Anal HPV Infection: Diagnosis, Treatment and Prevention

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Disclosures

- Merck and Company: Principle Investigator, Speaker and Consultant
- Qiagen: Investigator
- Aids Malignancy Consortium: Investigator

Prevalence and Natural History

Human Papillomavirus

OVER 100 DIFFERENT TYPES OF SMALL, DOUBLE STRAND DNA VIRUS CAUSING EVERYTHING FROM PLANTAR WARTS TO LARYNGEAL CANCER

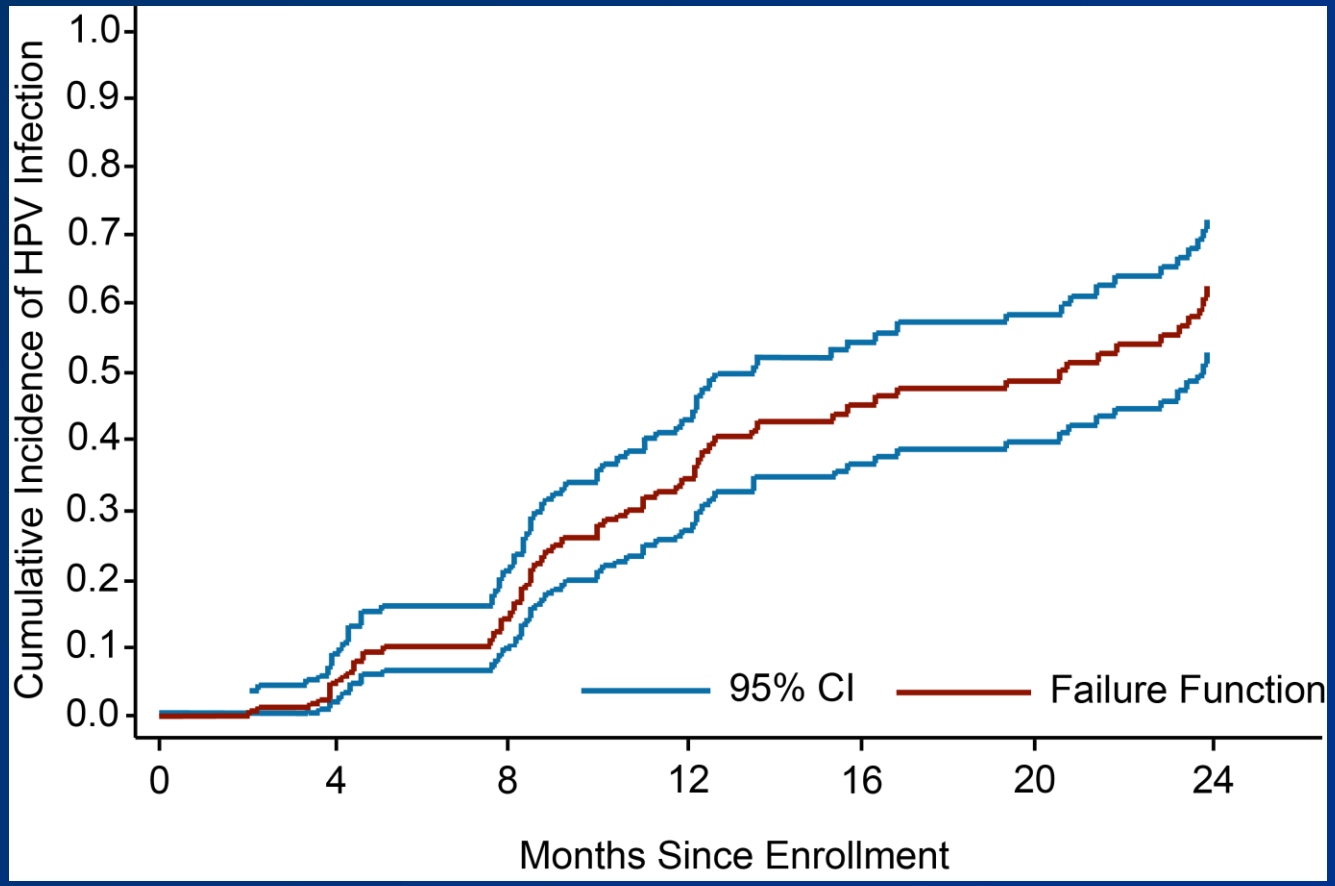
Type 16 & 18	Oncogenic (Cervical & Anal Ca)
Type 31, 33, & 35	Intermediate Risk
Types 6 & 11	Low Risk

HPV is Highly Prevalent in Sexually Active Men

- Seattle: In a study of sexually active college men the 24 mo. Cumulative incidence of HPV was 62.4% [1]
- Tampa/Tucson: Cumulative incidence of HPV was 65.4% and 29% oncogenic [2]
  - Female partners ≥21 vs 1-5 OR 2.5 [1.3-4.6] but it is significant after >6 partners
  - Condom use at least 50% vs less in past 3m OR 0.5 [0.3-0.8]
  - Smoking >10 vs 0-9 OR 2.3 [1.0-5.3]
  - Female partners in last 3 m ≥2 OR 2.9 [1.4-6.3] nonoc only

1. Partridge JM et al. *The Journal of Infectious Diseases* 2007;196: 1128-36.
2. Nielson CM et al. *The Journal of Infectious Diseases* 2007;196: 1137-45.

