



Comparative Analysis of High-Risk and Low-Risk HPV Types in High-Grade Cervical Intraepithelial Neoplasia (CIN) HR-HPV and LR-HPV Types in High-Grade CIN

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ABSTRACT

Human papillomavirus (HPV) infection is a significant etiological factor in the development of cervical cancer. High-risk (HR) HPV types are strongly associated with high-grade cervical intraepithelial neoplasia (CIN), while low-risk (LR) HPV types are typically linked to benign lesions. This review aims to compare the prevalence, oncogenic potential, and clinical implications of HR and LR HPV types in high-grade CIN, incorporating findings from recent studies.

Keywords: Cervical cancer, High-Risk HPV, Risk factors, High-grade CIN, Low-Risk HPV

Introduction

Cervical cancer is one of the most common cancers in women worldwide, with HPV infection being a primary cause. HR HPV types, particularly HPV16 and HPV18, are known to have high oncogenic potential and are frequently detected in high-grade CIN and cervical cancer cases. In contrast, LR HPV types are less oncogenic and are commonly associated with low-grade lesions and genital warts. This review will delve into the comparative analysis of HR and LR HPV types in high-grade CIN, focusing on their prevalence, oncogenic potential, and clinical implications, and incorporating data from recent studies on HPV16, HPV18, and other HPV types.

Prevalence and Distribution

The prevalence of HR HPV types in high-grade CIN is well-documented. HPV16, in particular, is the most common type detected in severe lesions. First study indicated that HPV16 accounted for 55.9% of CIN cases, significantly higher than other types. The odds ratio analysis from the study showed that HPV16 increases the likelihood of developing precancerous lesions by approximately 2.67 times. Furthermore, 33.3% of patients with CIN2 and 49.1% of patients with CIN3 had "only HPV-16," indicating a strong association between HPV16 and the development of high-grade precancerous lesions.

HPV18, another HR type, was found primarily in CIN1 cases and did not significantly increase the likelihood of developing high-grade lesions. However, it was noted that 50% of patients with HPV-18 were also involved in CIN2, suggesting a role in the progression to moderate-grade lesions but a lesser impact on high-grade lesions.

In the second study, the prevalence of other HPV types was assessed. Patients diagnosed with HPV types such as HPV45, HPV31, HPV39, and HPV58 were considered positive for those types, regardless of the presence of other HPV types. The study revealed that 50% of patients with HPV45 and 33.3% of patients with HPV31 were involved in CIN2 and CIN3, respectively. Additionally, a significant relationship was observed between HPV39 and CIN1, and between HPV58 and CIN1. These findings highlight the varied impact of different HPV types on the development of cervical intraepithelial neoplasia.

Oncogenic Potential

HR HPV types exhibit varying degrees of oncogenic potential. HPV16 and HPV18 are among the most oncogenic, with HPV16 showing a particularly strong association with high-grade CIN. The ability of these HR HPV types to integrate into the host genome leads to the disruption of cellular regulatory mechanisms and the development of cancer. This genomic integration results in the overexpression of oncogenes E6 and E7, which inactivate tumor suppressor proteins p53 and Rb, leading to uncontrolled cell proliferation and malignant transformation.

LR HPV types, while having minimal oncogenic potential, still contribute to significant morbidity through benign conditions such as genital warts and low-grade lesions. The second study highlighted the role of other HR HPV types, such as HPV45 and HPV31, in the development of high-grade lesions.

The presence of these types in CIN2 and CIN3 underscores the need for comprehensive screening and management strategies that consider multiple HR HPV types.

Clinical Implications

The detection of HR HPV types in cervical screening programs is crucial for the early identification and management of high-grade CIN. Women infected with HR HPV types, particularly HPV16 and HPV18, are at a higher risk of developing cervical cancer, necessitating close monitoring and appropriate intervention. The inclusion of other HR HPV types in screening programs can enhance the detection of potential high-grade lesions and improve patient outcomes.

LR HPV types, while less oncogenic, can still cause significant morbidity and should be managed accordingly. The presence of multiple HPV types in high-grade lesions, as highlighted in the studies, emphasizes the need for personalized and targeted approaches to cervical cancer prevention and treatment. Vaccination programs targeting HR HPV types, particularly HPV16 and HPV18, have shown significant efficacy in reducing the incidence of high-grade lesions and cervical cancer.

Conclusion

Understanding the comparative analysis of HR and LR HPV types in high-grade CIN is essential for effective cervical cancer prevention and management. HR HPV types, especially HPV16 and HPV18, are strongly associated with high-grade lesions and cervical cancer, while LR HPV types are linked to benign conditions. The presence of other HR HPV types also poses a risk for precancerous lesions, underscoring the need for comprehensive screening. Early detection and appropriate management of HR HPV infections can significantly reduce the burden of cervical cancer.

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The authors declare no conflict of interest

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