Diagnosis and Treatment of Anal Precancerous Lesions (AIN). High Resolution Anoscopy: Tools, Methodology and Interpretations

By

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2025

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Learning objectives

- **Overview of AIN**
- **Understand indications and patient selection for HRA**
- **List of essential equipment and room setup**
- **Master staining and visualization techniques (acetic acid, Lugol's iodine)**
- **Interpret HRA findings and map lesions**
- **Perform directed biopsies safely and plan management**

Overview of AIN

- Anal intraepithelial neoplasia (AIN) is a precancerous abnormalities in the anal epithelium
- It results from persistent human papillomavirus (HPV) infection
- AIN Grade 1: low-grade squamous intraepithelial lesions (LSIL)
- AIN Grade 2 and 3: high-grade squamous intraepithelial lesions (HSIL)

Overview of AIN

- HSIL characterized by moderate to severe dysplasia, and sometimes even anal carcinoma *in situ*
- Primary prevention is vaccination (ideally before sexual activity initiation).
- Secondary prevention consists of screening and treating HSIL, the precursor lesions

Why HRA matters

- **What is HRA?** A specialized colposcopic technique adapted for the anal canal.
- **Purpose:** Magnified, detailed visualization of the anal epithelium to detect abnormalities, particularly those associated with Human Papillomavirus (HPV) infection.
- **Importance:** Early detection and management of anal intraepithelial neoplasia (AIN) to prevent progression to anal cancer.