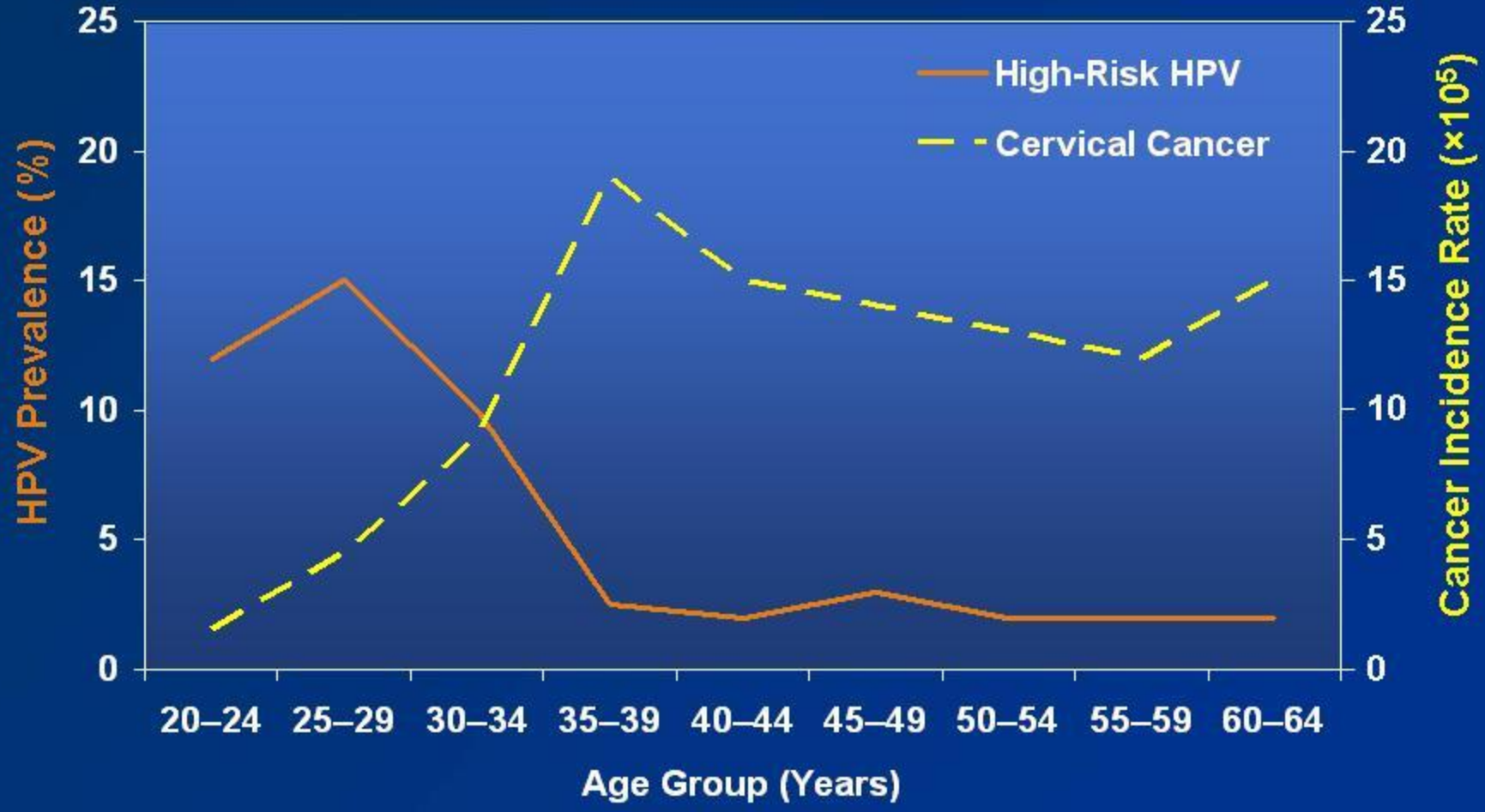
Sexually Active Male University Students 18-20 Years of Age (June 2003-March 2006): 24-Month Cumulative Incidence



Multivariate analysis: new partner 0-4 months, HR 2.0 (1.3-3.0); history of smoking, HR 1.6 (1.1-2.4)

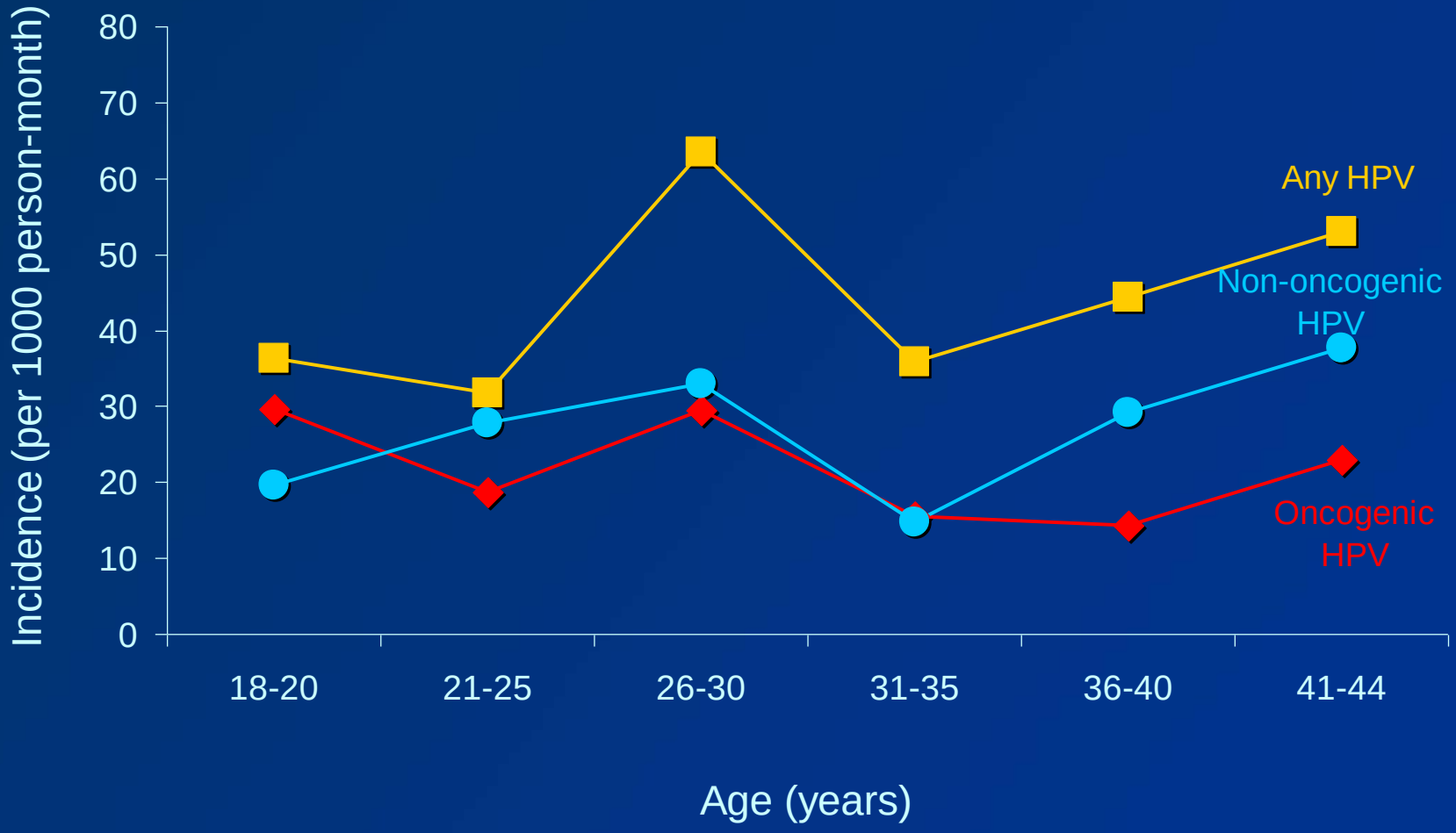
Partridge JM, et al. *J Infect Dis*. 2007;196:1128-1136.

