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Cervical intraepithelial neoplasia: Histological classification and screening implications.

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Introduction

Cervical Intraepithelial Neoplasia (CIN) refers to the premalignant transformation and abnormal growth of squamous cells on the surface of the cervix. It is a key precursor to invasive cervical cancer and is primarily linked to persistent infection with high-risk human papillomavirus (HPV) types, especially HPV-16 and HPV-18 . CIN is typically asymptomatic and is often detected through routine cervical screening programs using Pap smears or HPV DNA testing. Understanding the histological classification of CIN is essential for proper diagnosis, management, and prevention of cervical cancer.[1].

Histologically, CIN is classified into three grades based on the extent of epithelial abnormality. CIN 1 (mild dysplasia) involves the lower one-third of the cervical epithelium and is generally associated with transient HPV infections that often regress spontaneously. CIN 2 (moderate dysplasia) and CIN 3 (severe dysplasia to carcinoma in situ) reflect progressively severe atypical changes extending into two-thirds or more of the epithelial thickness. These higher-grade lesions are considered high risk for progression to invasive cancer if left untreated.[2].

The Bethesda System also complements CIN classification by categorizing lesions as low-grade or high-grade squamous intraepithelial lesions (LSIL and HSIL). LSIL typically corresponds to CIN 1, while HSIL encompasses CIN 2 and CIN. This dual classification supports both cytological interpretation and clinical management decisions.

Prophylactic HPV vaccination has revolutionized cervical cancer prevention by targeting the most oncogenic HPV types. Vaccination programs have already shown a significant decrease in the prevalence of high-grade CIN in vaccinated populations [3]

Histopathological examination of cervical biopsies is the gold standard for diagnosing CIN. Biopsies are typically prompted by abnormal screening results, especially if HPV testing shows positivity for high-risk strains. Immunohistochemical markers such as p16INK4a and Ki-67 are increasingly used to enhance diagnostic accuracy, especially in ambiguous cases.
Management of CIN depends on the grade of the lesion, patient age, and reproductive considerations. CIN 1 is usually managed with observation, while CIN 2 and CIN 3 often require treatment through ablative or excisional procedures such as cryotherapy or loop electrosurgical excision procedure
(LEEP). Timely intervention prevents progression t o invasive cervical cancer. [4].

Screening has significantly reduced cervical cancer incidence and mortality in developed countries. Traditional cytology-based Pap smears have evolved into more sensitive HPV DNA testing strategies, which allow for earlier detection of high-risk HPV infections before cellular changes occur Current guidelines recommend initiating screening at age 21 and continuing through age 65, with the option of co-testing with HPV and cytology or primary HPV testing at intervals ranging from 3 to 5 years, depending on age and risk factors. [5].

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Conclusion

Histological classification of CIN provides a critical framework for understanding the progression of HPV-related cervical lesions and guiding screening and treatment strategies. Enhanced screening programs and widespread vaccination hold promise for further reducing the global burden of cervical cancer.

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