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Authors

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Martínez-Vernaza, Samuel
Ordóñez-Blanco, Ivonne Tatiana
et al.

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Screening With Anal Cytology in Colombia: Initial Experience and Need for High-Resolution Anoscopy

Kevin J. Blair, MD[a,b,*], **Samuel Martínez-Vernaza, MD**[c], **Ivonne Tatiana Ordóñez-Blanco, MD**[c,d], **William Hernandez, NP**[e,f], **Camilo Quiroga, MD**[c,d], **Ellen Lowenstein, MD**[c], **Sandra Liliana Valderrama-Beltrán, MD, MSc**[c,d], **Jesse Clark, MD, MSc**[a,g], **Jordan E. Lake, MD, MSc**[a,h], **Catherine Juillard, MD, MPH**[b], **Luis Jorge Lombana Amaya, MD**[i]

[a]South American Program in HIV Prevention Research (SAPHIR), University of California Los Angeles (UCLA), Los Angeles, California

[b]Program for the Advancement of Surgical Equity (PASE), Department of Surgery, UCLA, Los Angeles, California

[c]Unidad de Infectología, Departamento de Medicina Interna, Hospital Universitario San Ignacio (HUSI), Bogotá, Colombia

[d]Facultad de Medicina, Pontificia Universidad Javeriana, Bogotá, Colombia

[e]School of Nursing, UCLA, Los Angeles, California

[f]DAP Health, Palm Springs, California

[g]Division of Infectious Diseases, Department of Medicine, UCLA, Los Angeles, California

[h]Department of Internal Medicine, McGovern Medical School, The University of Texas Health Sciences Center at Houston, Houston, Texas

[i]Unidad de Coloproctología, Departamento de Cirugía General, HUSI, Pontificia Universidad Javeriana, Bogotá, Colombia

Abstract

Background: Men who have sex with men (MSM) living with human immunodeficiency virus (HIV) are at increased risk of anal cancer. Anal cytology can be used to screen for dysplasia, with high-resolution anoscopy (HRA) required for diagnostic confirmation. We describe the impact lack of HRA had on management of abnormal screening results in Bogotá, Colombia.

Material and Methods: This retrospective cohort study includes MSM with HIV who underwent anal cytology screening between January 2019February 2020, with colorectal surgery

*Corresponding author. South American Program in HIV Prevention Research (SAPHIR), University of California Los Angeles (UCLA), 10833 Le Conte Ave, 72-227 CHS, Los Angeles, CA 90095. Phone: 636-236-8515; Fax: 310-267-0369. kevin.james.blair@gmail.com (K.J. Blair).

Author Contributions

K.J.B., S.M.V., I.T.O.B., S.L.V.B., L.J.L.A. were involved with idea generation. K.J.B., S.M.V., I.T.O.B., C.Q., E.L., S.L.V.B., J.C., and L.J.L.A. developed the project protocol. K.J.B., S.M.V., and I.T.O.B. completed data collection and compilation. K.J.B., S.M.V., and I.T.O.B. analyzed the data. K.J.B., S.M.V., I.T.O.B., W.H., S.L.V.B., J.C., J.E.L., C.J., and L.J.L.A. interpreted and contextualized the results. K.J.B. drafted the initial manuscript. All authors revised and offered final approval of the final manuscript.

Disclosure

No conflict of interest.

(CRS) follow-up through July 2020. Cytology results included atypical squamous cells of undetermined significance (ASC-US), low-grade squamous intraepithelial lesion (LSIL), and high-grade squamous intraepithelial lesion (HSIL). Categorical and continuous variables were compared via Fisher's exact test and Wilcoxon rank-sum, respectively.

Results: Of 211 MSM screened, 68 had abnormal cytology: ASC-US ($n = 23$), LSIL ($n = 41$), HSIL ($n = 4$). Sixty (88.2%) were referred to CRS, and 51 (75.0%) attended ≥ 1 appointment. At initial assessment, 17 were referred for anal exam under anesthesia (EUA) for tissue resection, and 21 for rectosigmoidoscopy. Having perianal condyloma was associated with recommendation for EUA ($P < 0.001$), while cytology grade of dysplasia was not ($P = 0.308$). Eleven (16.2%) underwent EUA for condyloma resection.

Conclusions: Few studies have described anal cancer screening in settings without HRA. We found lack of HRA limited management of abnormal cytology in Colombia. Those with condyloma underwent resection, but HRA remains necessary to localize and treat microscopic disease. Next steps include implementation of HRA in order to further develop the anal cancer screening program for MSM with HIV in Bogotá.

Resumen

Los hombres que tienen sexo con hombres (HSH) viviendo con el virus de inmunodeficiencia humana (VIH) tienen alto riesgo de desarrollar cáncer del ano. La citología anal se puede utilizar para detectar displasia anal y se requiere anoscopia de alta resolución (AAR) para la confirmación del diagnóstico. Describimos el impacto que tuvo la falta de AAR en el manejo de resultados de tamización anormales en Bogotá, Colombia.