Age-Specific Rates of HPV Infection and Cervical Cancer[1]



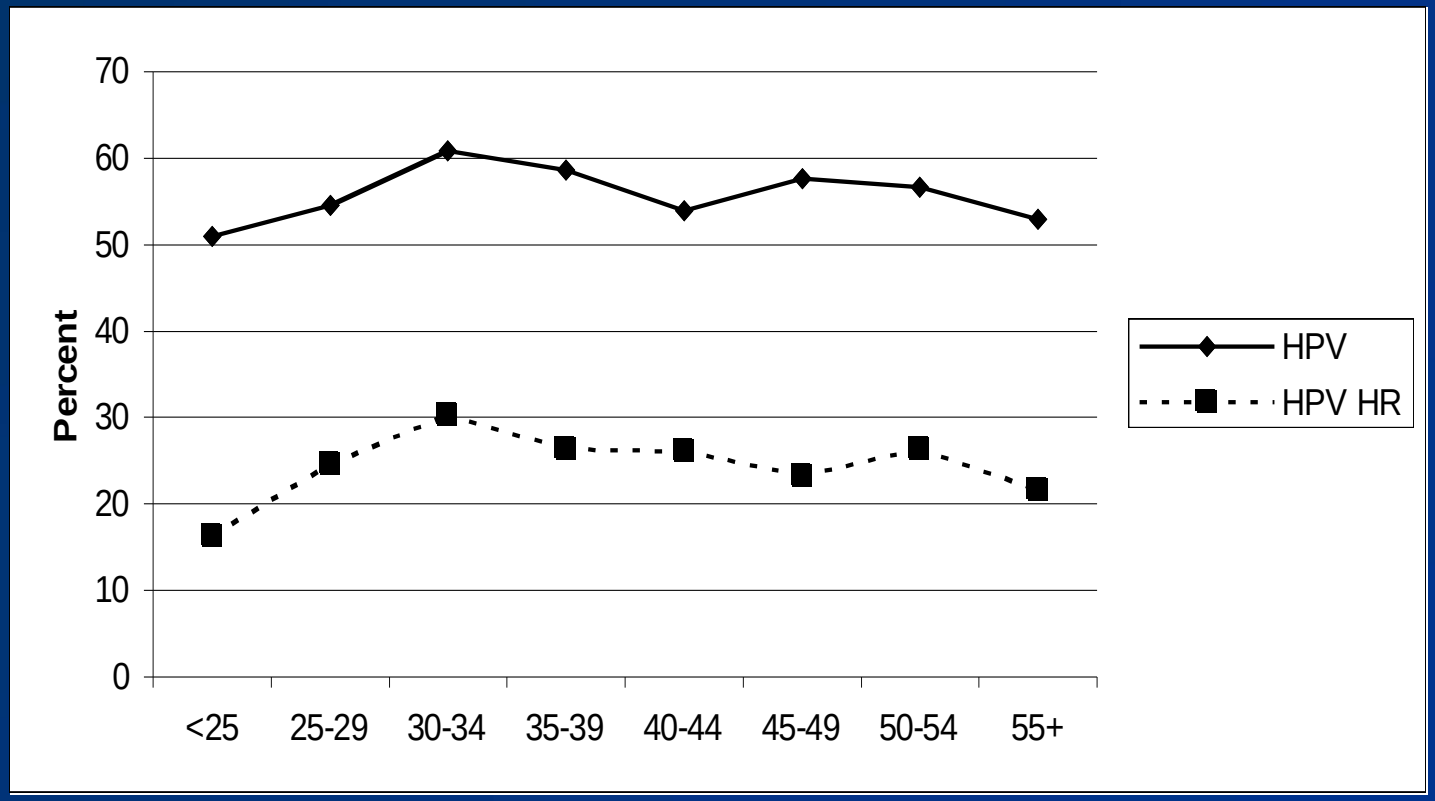
1. Bosch FX, Lorincz A, Muñoz N, Meijer CJLM, Shah KV. *J Clin Pathol*. 2002;55:244–265. Reproduced with permission from the BMJ Publishing Group.

Age-specific Incidence in Men



Giuliano AR et al, J Infect Dis. 198:827-35.