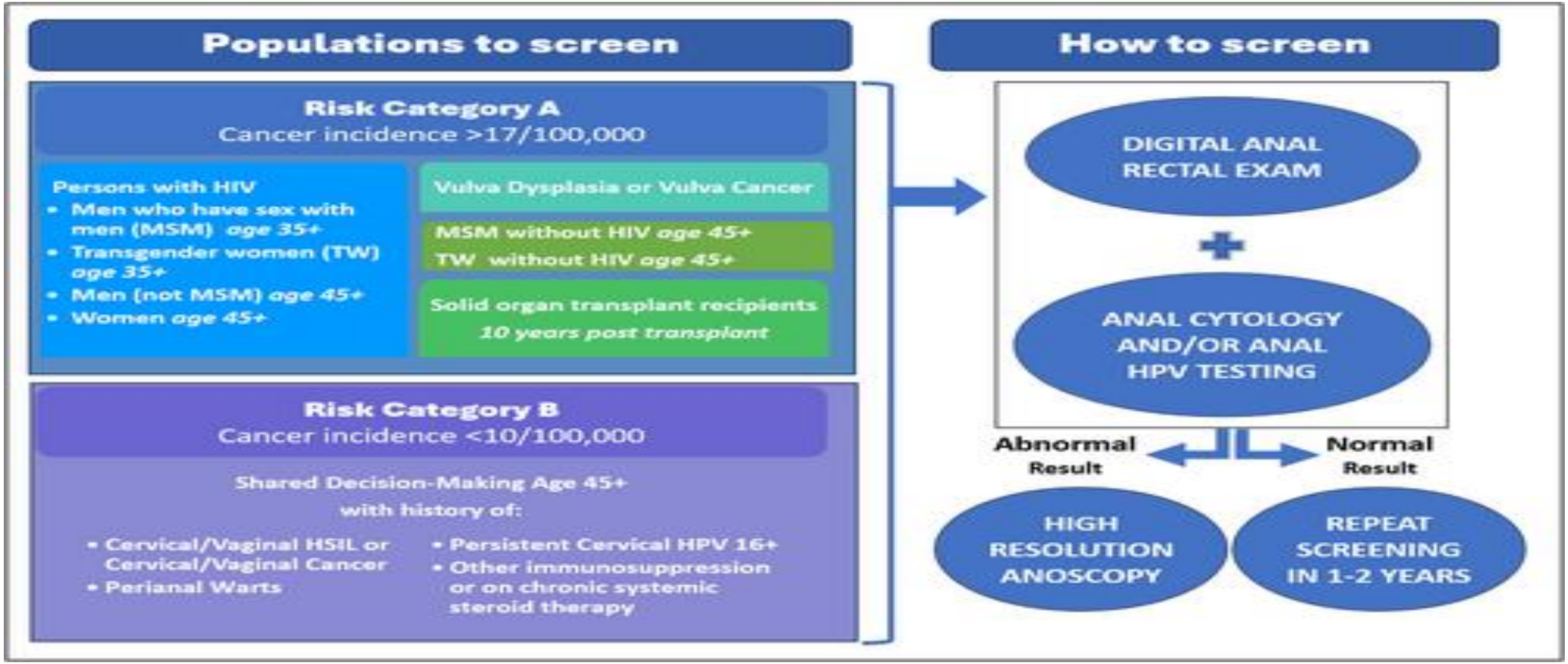
Epidemiology & risk factors

- Anal cancer incidence rising in several populations
- Risk groups: people with HIV, MSM, prior cervical/vulvar HSIL, immunosuppressed patients

Indications for HRA

- Abnormal anal cytology
- Persistent high-risk HPV positive anal test
- Visible perianal lesion or symptoms (bleeding, pain, mass)
- Surveillance in high-risk populations