Este estudio de cohorte retrospectiva incluye HSH con VIH que se sometieron a tamización con citología anal entre enero de 2019 y febrero de 2020, con seguimiento por coloproctología (CRS) hasta julio de 2020. Los resultados de la citología incluyeron atipia de células escamosas de significado indeterminado (ASCUS), lesión intraepitelial escamosa de bajo grado (LSIL), y lesión intraepitelial escamosa de alto grado (HSIL). Las variables categóricas y continuas se compararon mediante la prueba exacta de Fisher y la suma de rangos de Wilcoxon, respectivamente.

De 211 HSH tamizados, 68 tenían citología anormal: ASC-US (n = 23), LSIL (n = 41), HSIL (n = 4). Sesenta (88,2%) fueron remitidos a CRS, y 51 (75,0%) asistieron a ≥1 cita. En la evaluación inicial, 17 fueron remitidos para examen anal bajo anestesia (EUA) para resección de tejido y 21 para rectosigmoidoscopia. Tener condiloma perianal se asoció con la recomendación de EUA (p < 0,001), mientras que el grado citológico de displasia no lo fue (p = 0,308). Once (16,2%) se sometieron a EUA para resección de condiloma perianal.

Pocos estudios han descrito la tamización del cáncer anal en entornos sin AAR. Encontramos que la falta de AAR limitó el manejo de citología anal anormal en Colombia. Aquellos con condiloma se sometieron a resección, pero la AAR sigue siendo necesaria para localizar y tratar la enfermedad microscópica. Los próximos pasos incluyen la implementación de AAR para seguir desarrollando el programa de detección de cáncer anal para HSH con VIH en Bogotá.

Keywords

Anus neoplasms; Cytological techniques; Colposcopy; Men who have sex with men; HIV; Cancer screening

Introduction

Men who have sex with men (MSM) and are living with human immunodeficiency virus (HIV) are at increased risk of developing anal squamous cell carcinoma (anal cancer).[1] A recent meta-analysis estimated an anal cancer incidence rate of 85 per 100,000 in MSM with HIV,[2] compared to 0.5 per 100,000 in the male population globally.[3] While the slow natural history of anal cancer limits the ability to collect randomized controlled trial data, observational data suggest screening for and treating high-grade anal intraepithelial neoplasia (HGAIN), a precursor to anal cancer,[4] may be cost-effective[5] and leads to decreased anal cancer incidence in MSM with HIV.[6,7] This observation has prompted some groups, such as the European AIDS Clinical Society (EACS) and the Infectious Diseases Society of America (IDSA), to recommend screening in this high-risk group.[8–10] Notably, data and recommendations supporting anal cancer screening in MSM with HIV have largely come from high-income countries (HICs).[2,11,12]

Anal cancer screening is most commonly performed using anal cytology,[13–15] but due to the low sensitivity of high-grade dysplasia on cytology predicting histopathologic HGAIN, all abnormal cytology results require diagnostic confirmation with high-resolution anoscopy (HRA) (Figure 1).[16,17] HRA is an examination of anal tissue under magnification following application of acetic acid and/or Lugol's iodine, which allows for identification of dysplastic tissue for targeted biopsy that is not otherwise visible.[16] However, proficient identification of abnormal tissue for biopsy using HRA requires specialized equipment, expert training, and months of experience,[17–21] all of which present barriers to HRA implementation in low- and middle-income countries (LMICs). While HRA has been used in a few Latin American countries,[22,23] particularly Brazil,[24–27] many countries in the region lack this key resource, and there is limited research describing how lack of HRA impacts the implementation and scale up of anal cancer screening programs in these settings.

Colombia is a middle-income country in South America with a population of over 50 million.[28] There were nearly 110,000 people living with HIV (PLWH) in Colombia in 2019,[29] though estimates suggest the true number may be closer to 200,000.[28] Over one-third of PLWH in Colombia are MSM,[29] with an HIV prevalence among Colombian MSM as high as 17%.[30] Anal cancer incidence among Colombian men is estimated to be between 0.2 to 0.4 per 100,000,[31,32] but incidence data specific to MSM with HIV are not available. Despite the lack data, the Colombian Ministry of Health included consideration of anal cancer screening for MSM with HIV in its 2014 HIV Clinical Practice Guide,[33] which prompted certain facilities to implement screening programs. In this retrospective cohort study, we describe the management of abnormal anal cytology results at a university-affiliated hospital in Bogotá, Colombia where HRA was not available. Results from this study can be used to inform decisions regarding implementation of HRA and scale up of anal cancer screening for MSM with HIV in similar LMIC settings.

Material and Methods

Setting, Study Population, and Study Design

Hospital Universitario San Ignacio (HUSI) is a tertiary-care, academic hospital affiliated with Pontificia Universidad Javeriana in Bogotá, Colombia. In response to recommendations from the Colombian Ministry of Health, the Comprehensive HIV Care Clinic at HUSI implemented an anal cancer screening program for MSM with HIV using conventional anal Papanicolaou cytology. All MSM with HIV receiving care at the clinic are eligible to undergo annual screening. Anal cytology specimens are collected by trained staff by inserting a citoswab collection brush into the anal canal and applying pressure against the walls of the anal canal as the swab is removed slowly in a circular fashion.[34] Those with abnormal anal cytology screening results are referred to the colorectal surgery (CRS) clinic at HUSI for management. Notably, HRA was not available at HUSI nor anywhere in Bogotá at the time the screening program was implemented.