Incidence of Anal HPV Infection in HIV-negative MSM



Chin-Hong et al, J Infec Dis 2004;190:2070-6

HPV Prevalence

SAN FRANCISCO COHORT *

HIV + 93% had HPV with 80% carrying an oncogenic type

HIV - 61% had HPV with 29% carrying an oncogenic type

* 680 men who have sex with men

Risk of HPV if Negative at Baseline

	HIV +	HIV –
1 YEAR	45%	40%
2 YEARS	78%	54%

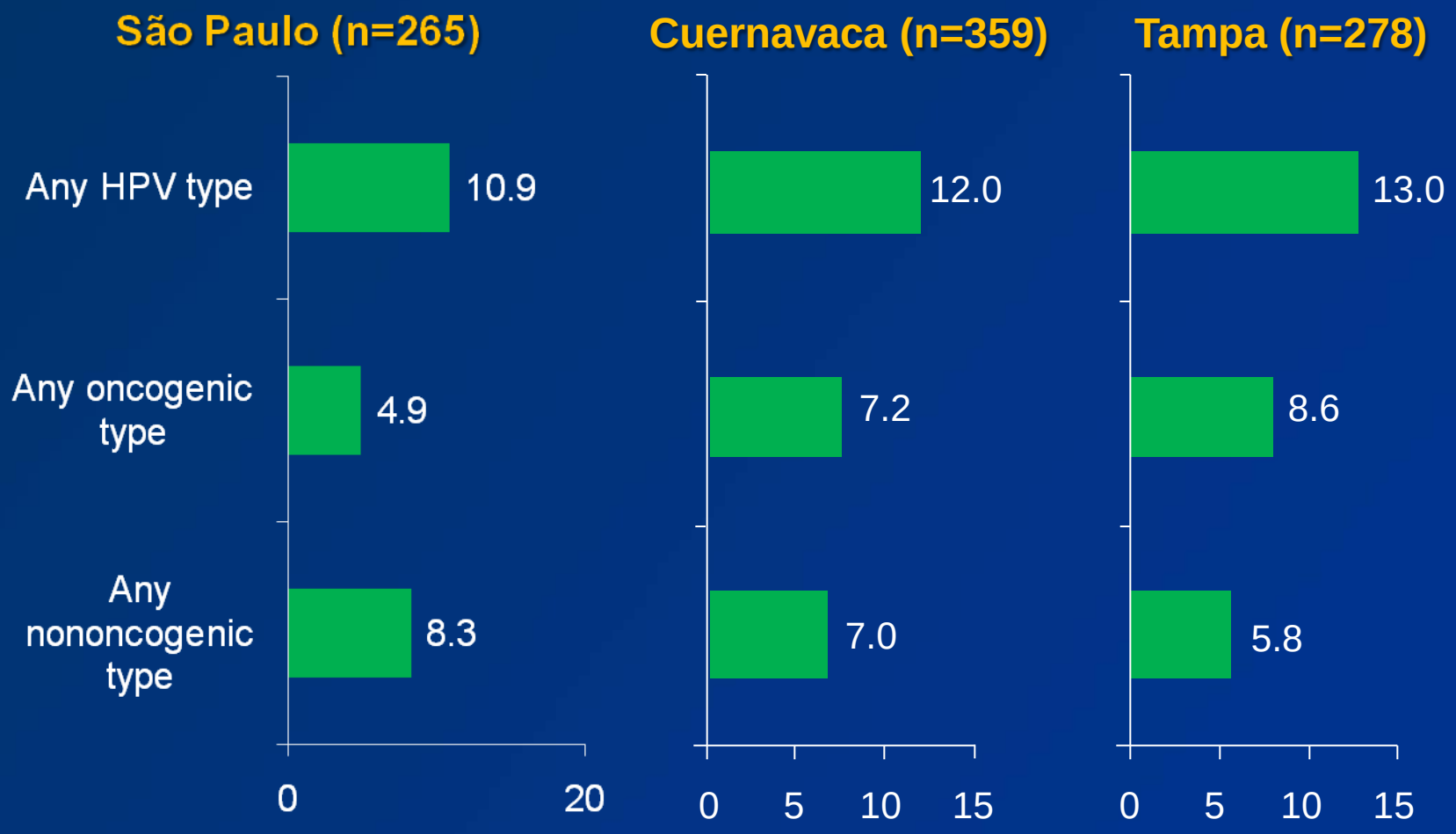
HPV Prevalence, Clearance & Incidence in HIV+ MSM- Montreal

- 247 HIV+ MSM followed every 6 m for 3 yrs
  - Median age 43 yrs and median time from HIV diagnosis 10.7 yrs
- HPV infection in 97.9% at baseline
  - median 5 types
  - most common types: HPV 16 (38.2%) & HPV 6 (35.3%)
    - HPV 18 (25%) HPV 11 (23%)
- Clearance

	Cleared Episodes/1000 person-months	Median Time to Clearance (months)
HPV 16	12.2	35.8
HPV 6	13.5	33.6
HPV 18	20.4	29.8
HPV 11	14.1	33.4

de Pokomandy et al JID 2009:199; 965-73

Anal Canal HPV Prevalence in MSW by Region[1]



Any HPV = positive for 1 or more of 37 HPV types tested and includes unclassified HPV; oncogenic = any of 13 types detected (16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58, 59, and 66) regardless of presence of nononcogenic HPV; nononcogenic = 1 or more nononcogenic types detected regardless of presence of oncogenic types.

MSW = men who have sex with women.

1. Nyitray AG et al. *J Infect Dis*. In press.

24 Month Cumulative Incidence

Sexually active male university students 18-20years of age (June 03 – March 06)

- Detection of HPV DNA under fingernails
  - 31.9% for any genital type
  - 25.8% for any high risk type
  - ~ half the incidence for all genital sites combined
- Study by Sonnex et al. confirmed DNA sequencing of HPV-16 carried at both genital and fingertip sites in men
  - Suggestive of autoinoculation
- Winer et al. also showed HPV transmission through finger vulvar contact in women

Partridge et al. JID 2007:196
Sonnex et al. Sex Trans Infec 1999:75
Winer et al. Am J Epi 2003:157

