COLPOSCOPY, BIOPSY AND MOLECULAR TESTS IN THE DIAGNOSIS OF CIN:

COMPARATIVE EFFECTIVENESS AND PLACE IN THE MODERN CLINICAL ALGORITHM

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1 BACKGROUND

Cervical intraepithelial neoplasia (CIN) is caused by persistent HPV infection with high-risk genotypes.

Accurate and timely diagnosis of CIN and its appropriate management are essential for the prevention of cervical cancer.

High-risk HPV genotypes significantly increase the risk of CIN development and progression.

2 AIM

To compare the diagnostic effectiveness of colposcopy, biopsy and molecular tests in the detection of CIN and to determine their place in the modern clinical algorithm according to current guidelines.

3 RESULTS

3.1 DIAGNOSTIC METHODS



Colposcopy

- Visual assessment of the cervix with acetic acid and iodine tests.
- Guides targeted biopsy.
- Essential for evaluation of abnormal screening results.



Biopsy (histology)

- Gold standard for definitive diagnosis of CIN.
- Recommended for all suspected high-grade lesions.
- Provides histopathological grading (CIN1, CIN2, CIN3).



Molecular tests

- High-risk HPV testing (primary screening or triage), genotyping (16/18), biomarkers (p16/Ki-67).
- Increase diagnostic accuracy and help risk stratification.

3.2 COMPARATIVE DIAGNOSTIC PERFORMANCE

Method	Sensitivity (%)	Specificity (%)	Key features
Colposcopy (for CIN2+)	60–87	48–86	Operator-dependent, guides biopsy
Biopsy (histology)	90–100	98–100	Gold standard for definitive diagnosis
High-risk HPV testing	90–95	50–70	Highest sensitivity, used for primary screening and triage
HPV genotyping (16/18)	70–80	60–80	Higher risk of CIN2+
p16/Ki-67 (dual staining)	85–95	70–85	Improves specificity in triage of HPV-positive women

3.3 PLACE IN THE CLINICAL ALGORITHM

Abnormal cervical screening result
(positive HPV test and/or abnormal cytology)

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Colposcopy
with targeted biopsy
(if indicated)

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Histological diagnosis (CIN1/2/3)

CIN1	CIN2	CIN3
Follow-up (HPV testing and/or cytology) according to guidelines	Individualized management (excisional treatment recommended in most cases)	Excisional treatment (recommended) and follow-up

3.4 KEY EVIDENCE

High-risk HPV testing has the highest sensitivity for detection of CIN2+ (90–95%).

Colposcopy is essential for triage and targeted biopsy but has moderate sensitivity (60–87%) and specificity (48–86%).

Biopsy with histology is the gold standard for definitive diagnosis (sensitivity 90–100%, specificity 98–100%).

HPV genotyping (16/18) and p16/Ki-67 increase diagnostic specificity and help risk stratification.

Integration of molecular tests, colposcopy and histology in clinical algorithms improves diagnostic accuracy and optimizes management according to current guidelines.

4 CONCLUSIONS

1. Colposcopy, biopsy and molecular tests provide complementary diagnostic information for accurate detection and grading of CIN.
2. High-risk HPV testing has the highest sensitivity, biopsy remains the gold standard, and colposcopy is essential for targeted evaluation.
3. Their integration in clinical algorithms according to current international and national guidelines improves diagnostic accuracy and ensures appropriate management.
4. Implementation of evidence-based strategies contributes to early detection and effective treatment of CIN, reducing the burden of cervical cancer and improving women's reproductive health.