International Anal Neoplasia Society (IANS) Guidlines



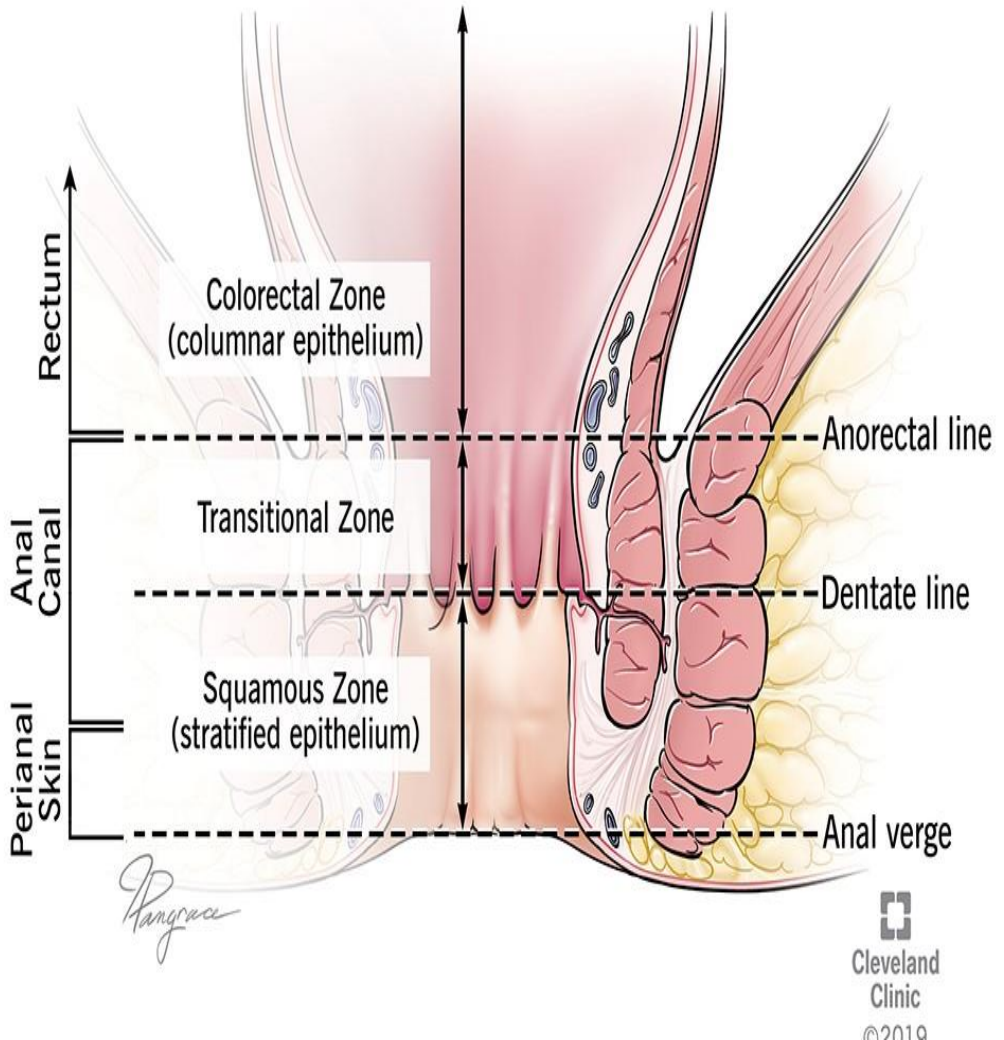
Contraindications & precautions

- Acute proctitis or severe anorectal pain (defer until treated)
- Uncontrolled bleeding diathesis (correct if possible)
- Severe anal stenosis — procedural modification or anesthesia may be required

Relevant anatomy review

Anal canal zones:

- Squamous zone
- Dentate (pectinate) line
- Transitional zone
- Squamocolumnar junction (SCJ)



Essential equipment — overview

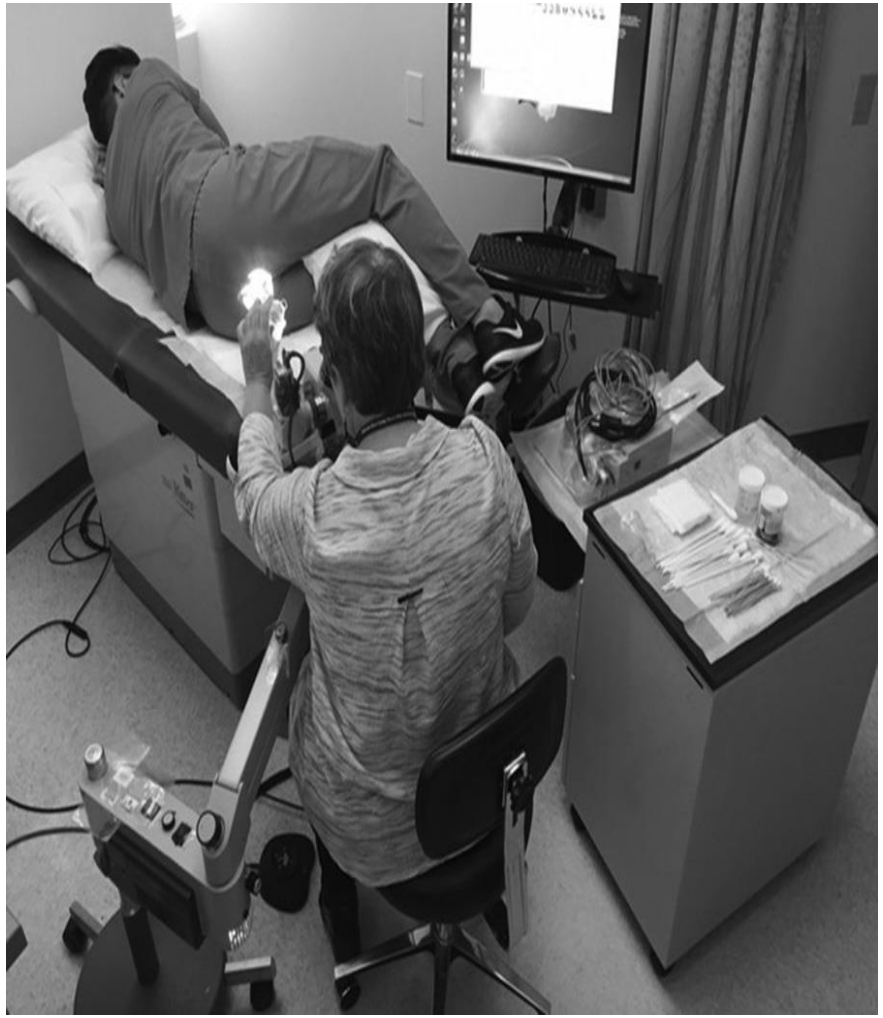
- High-resolution colposcope (10–40× magnification) with bright coaxial light
- Anoscopes (disposable/plastic, different diameters)
- Video capture, camera, storage