Anal HPV Infection in a Cohort of Women

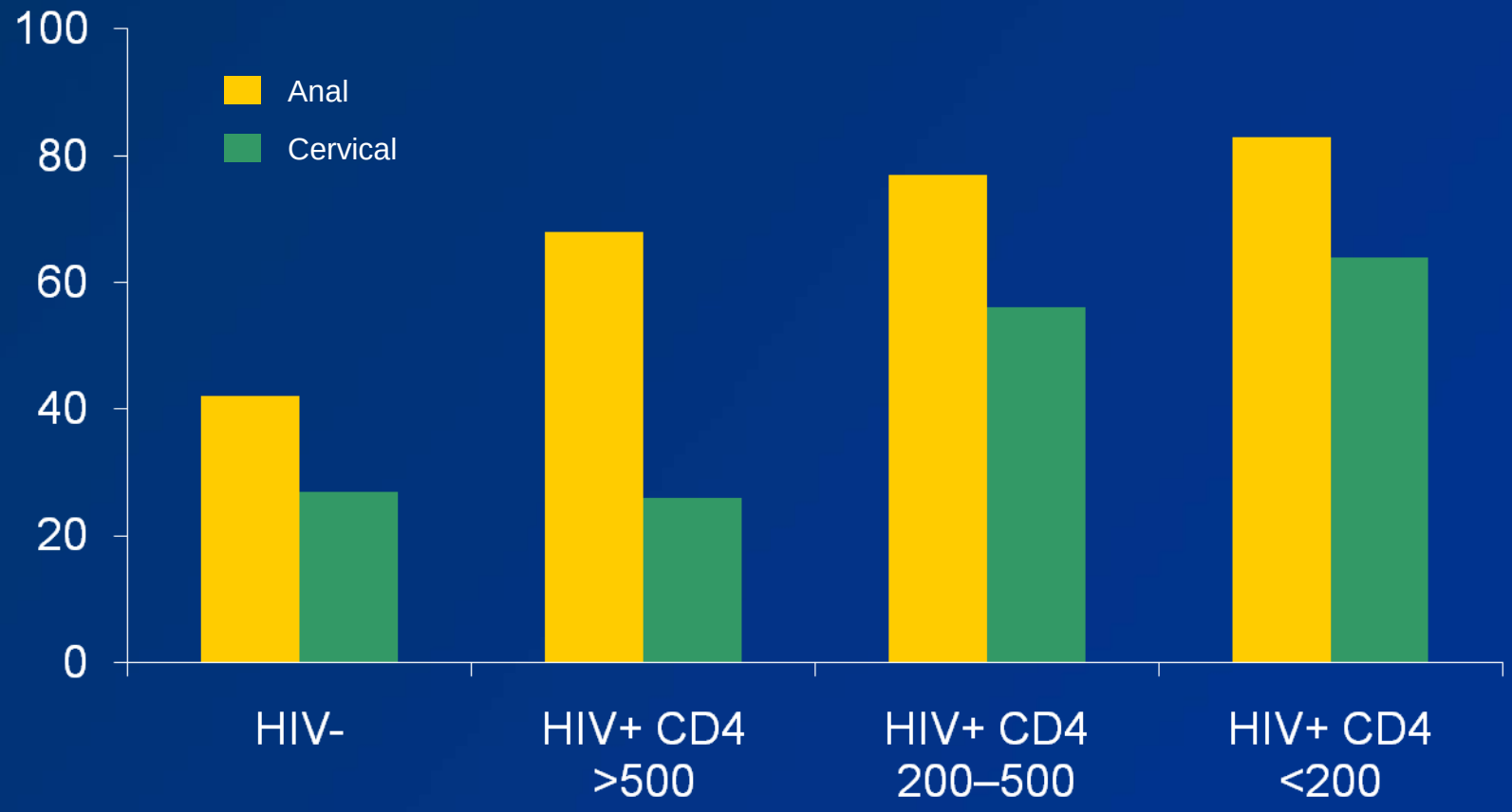
- Hawaii cohort 1998–2003[1]
  - 650 women; 431 contributed intra-anal specimens
  - Majority were white; median age 40 years
  - Followed every 4 months for an average of 1.3 years
- 42% had prevalent anal HPV infection at enrollment[1]
  - 22.3% had high-risk types[a]
  - 15.8% had multiple HPV types
- 50% had at least 1 incident anal HPV infection during follow up[2]
  - Higher risk among women with anal infection at baseline[1]
  - Baseline anal HPV 16 infection was positively associated with the risk of a subsequent HPV infection[1]

[a]Most common high-risk types: HPV 16, 51, 52, 53.

1. Goodman MT et al. *J Infect Dis.* 2008;197:957–966. **2.** Shvestov YB et al. *Clin Infect Dis.* 2009;48:536–546.

Anal and Cervical HPV Infection in Women[1]

Among participants in the Women's Interagency HIV Study (WIHS)



1. Adapted from Palefsky J et al. *Top HIV Med. 2007*;15:130–133.

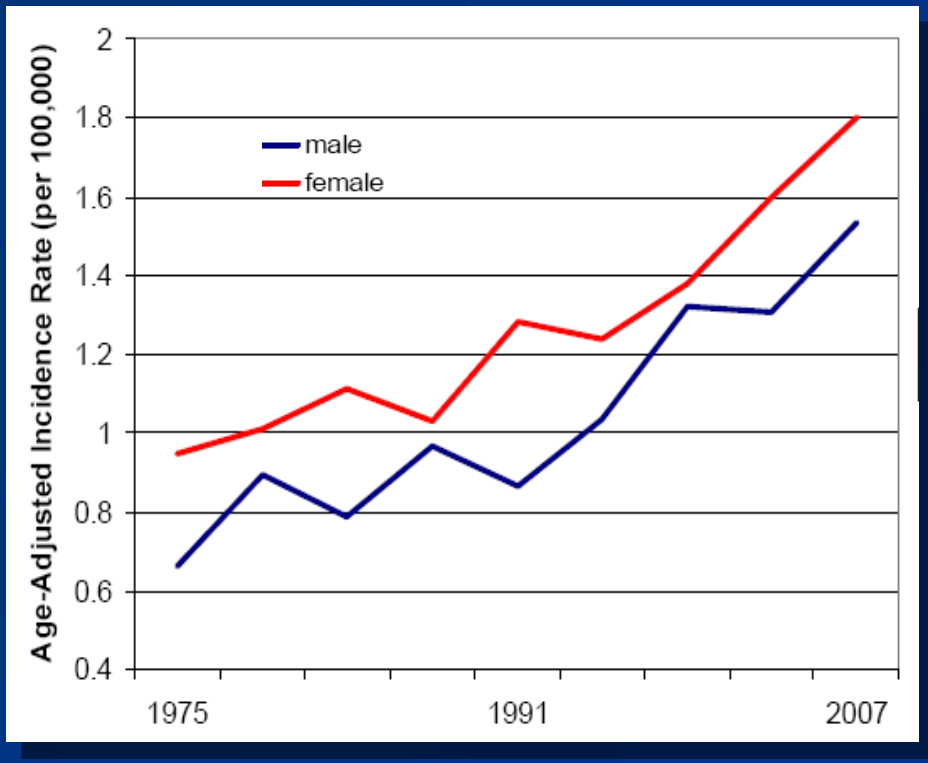
ANAL HPV Infection and HIV Acquisition in MSM

- Explore study population of 1409 MSM from January 2001-October 2002
  - Followed every 6 months for 1-4 yrs.
  - 51 seroconverted for an overall rate of 1.17/100 person-yrs
- Risk of Seroconversion – multivariate analysis
  - Infection with 1 HPV type — HR 2.0 (CI 0.61-6.5) P=0.25
  - Infection with ≥ 2 HPV types — HR 3.5 (CI 1.2-10.6) P=0.002
  - Unprotected AI with ? Partner — HR 7.1 (2.8-18.2) P<0.0001
  - Amphetamine use — HR 4.6 (1.7-12) P=0.002
  - Abnormal cytology — no significant increase in HR