We conducted a retrospective cohort study of adult (≥18 years old), cis-gender male patients with any history of sex with other men who underwent anal cancer screening via anal cytology between January 2019 and February 2020 and had an abnormal screening result. Abnormal screening results included: atypical squamous cells of undetermined significance (ASC-US), atypical squamous cells cannot rule out high-grade squamous intraepithelial lesion (ASC-H), low-grade squamous intraepithelial lesion (LSIL), high-grade squamous intraepithelial lesion (HSIL). In this analysis we focus on follow-up with CRS through July 2020. Data were collected through review of HUSI electronic medical records by authors K.J.B., S.M.V., and I.T.O.B. Records were reviewed by at least two authors. Data were de-identified and compiled using the REDCap (Research Electronic Data Capture) tools hosted at HUSI.[35,36]

Variables

Outcome—The primary outcome for this analysis was the management of abnormal anal cytology results, which was considered only for those who attended at least one consultation appointment with CRS. Management plans were categorized as follows: (1) no intervention and follow up with infectious disease (ID) clinicians; (2) no intervention and continue follow up with CRS; (3) referral to gastroenterology (GI) for rectosigmoidoscopy; (4) or anal exam under anesthesia (EUA) with surgical resection of tissue. Certain patients were referred for EUA with resection after completion of rectosigmoidoscopy by GI. For the purpose of this analysis, these patients were grouped together with those who were initially recommended EUA with resection. For those patients who underwent EUA with tissue resection, histopathologic results (presented as normal, anal intraepithelial neoplasia grade 1 (AIN 1), grade 2 (AIN 2), or grade 3 (AIN 3)) are reported as a secondary outcome, with AIN 2 and 3 considered HGAIN.

Sociodemographic and Clinical Variables—Sociodemographic variables included age, gender of sexual partners, and level of education. Age in years was collected as a continuous variable. Education levels include university-level or higher, technical college, and high school or lower. Clinical variables included sexually transmitted infection (STI) in

the previous 12 months (includes both self-reported and laboratory diagnosed), time since HIV diagnosis, current antiretroviral therapy, current HIV viral load (copies/mL), current CD4+ T Lymphocyte (CD4) count (cells/μL), nadir CD4 count, referral to CRS, and surgeon seen at initial CRS appointment. STI in the previous 12 months included anal or penile condyloma, gonorrhea, chlamydia, syphilis, herpes, hepatitis B, hepatitis C, non-specified proctocolitis, and non-specified urethritis. Time since HIV diagnosis was measured in months from diagnosis to the date of anal cytology. HIV viral load limit of detection was ≥ 40 copies/mL. Normal range for CD4 count at the HUSI laboratory was 518 to 1,472 cells/μL. To maintain anonymity, surgeon seen at initial CRS appointment is categorized as A, B, or C.

Statistical Analysis

Data were exported from REDCap and analyzed using Stata/IC 16.1.[37] Descriptive statistics were used to describe sociodemographic and clinical variables, as well as management plans by CRS. Those who were recommended to undergo EUA with tissue resection were compared against those who were not. Due to the small sample size and non-normal distribution of data, categorical and continuous variables were compared using Fisher's exact test and Wilcoxon rank-sum, respectively. Regression models were not created given the small sample size.

Ethics

This study received approval from the Pontificia Universidad Javeriana and HUSI research ethics committee (FM-CIE-0366-20) and from the University of California, Los Angeles (UCLA) Institutional Review Board (IRB #19-002232). No informed consent was required due to the nature of the study as a retrospective chart review.

Results

Of the 211 MSM with HIV who were screened with anal cytology between January 2019 and February 2020, 68 (32.2%) had an abnormal result (Fig. 2): 23 (33.8%) with ASC-US, 41 (60.3%) with LSIL, and 4 (5.9%) with HSIL. Among those with abnormal screening results, median age was 32 years (interquartile range (IQR) 25.541.5), 83.8% reported sex exclusively with men, and a majority (64.7%) were university-level educated (Table 1). One-third (32.4%) had a detectable HIV viral load at the time of anal cytology and 22.1% had a current CD4 count less than 200 cells/μL.

Among those with abnormal cytology, 60 (88.2%) were referred to CRS and 51 (75.0%) attended at least one CRS appointment. Management flow, as well as reasons for non-referral, are described in Figure 3. The initial CRS plan for management of abnormal screening results in those who attended at least one appointment included no intervention and follow up with ID clinicians (n = 7, 13.7%); no intervention and continue follow up with CRS (n = 6,11.8%); referral to GI for rectosigmoidoscopy (n = 21, 41.2%); or EUA with tissue resection (n = 17, 33.3%). Of those who underwent rectosigmoidoscopy, two were subsequently recommended to undergo EUA. Nearly all who were referred for EUA with tissue resection had clinical documentation of anal condyloma compared to only one-fourth

of those who were not recommended EUA (94.7% versus 25.0%, $P < 0.001$) (Table 2). Relatedly, a larger percentage of those recommended to undergo EUA with resection had a current CD4 count less than 200 cells/μL (42.1% versus 12.5%, $P = 0.037$). Notably, referral for EUA was not significantly associated with grade of dysplasia identified on screening cytology ($P = 0.308$).

