tumors that develop are benign, the prevalence of malignancy is higher than in the general population. Some investigators recommend bilateral prophylactic mastectomies as early as the third decade of life for female patients because of the associated increased risk of breast cancer.

ACANTHOSIS NIGRICANS
Acanthosis nigricans is an acquired dermatologic problem characterized by the development of a velvety, brownish alteration of the skin. In some instances, this unusual condition develops in conjunction with gastrointestinal cancer and is termed malignant acanthosis nigricans. The cutaneous lesion itself is benign, yet it is significant because it represents a cutaneous marker for internal malignancy. The cause of malignant acanthosis nigricans is unknown, although a cytokine-like peptide capable of affecting the epidermal cells may be produced by the malignancy.

Most cases, estimated to affect as many as 5% of adults, are not associated with a malignancy and are termed benign acanthosis nigricans. A clinically similar form, pseudocanthosis nigricans, may occur in some obese people. Some benign forms of acanthosis nigricans may be inherited or may occur in association with various endocrinopathies, such as diabetes mellitus, Addison's disease, hypothyroidism, and acromegaly. Furthermore, benign acanthosis nigricans may occur with certain syndromes (e.g., Crouzon syndrome) or drug ingestion (oral contraceptives, corticosteroids). These forms of the condition are typically associated with resistance of their tissues to the effects of insulin, similar to the insulin resistance seen in noninsulin-dependent diabetes mellitus. Even though the affected individuals may not have overt diabetes mellitus, they often show increased levels of insulin or an abnormal response to exogenously administered insulin.

CLINICAL FEATURES
The malignant form of acanthosis nigricans develops in association with an internal malignancy, particularly adenocarcinoma of the gastrointestinal tract. Approximately 20% of the cases of malignant acanthosis nigricans are identified before the malignancy is found, but most appear at about the same time as discovery of the gastrointestinal tumor or thereafter. Both forms of acanthosis nigricans affect the flexural areas of the skin predominantly, appearing as finely papillary, hyperkeratotic, brownish patches that are usually asymptomatic. The texture of the lesions has been variably described as either velvety or leathery.

Oral lesions of acanthosis nigricans have also been reported and may occur in 25% to 50% of affected patients, especially those with the malignant form. These lesions appear as diffuse, finely papillary areas of mucosal alteration that most often involve the tongue or lips, particularly the upper lip (Figure 25).

Figure 25: Diffuse verruciform papillomatous papules and plaques on the upper and lower vermilion

HISTOPATHOLOGY
The histopathology of the various forms of acanthosis nigricans is essentially identical. The epidermis exhibits hyperorthokeratosis and papillomatosis. Usually, some degree of increased melanin deposition is noted, but the extent of acanthosis (thickening of the spinous layer) is really rather mild. The oral lesions have much more acanthosis, but show minimal increased mel-anin pigmentation.

TREATMENT AND PROGNOSIS:
Although acanthosis nigricans itself is a harmless process, the patient should be evaluated to ascertain which form of the disease is present. Identification and treatment of the underlying malignancy obviously are important for patients with the malignant type; unfortunately, the prognosis for these individuals is very poor. Interestingly, malignant acanthosis nigricans may resolve when the cancer is treated. Keratolytic agents may improve the appearance of the benign forms.

VERRUCIFORM LEUKOPLAKIA
Leukokeratosis, Oral Proliferative Leukoplakia
Oral leukoplakia (leuko — white; plakia — patch) is defined by the World Health Organization (WHO) as “a white patch or plaque that cannot be characterized clinically or pathologically as any other disease.” The term is strictly a clinical one and does not imply a specific histopathologic tissue alteration. (Neville et al., 2005)

CLINICAL FEATURES
Leukoplakia usually affects persons older than 40 years of age. Prevalence increases rapidly with age, especially for males, and as many as 8% of men older than 70 years of age reportedly are affected. The average age of affected persons (60 years) is similar to the average age for patients with oral cancer; however, in some studies leukoplakia has been found to occur about 5 years earlier (on average) than oral squamous cell carcinoma.

Individual lesions may have a varied clinical appearance and tend to change over time. Early and mild lesions appear as slightly elevated gray or graywhite plaques, which may appear somewhat translucent, fissured, or wrinkled and are typically soft and flat (Figure 26).