Chin-Hong et al AIDS 2009, 23:1135-42

U.S. Epidemiology: Increasing Incidence of Anal Cancer

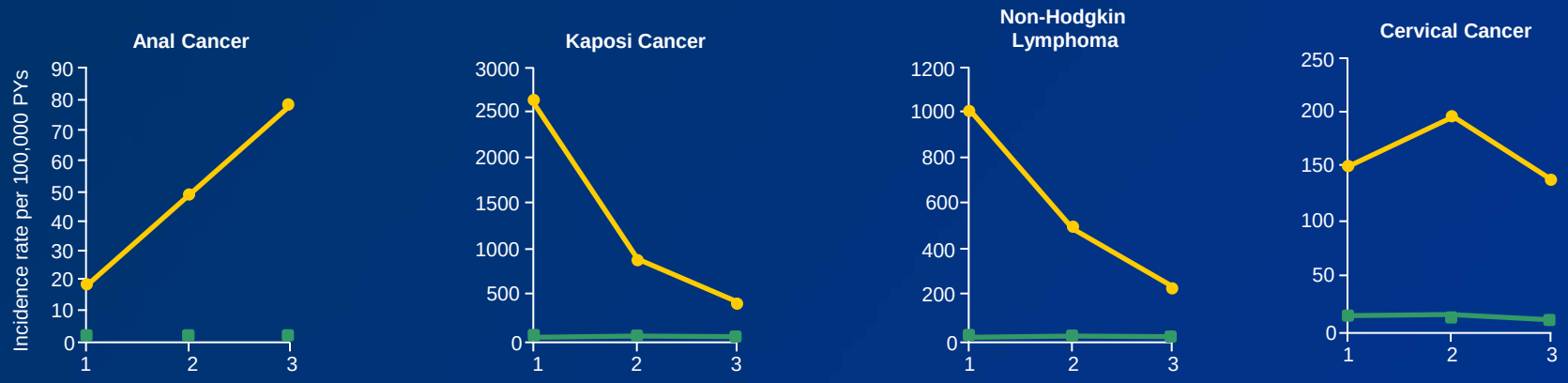
- Anal cancer represents ~4% of all lower GI tract cancers in U.S[2]
- Incidence is increasing at ~2% per year[1]
- Age-adjusted rates from 1975 to 2007 doubled from 0.8 to 1.6 per 100,000[1]



[a]Rates are per 100,000 and are age-adjusted to the 2000 US Std Population

1. Horner MJ et al. *SEER Cancer Statistics Review 1975-2006*. SEER Web site. http://seer.cancer.gov/sr/1975_2006/. Accessed December 1, 2010. 2. Clark MA Lancet Oncology ;Vol 5 2004 pp149-157

Cancer Incidence Rates in HIV-Positive Subjects: Pre-/Post-HAART[1]



Standardized incidence rates of 3 AIDS-defining and 9 non-AIDS-defining cancers among HIV-infected persons and the general population, stratified by 3 periods from 1992 to 2003 (1: 1992–1995; 2: 1996–1999; 3: 2000–2003).

Data derived from the Adult and Adolescent Spectrum of HIV Disease (ASD) Project, the HIV Outpatient Study (HOPS) and the Surveillance, Epidemiology, and End Results (SEER) program of the National Cancer Institute.

HAART = highly active antiretroviral therapy; PYs = person-years.

1. Patel P et al. *Ann Intern Med.* 2008;148:728–736.

Anal Cancer Incidence in MSM: Comparison to Cervical Cancer

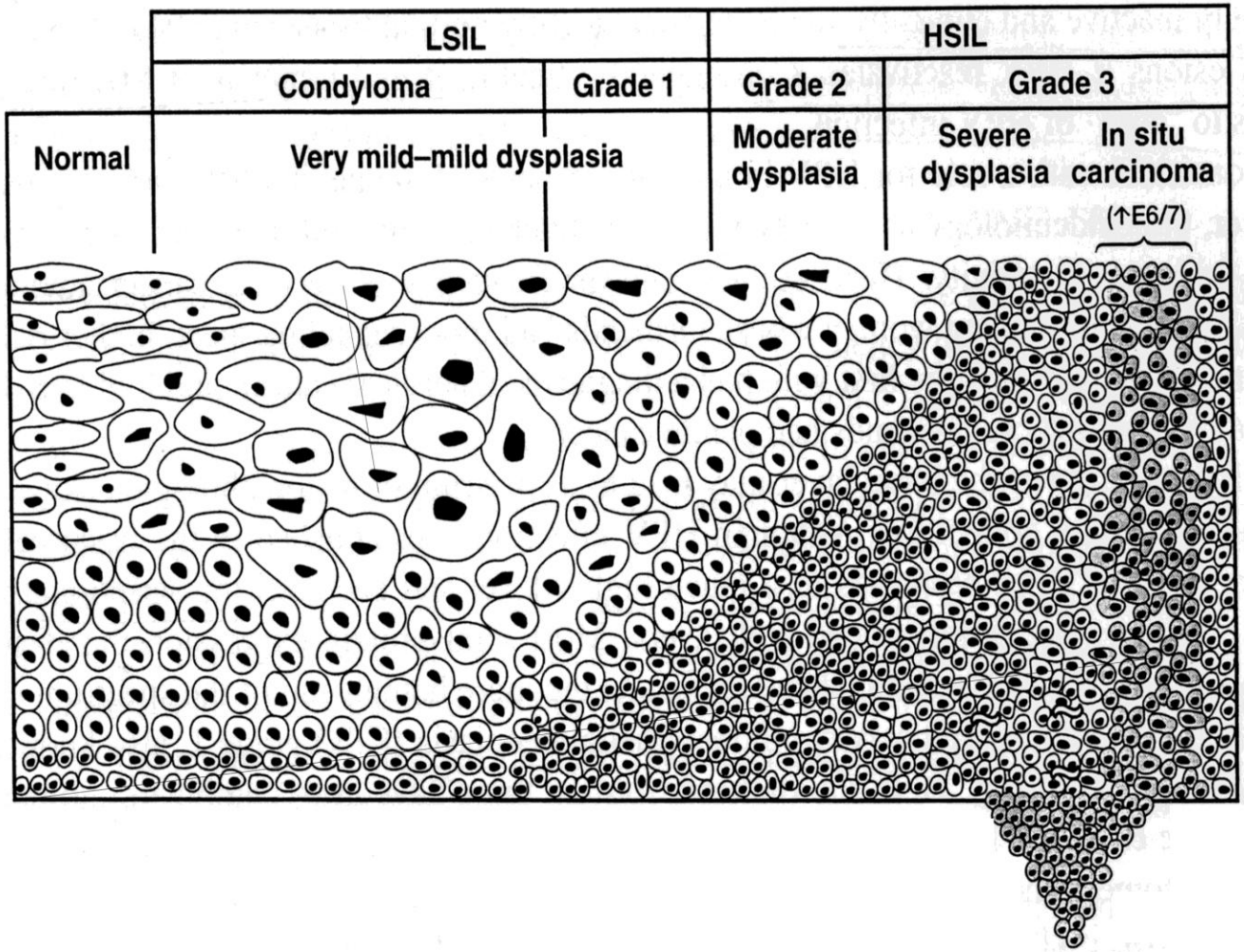
- Cervical cancer prior to cervical cytology screening: 40–50/100,000[1]
- Cervical cancer currently: 8.4/100,000[2]
- Anal cancer incidence among MSM prior to HIV epidemic: 35/100,000[1]
  - Estimates twice as high among HIV+ MSM versus HIV− MSM[3]