Only 11 (16.2%) of those with abnormal screening cytology underwent EUA with resection of perianal tissue, all of whom had resection ± ablation of perianal condyloma. For those who underwent EUA, median time from initial anal cytology to EUA was 3.8 months (IQR 2.54.7), with median number of seven (IQR 6–7) appointments from initial cytology to CRS follow up after EUA. Histopathology results for those who underwent EUA with tissue resection are presented in Table 3. Two individuals with LSIL on screening anal cytology were found to have HGAIN.

Discussion

This study adds to a limited body of literature discussing anal cancer screening among MSM with HIV in Latin America [22–27] and is one of the first to identify lack of access to HRA as a key limitation to appropriately carrying out screening in an LMIC setting. According to the most widely accepted screening algorithm (Fig. 1), all individuals with abnormal anal cytology results should have undergone diagnostic confirmation with HRA-informed biopsy. In the absence of HRA, however, management of abnormal cytology results was varied, with tissue resection limited only to those with macroscopic disease. Thus, only a small percentage of MSM with HIV who had abnormal cytology received a histopathologic result, while the majority never received a confirmatory diagnosis. Consequently, those with true, yet unconfirmed, cases of anal dysplasia were unable to receive the appropriate treatment to limit progression to cancer, which is the purpose of an anal cancer screening program.

Identification and resection of anal condyloma in MSM with HIV was appropriate,[38] but could have been done apart from a screening program utilizing anal cytology. While the majority of anal condylomas are caused by low-risk strains of anal human papillomavirus (HPV), up to 31.0% may be caused by high-risk HPV strains, such as HPV-16 and -18, which are associated with the development of anal dysplasia and cancer.[39] One study found that nearly half of HIV-infected MSM with excised anal condyloma had HGAIN or cancer diagnosed on pathology,[40] and another study of both HIV-infected and -uninfected men found roughly a quarter of those with excised anal condyloma had HGAIN.[41]

Treatment of anal condyloma, however, does not negate the need for HRA examination to identify concurrent microscopic dysplasia in those MSM who had a positive screening anal cytology result.[42] A recent study of anal dysplasia among MSM in Nigeria found that men with visible anal condyloma were significantly more likely to have LSIL or HSIL diagnosed during their HRA exam.[43,44] While our sample size of those with histopathologic results from condyloma resection is small, there was discordance with screening anal cytology results, suggesting there may have been areas of microscopic dysplasia apart from the condylomas that could have been identified with HRA. There are anal cancer screening protocols which focus on identifying macroscopic disease, such as condyloma or palpable

cancer, through digital rectal examination rather than anal cytology,[45–47] but this approach is thought to be less cost effective than screening using anal cytology,[5,48] and is less widely used. Settings without access to HRA, like Colombia, that wish to implement anal cancer screening for MSM with HIV may consider this approach as more feasible than cytology.

Referral to GI for rectosigmoidoscopy was the most common recommendation by CRS for the initial workup of abnormal cytology results, despite the fact that rectosigmoidoscopy is not included in anal cancer screening algorithms. Rectosigmoidoscopy could be used to identify dysplastic tissue at the anal squamocolumnar junction, but lesions in the distal anal canal or perianal region would be missed with this approach.[47] Rectosigmoidoscopy also allows for the additional visualization of the rectum and sigmoid colon; however, PLWH are not known to have an increased risk of colorectal cancer,[45] so the additional visualization of the rectum and sigmoid colon confers little to no added benefit, while subjecting patients to an additional invasive procedure and longer follow up times. At HUSI, these referrals were made in order to identify anal condyloma amenable to resection. Rectosigmoidoscopy was thought to be the best alternative to HRA, as it offered better visualization of the anal canal than standard anoscopy in the CRS clinic and was cheaper and less invasive than an EUA, which typically required referral to anesthesiology for general anesthesia. Access to HRA, which can be performed in the CRS clinic using local anesthesia, would avoid the need to consider referral for rectosigmoidoscopy. Alternatively, an approach focused on screening for macroscopic disease could simply rely on standard anoscopy performed in the CRS clinic, which in our study was able to identify all but two of those with condyloma.

The International Anal Neoplasia Society (IANS) practice standards for the detection of anal precursor lesions recommends that histopathologic confirmation of HSIL occur within three months of the initial screening cytology.[49] Among the few patients in our study who underwent an EUA with condyloma resection, median follow up time was nearly four months, and at least six appointments were required from the initial anal cytology to post-procedure CRS follow up. Lack of clarity regarding management of abnormal anal cytology in a setting without access to HRA and the high number of appointments required of patients across multiple specialties likely contributed to the long follow-up times and the fact that eight of the 19 recommended to undergo EUA did not ultimately undergo the procedure. An additional factor that likely increased loss to follow-up was the coronavirus disease 2019 (COVID-19) pandemic; four of the eight who did not undergo their recommended EUA had their follow-up extend past March 2020, when COVID-19 was first diagnosed in Bogotá.[50]