Essential equipment — overview

- Biopsy forceps, curettes, hemostatic tools (cautery, clips)
- Camera system for stills/video, specimen bottles,
- 3% acetic acid, Lugol's iodine

Room setup & Positioning & Ergonomics

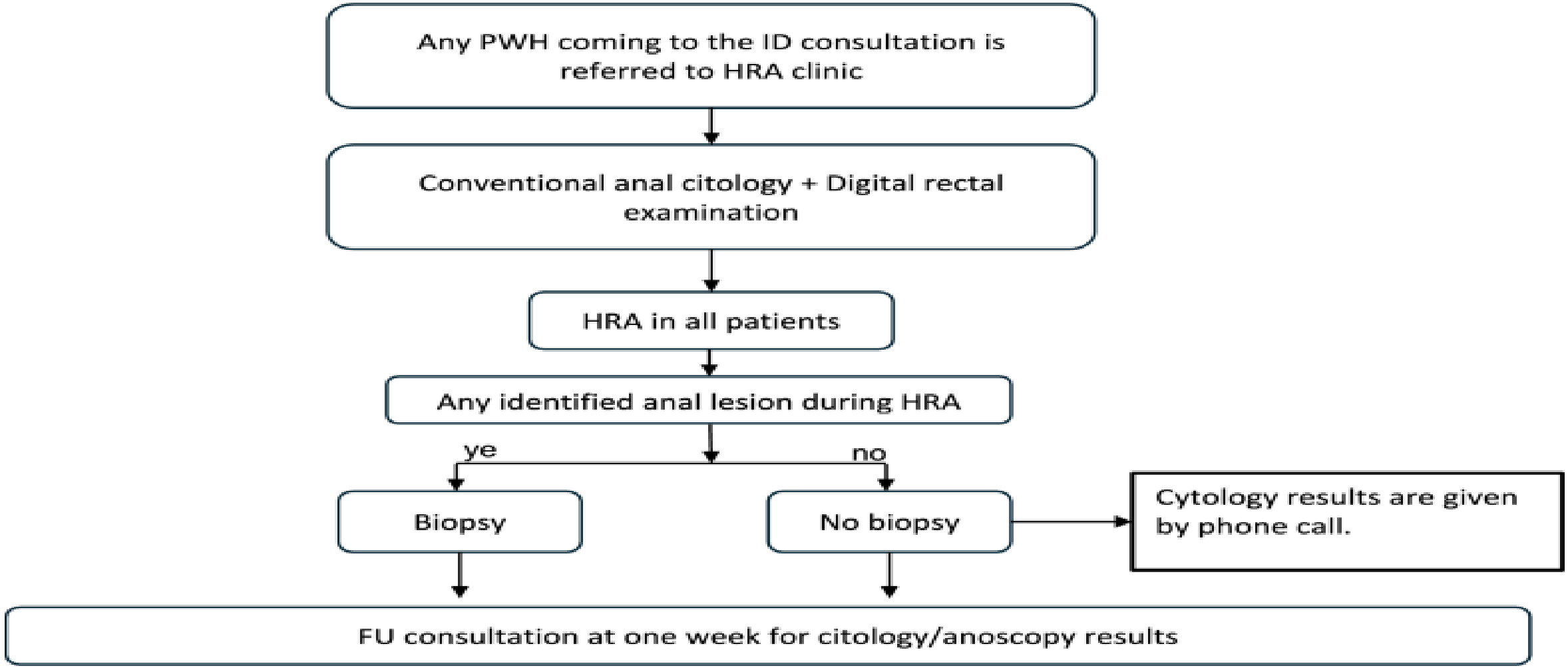
- Left lateral decubitus, lithotomy, , prone, jackknife — pros/cons
- Colposcope placement and operator posture to reduce fatigue
- Camera and monitor placement for team visualization