Figure 26: Exophytic papillary lesion of the anterior maxillary alveolar ridge

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They usually have sharply demarcated borders but occasionally blend gradually into normal mucosa. Mild or thin leukoplakia, which seldom shows dysplasia on biopsy, may disappear or continue unchanged. For tobacco smokers who do not reduce their habit, as many as two thirds of such lesions slowly extend laterally, become thicker, and acquire a distinctly white appearance. The affected mucosa may become leathery to palpation, and fissures may deepen and become more numerous. At this stage or phase, the lesion is often called a homogeneous or thick leukoplakia. Most thick, smooth lesions remain indefinitely at this stage. Some, perhaps as many as one third, regress or disappear; a few become even more severe, develop increased surface irregularities, and are then called granular or nodular leukoplakia. Some lesions demonstrate sharp or blunt projections and have been called verrucous or verruciform leukoplakia.\textsuperscript{14}

**HISTOPATHOLOGY\textsuperscript{14}**

Microscopically, leukoplakia is characterized by a thickened keratin layer of the surface epithelium (hyperkeratosis), with or without a thickened spinous layer (acanthosis). Some leukoplakias demonstrate surface hyperkeratosis but show atrophy or thinning of the underlying epithelium. Frequently, variable numbers of chronic inflammatory cells are noted within the subjacent connective tissue. The keratin layer may consist of parakeratin (hyper-parakeratosis), orthokeratin (hyperorthokeratosis), or a combination of both (Figure 27) with parakeratin, there is no granular cell layer and the epithelial nuclei are retained in the keratin layer. With orthokeratin, the epithelium demonstrates a granular cell layer and the nuclei are lost in the keratin layer.

Verrucous leukoplakia has papillary or pointed surface projections, varying keratin thickness, and broad, blunted rete ridges. It may be difficult to differentiate it from early verrucous carcinoma.\textsuperscript{19}

**TREATMENT AND PROGNOSIS**

Because leukoplakia represents a clinical term only, the first step in treatment is to arrive at a definitive histopathologic diagnosis. Therefore, a biopsy is mandatory and will guide the course of treatment. Tissue obtained for biopsy, moreover, should be taken from the clinically most “severe” areas of involvement.\textsuperscript{14} Multiple biopsies of large or multiple lesions may be required. Leukoplakia exhibiting moderate epithelial dysplasia or worse warrants complete destruction or removal, if feasible. The management of leukoplakia exhibiting less severe change is guided by the size of the lesion and the response to more conservative measures, such as smoking cessation. Complete removal can be accomplished with equal effectiveness by surgical excision, electrocautery, cryosurgery, or laser ablation. Long-term follow-up after removal is extremely important because recurrences are frequent and because additional leukoplakias may develop. This is especially true for the verruciform or granular types, 83% of which recur and require additional removal or destruction\textsuperscript{14}.

**DARIER’S DISEASE**

Keratosis Follicularis; Dyskeratosis Follicularis; Darier-WhiteDisease\textsuperscript{51}

Darier's disease is an uncommon genodermatosis with rather striking skin involvement and relatively subtle oral mucosal lesions. The condition is inherited as an autosomal dominant trait, having a high degree of penetrance and variable expressivity.\textsuperscript{52} A lack of cohesion among the surface epithelial cells characterizes this disease, and mutation of a gene that encodes an intracellular calcium pump has been identified as the cause for abnormal desmosomal organization in the affected epithelial cells. Estimation of the prevalence of Darier's disease in northern European populations range from 1 in 36,000 to 1 in 100,000.\textsuperscript{53}

**CLINICAL FEATURES:**

Patients with Darier's disease have numerous erythematous, often pruritic, papules on the skin of the trunk and the scalp that develop during the second decade of life. An accumulation of keratin, producing a rough texture, may be seen in association with the lesions, and a foul odor may be present as a result of bacterial degradation of the keratin. The process generally becomes worse during the summer months, either because of sensitivity of some patients to ultraviolet light or because increased heat results in sweating, which induces more epithelial clefting. The palms and soles often exhibit pits and keratoses.\textsuperscript{53, 54} The nails show longitudinal lines, ridges, or painful splits.

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Figure 27: Composite representation of the various phases or clinical appearances of oral leukoplakia, with anticipated underlying histopathologic changes. Lesions have increasing malignant transformation potentials as their appearances approach those toward the right\textsuperscript{14}. 

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The oral lesions are typically asymptomatic and are discovered on routine examination. The frequency of occurrence of oral lesions ranges from 15% to 50%. They consist of multiple, normal-colored or white, flat-topped papules that, if numerous enough to be confluent, result in a cobblestone mucosal appearance (Figure 28). Although the condition is not premalignant or otherwise life threatening, genetic counseling is appropriate.\(^\text{14}\) (Neville et al., 2005)

**CONCLUSION:**
In all instances microscopic examination is essential and must be coordinated with the clinical findings in order to allow for a definitive diagnosis.

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Conflict of interest: None declared

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