Among Latin American countries, HRA has been described as a part of anal cancer screening in Mexico[22], Brazil[24–26], Argentina[23]. None of these studies discussed feasibility in Latin America, but a study from Nigeria[43] utilizing HRA practice standards from IANS[49] found implementation of HRA was feasible in a middle-income, sub-Saharan African setting. To date, however, there remains a lack of research identifying strategies to overcome barriers to HRA implementation experienced in LMICs, particularly regarding HRA training access. There are a limited number of HRA providers worldwide,[47] and training for prospective HRA providers involves attending a didactic training course followed by a preceptorship with an established HRA provider, a process that could last several years.[21] Since identification of abnormal anal tissue for biopsy and/or treatment during an HRA

exam can be challenging, new HRA providers are recommended to perform up to 100 proctored examinations in order to attain proficiency.[21,49] For prospective providers from LMICs with no existing HRA capacity, such an intensive training process requires a significant amount of international travel. For example, in the HRA implementation study from Nigeria, two prospective Nigerian HRA providers and a Nigerian pathologist traveled to the United States (US) to receive training, and a US physician traveled to Nigeria for two separate week-long mentoring sessions.[43] While this particular study cites financial support from multiple grants,[43] prospective HRA providers from LMICs without grant-support would have a difficult time completing the recommended training. In order to expand anal cancer screening access for MSM with HIV in LMIC settings, future research must consider alternative approaches to HRA training, such as telementoring,[51,52] that are cheaper and more logistically feasible for LMICs with no existing HRA providers.

Existing research on cost-effectiveness of anal cancer screening has also failed to account for the costs of training prospective HRA providers from LMICs.[11] In fact, nearly all of the cost and clinical data used for existing economic evaluations of anal cancer screening strategies have come from HICs.[11] Additionally, the study from the US that found screening with anal cytology to be cost-effective did not consider that the cost-effectiveness threshold may be different in an LMIC such as Colombia.[5,53] Thus, determination of cost-effectiveness of anal cancer screening for MSM with HIV in LMICs will require that future research collect and include LMIC-specific data, which will be even more important if the ANCHOR clinical trial identifies improved outcomes in those who have been treated for HGAIN.[54]

These results underscore an important principle of screening for any disease: facilities and equipment must be available for diagnosis and treatment of those who screen positive.[55] With this concept in mind, it is important for Ministries of Health and other recommending groups in LMICs to consider access to HRA before making recommendations to conduct anal cancer screening. Many of the aforementioned limitations of the anal cancer screening program at HUSI could be addressed by implementing HRA or by adjusting screening recommendations around lack of equipment to follow up on abnormal cytology results. To that end, one of the authors (L.J.L.A.) has recently received HRA training and our team plans to pilot an HRA program at HUSI. We intend to study the HRA implementation process to further develop access to anal cancer screening for MSM with HIV in Colombia and to inform decisions to establish screening programs in other LMIC settings which similarly do not have existing HRA capacity.

There are several limitations to address in this study. First, given the lack of literature describing the impact lack of HRA has on anal cancer screening in LMICs, these data are meant to be descriptive in nature but do not allow for assessment of clinical effectiveness of one management strategy over another. Moreover, these data are from a single tertiary-care, university-affiliated hospital in Colombia’s capital city, and are not necessarily reflective of management strategies in a less-resourced clinical environment. However, given the training and equipment required to implement HRA, HUSI is representative of the type of facility where scale up of anal cancer screening in Colombia is most likely to be successful. Lastly, in the Colombian context management of anal dysplasia is led by CRS, so our results may

not be representative of management in other countries, where internal medicine or ID clinicians may perform follow up and HRA for abnormal anal cytology findings.

Conclusions

Management of abnormal anal cytology screening results at a university-affiliated hospital in Bogotá, Colombia was inadequate without HRA. The majority of MSM did not undergo diagnostic confirmation of their screening anal cytology results, management plans were varied, and patients were required to attend numerous appointments with long follow-up times for those who underwent resection of condyloma. Recommendations for anal cancer screening in MSM with HIV in LMICs must consider and address access to HRA as a key factor affecting the feasibility of implementing screening protocols. Moreover, there is a need for LMIC-specific HRA implementation strategies if Colombia, or other similarly resourced countries, wish to scale up anal cancer screening for MSM with HIV.