Patient preparation & Consent

- Bowel prep: optional cleansing enema may improve view
- Analgesia options: topical, local anesthesia for targeted biopsy
- Informed consent: describe biopsy risks (bleeding, pain, infection)

HRA Procedure Overview



Systematic HRA exam sequence

1) Visual inspection of perianus without instruments
2) Anal cytology specimen
3) PR with topical anesthetic such as lidocaine gel
4) Insert anoscope gently, inspect canal with white light
5) Apply acetic acid; observe acetowhitening
6) Apply Lugol's iodine and note iodine-negative areas
7) Targeted biopsies of suspicious areas

Staining protocol — acetic acid

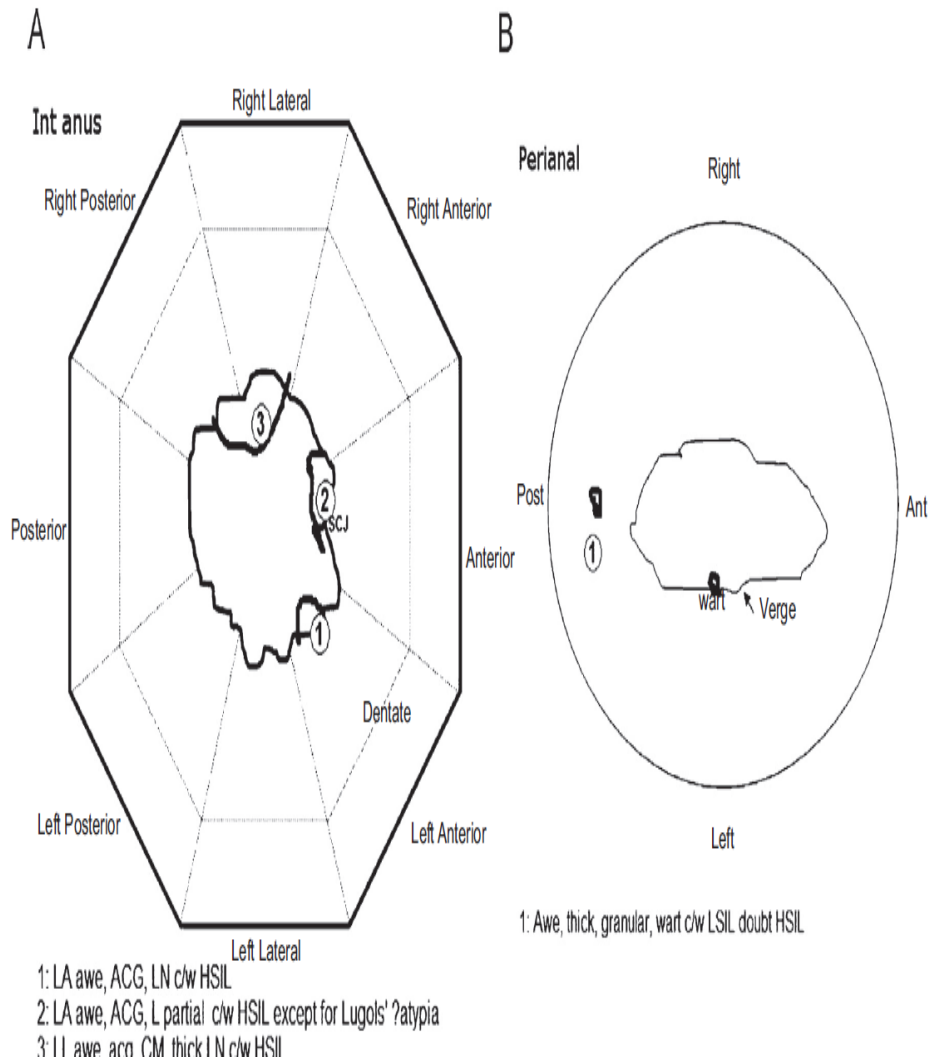
- Use 3–5% acetic acid applied via gauze or syringe
- Wait 2–3 minutes; acetowhitening highlights high-nuclear-density epithelium