[a]Annual incidence.
MSM = men who have sex with men.

1. Martins CR. *Hopkins HIV Report*. May 2001. http://ww2.aegis.org/pubs/jhopkins/2001/ JH20010503.html. Accessed November 5, 2008.
2. National Cancer Institute. SEER stat fact sheet: Cancer of the cervix. http://seer.cancer.gov/statfacts/html/cervix.html. Accessed November 5, 2008. **3.** Chin-Hong PU et al. *Dermatol Ther.* 2005;18:67–76.

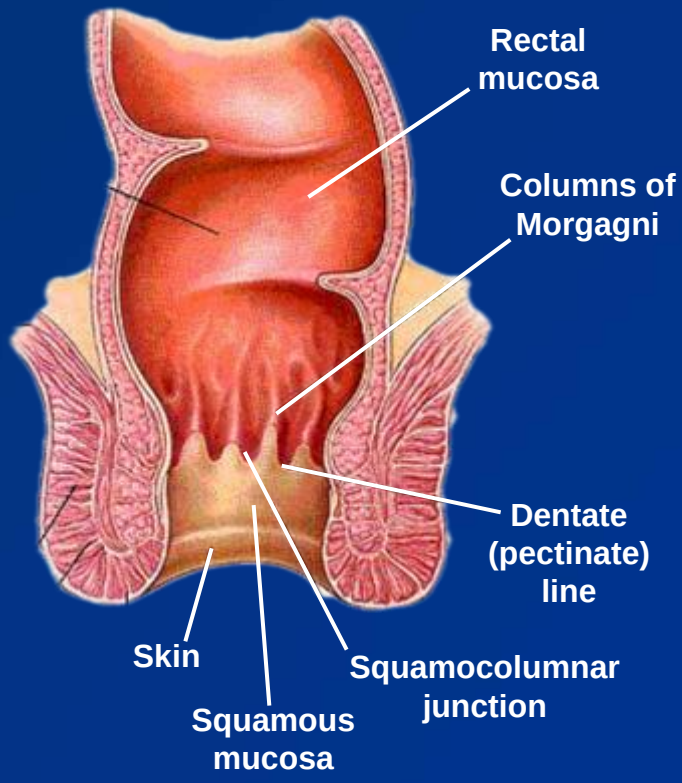
Screening for Anal Cancer

Dysplasia: AIN



Anal Anatomy
Similarity to Cervical Anatomy and Cancers

- Anal canal lined with mucosa and squamous epithelium[1]
- Anus is structurally similar to the cervix[2]
- Squamous cells at leading edge of transformation zone are most susceptible to oncogenic HPV
- Majority of anal and cervical cancers are SCCs[3]



Adapted from Ryan DP et al. Carcinoma of the anal canal. *N Engl J Med* 2000;342(11):792–800.

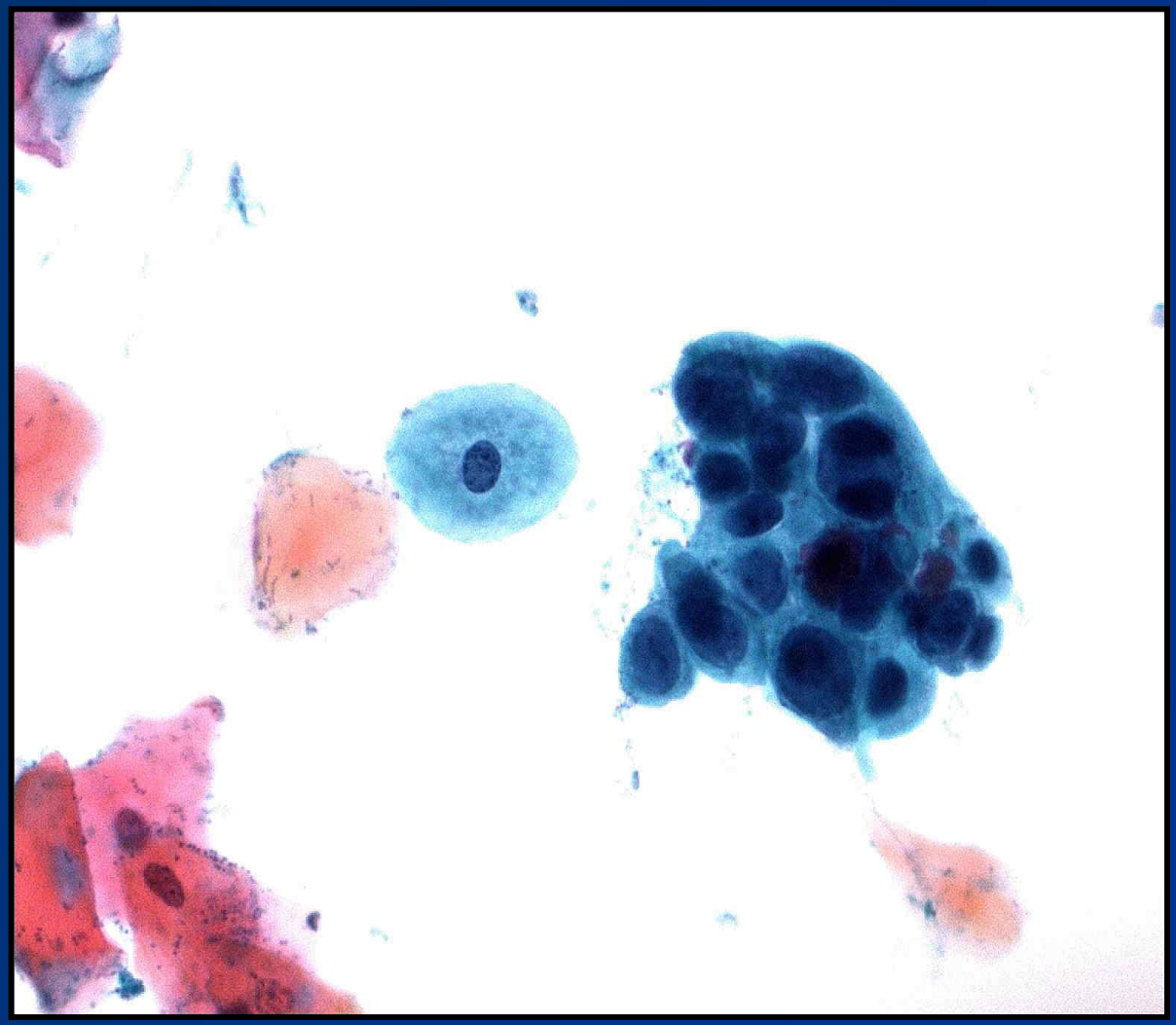
SCC = squamous cell carcinoma.