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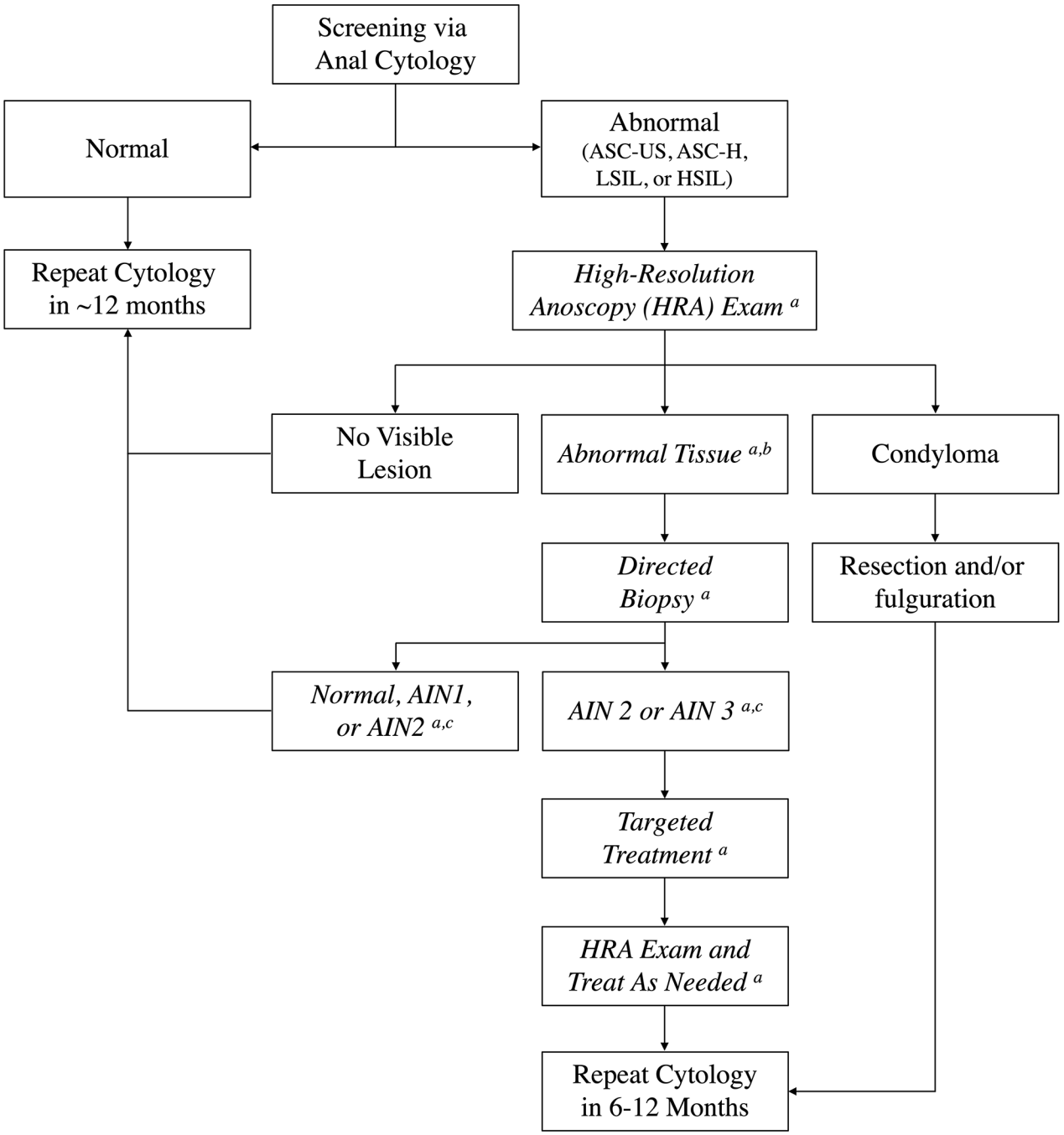

Fig. 1 –.

Typical anal cancer screening algorithm for MSM with HIV. [a] Steps of the algorithm not possible without availability of HRA. [b] Acetowhite lesions with abnormal vasculature visualized under high-resolution. [c] P16 staining is used to differentiate high- and low-grade AIN2.