Staining protocol - Lugol's iodine

- Lugol's iodine should be used after acetic acid to map and confirm lesions
- It stains glycogen-rich normal squamous epithelium dark brown
- Non-staining areas (iodine-negative) may indicate dysplasia or non-keratinized mucosa

Consensus Classification & Reporting

- Use standardized terminology for mapping and reporting
- Document lesion size, location (clock face), staining behaviour
- Photograph with scale and orientation markers



Consensus Classification & Reporting

Lesion characteristics.

Category	LSIL	HSIL	Cancer
Color	Acetowhite, shiny, barely visible, or distinct	Flat acetowhite, matted tone, gray	Thick acetowhite (in SISCCA), red or cannot be assessed due to friability
Margins	Distinct, indistinct, sharp, jagged	Distinct, indistinct, smooth	Very distinct, peeling rolled edges, or cannot be assessed due to friability
Contour	Flat, thin, raised or thickened, warty papillae, micropapillae	Flat, thickened, eroded, atypical papillae, ulcerations	Thickened, raised, eroded, friable ulcerations, growths
Vessels	Warty, looped capillary, punctation, striated, fine increased vascularity, rarely–fine mosaic pattern	Coarse mosaic, coarse punctation, atypical vessels, variable dilations, friable	Very coarse, atypical to abnormal vessels with bizarre shapes, wide variability in dilations, friable
Lugol's	Positive or partial, negative	Negative	Negative or cannot be assessed due to lack of epithelium
Epithelial changes	Rarely LSIL (slightly atypical metaplasia)	Lacy metaplasia, atypical clustered glands, honeycombing	NA

Biopsy technique & specimen handling

- Local anesthetic infiltration before biopsy for patient comfort
- Use appropriate biopsy forceps; obtain full-thickness mucosa when possible
- Label specimens with precise location and clinical impression

Common complications & management

- Bleeding: immediate local pressure, cautery or topical hemostatic agents
- Pain: local anesthetic and post-procedure analgesia plan
- Infection: rare

LSIL Treatment Options after HRA diagnosis

- Observation and regular follow-up with HRA
- Topical treatments (e.g., imiquimod or 5-FU)
- Lifestyle modifications (e.g., smoking cessation)
- HPV vaccination for prevention

HSIL Treatment Options after HRA diagnosis

- Ablative therapies (e.g., infrared coagulation, laser ablation)
- Excisional procedures (e.g., electrosurgical excision)
- Topical treatments (e.g., imiquimod or 5-FU)
- Close monitoring with follow-up HRA

Follow-up & surveillance strategies

- Post-treatment HRA schedule tailored by initial pathology (HSIL vs LSIL)
- Every 3-6 months for HSIL

- Combine cytology, HPV testing and HRA

- Long-term surveillance needed due to recurrence risk

Emerging technology & AI

- Wide-field intraluminal imaging and deep-learning assistance for lesion detection
- TeleHRA and remote mentorship models for capacity building
- Clinical validation ongoing

Conclusions

- Diagnosis and treatment of anal precancerous prevent progression to anal cancer.
- Priority of preventive measures like regular screenings and HPV vaccination among at-risk groups.
- HRA is a critical tool for managing (AIN).
- Future improvements in techniques and education enhance patient outcomes and reduce the burden of anal cancer.


Thank you