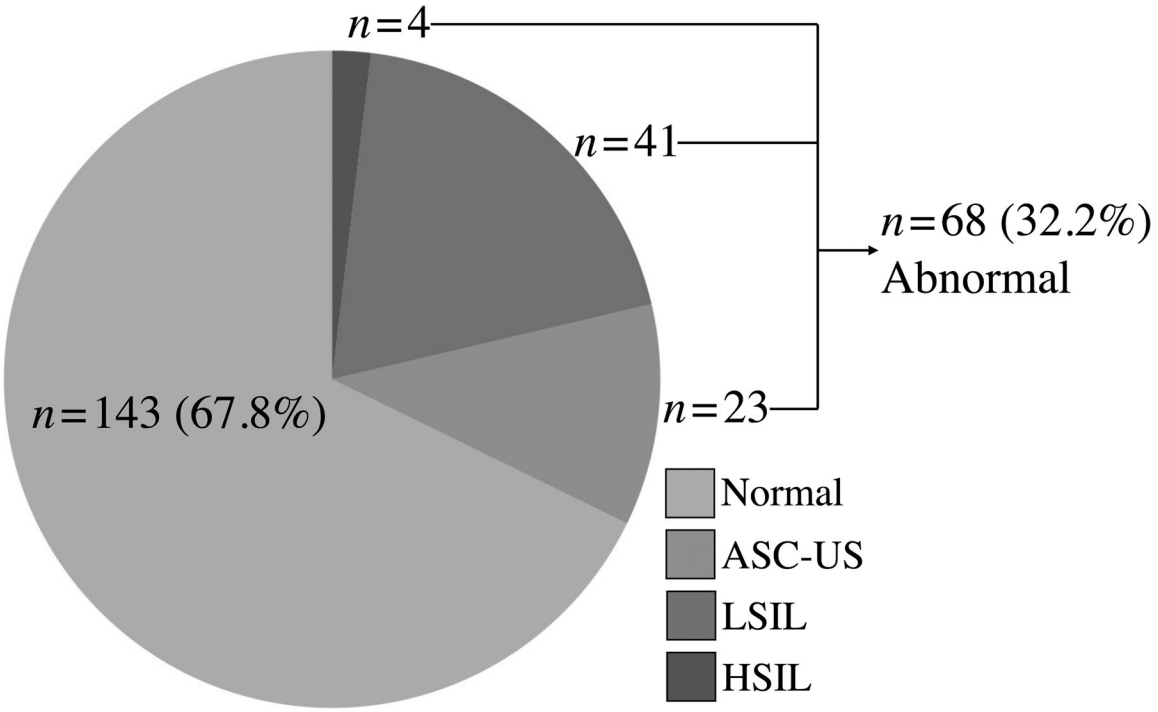

Fig. 2 –.
Anal cytology screening results.

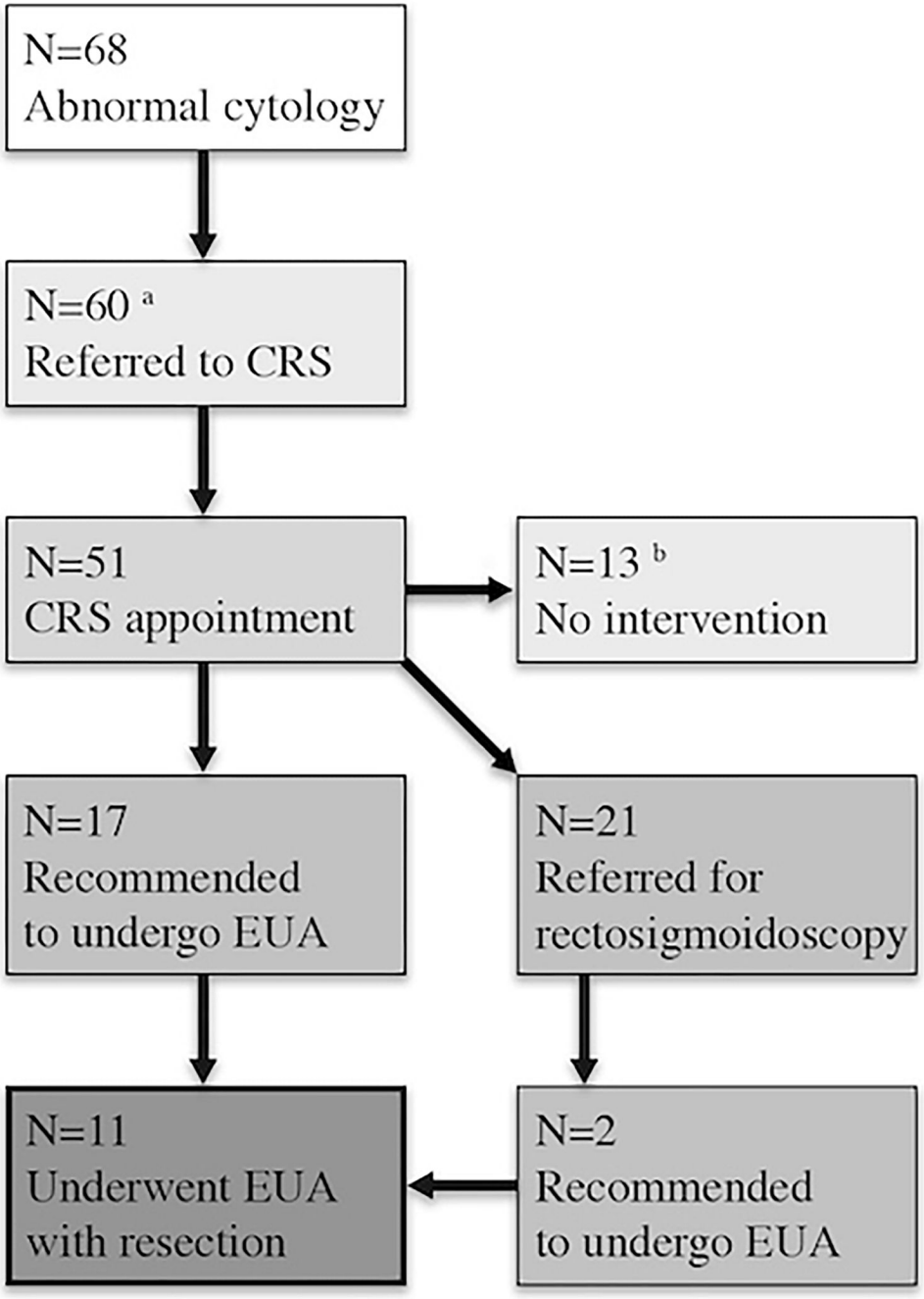

Fig. 3 –.

Management of abnormal anal cytology screening results in MSM with HIV in Colombia. [a] Among those who were not referred to CRS, $n = 2$ saw dermatology on their own and $n = 6$ did not receive any further evaluation. [b] $n = 7$ to follow up with the ID clinicians at the HIV clinic, $n = 6$ to continue follow up with CRS. Abbreviations: colorectal surgery (CRS), anal exam under anesthesia (EUA).

Table 1 –

Sociodemographic and clinical data for MSM with HIV with abnormal anal cytology results.

Variable	Overall, n=68
Age (years)	
Median [IQR]	32 [25.5–41.5]
Sexual Partners, N (%)	
Men	57 (83.8)
Men & Women	11 (16.2)
Education, N (%)	
University or Higher	44 (64.6%)
Technical College	12 (17.7%)
High School or Less	12 (17.7%)
Recent (12 mo.) STI Diagnosis, N (%) [a]	
Condyloma (penile or anal)	8 (11.8%)
Any other STI [b]	33 (48.5%)
Months since HIV Diagnosis	
Median [IQR]	20.3 [7.7–42.3]
Antiretroviral Therapy, N (%)	
Currently prescribed	65 (95.6)
HIV Viral Load (copies/mL) [c]	
Detectable, ≥ 40 [d]	22 (32.4)
Median [IQR] [e]	39,950 [1,120–102,000]
CD4 Count (cells/μL) [c]	
Median [IQR]	377.5 [229.5–525.5]
< 200, N (%)	15 (22.1)
CD4 Nadir (cells/μL)	
Median [IQR]	245 [118.5–337]
< 200, N (%)	26 (38.2)
Anal Cytology Result, N (%)	
ASC-US	23 (33.8)
LSIL	41 (60.3)
HSIL	4 (5.9)
Referral to CRS, N (%)	
Never referred	8
Referred, no appointment	9

Referred, ≥1 appointment	51

[a] Diagnosis in the 12 months prior to anal cytology

[b] Includes syphilis, hepatitis B, hepatitis C, herpes, proctocolitis unspecified, urethritis unspecified, other

[c] Laboratory data from closest date within six months before or after anal cytology

[d] n=2 of those with undetectable viral load had an unknown limit of detection

[e] Median for those (n=22) with detectable viral load ≥ 40 copies/mL

Abbreviations: MSM (men who have sex with men), HIV (human immunodeficiency virus), IQR (interquartile range), STI (sexually transmitted infection), CD4 ($CD4^+$ T lymphocyte), ASC-US (atypical squamous cells of undetermined significance), LSIL (low-grade squamous intraepithelial lesion), HSIL (high-grade squamous intraepithelial lesion), CRS (colorectal surgery)

Table 2 –

Demographic and clinical data compared between MSM who were and were not recommended to undergo EUA with tissue resection.

Variable	EUA [a] N=19	Other N=32	p value [b]
Age (years)			0.915
Median [IQR]	31 [26–37]	32 [25–40.5]	
Education, N (%)			0.131
University or Higher	10 (52.6)	24 (75.0)	
Technical College or Less	9 (47.4)	8 (25.0)	
HIV Viral Load, N (%) [c]			0.765
Detectable [d]	8 (42.1)	11 (34.4)	
CD4 Count (cells/μL) [c]			0.037 [f]
< 200, N (%)	8 (42.1)	4 (12.5)	
Anal cytology result, N (%)			0.308
ASC-US	4 (21.1)	9 (28.1)	
LSIL	12 (63.2)	22 (68.8)	
HSIL	3 (15.8)	1 (3.1)	
Surgeon at Initial CRS Visit, N (%)			0.105
A	8 (42.1)	5 (15.6)	
B	4 (21.1)	12 (37.5)	
C	7 (36.8)	15 (46.9)	
Documented anal condyloma			< 0.001 [f]
Yes [e]	18 (94.7)	8 (25.0)	

[a] n=17 were initially recommended EUA with tissue resection, and n=2 were recommended EUA with tissue resection after rectosigmoidoscopy findings were available (Figure 2)

[b] Categorical and continuous variables were compared using Fisher's exact test and Wilcoxon rank-sum, respectively

[c] Laboratory data from closest date within six months before or after anal cytology

[d] n=2 of those with undetectable viral load had an unknown limit of detection

[e] n=1 of those who were recommended EUA did not have documentation of anal exam at initial clinic visit

[f] Significant with p value < 0.05

Abbreviations: MSM (men who have sex with men), HIV (human immunodeficiency virus), EUA (exam under anesthesia), IQR (interquartile range), CD4 ($CD4^+$ T lymphocyte), ASC-US (atypical squamous cells of undetermined significance), LSIL (low-grade squamous intraepithelial lesion), HSIL (high-grade squamous intraepithelial lesion), CRS (colorectal surgery)

Table 3 –

Histopathologic results from resected perianal condyloma compared to initial anal cytology screening results.

		Histopathology Result			
		Normal	**AIN1**	**AIN2/3** [a]	**N/A** [b]
Anal Cytology Result	ASC-US	2	-	-	21
	LSIL	6	-	2	33
	HSIL	-	1	-	3

[a] AIN 2 and AIN 3 are considered high-grade intraepithelial neoplasia (HGAIN)

[b] Did not undergo EUA with tissue resection, and thus do not have histopathologic results

Abbreviations: ASC-US (atypical squamous cells of undetermined significance), LSIL (low-grade squamous intraepithelial lesion), HSIL (high-grade squamous intraepithelial lesion), AIN (anal intra-epithelial neoplasia), N/A (not applicable)