1. Parkin DM et al. *Vaccine*. 2006;24(suppl 3):S3/11–S3/25. **2.** Chang GJ et al. *Clin Colon Rectal Surg*. 2004;17:221–230. **3.** Joseph DA et al. *Cancer*. 2008;113(10 suppl):2892–2900.

Cytology / Pap Smear

- A moistened Dacron swab
- No preparation
- Insert the swab 2-3cm or until resistance to sample above the squamocolumnar transition zone
- Rotate and move in and out
- Immediately place in liquid based cytology
- Agitate and tap

Anal Pap Smear: HSIL

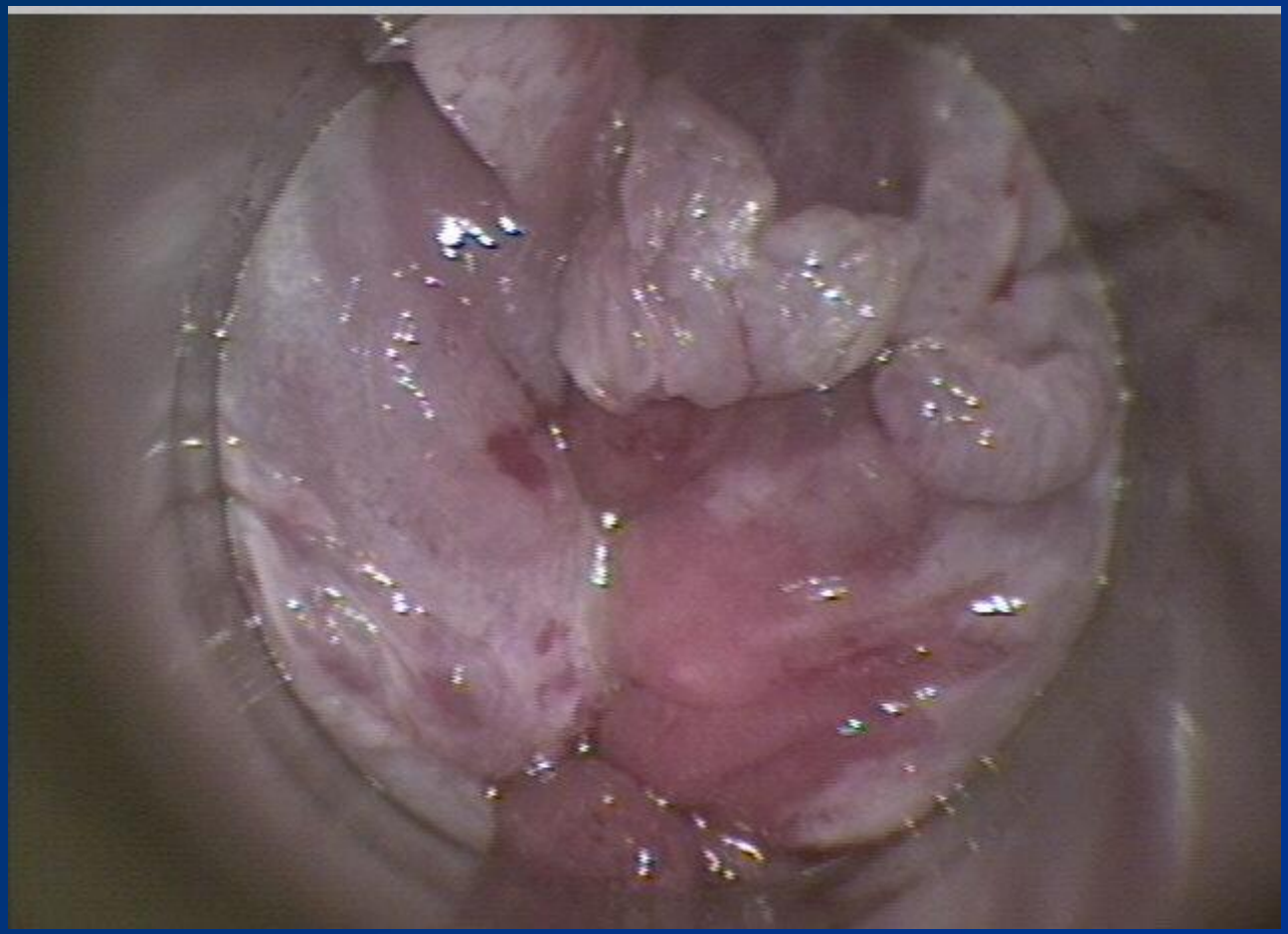


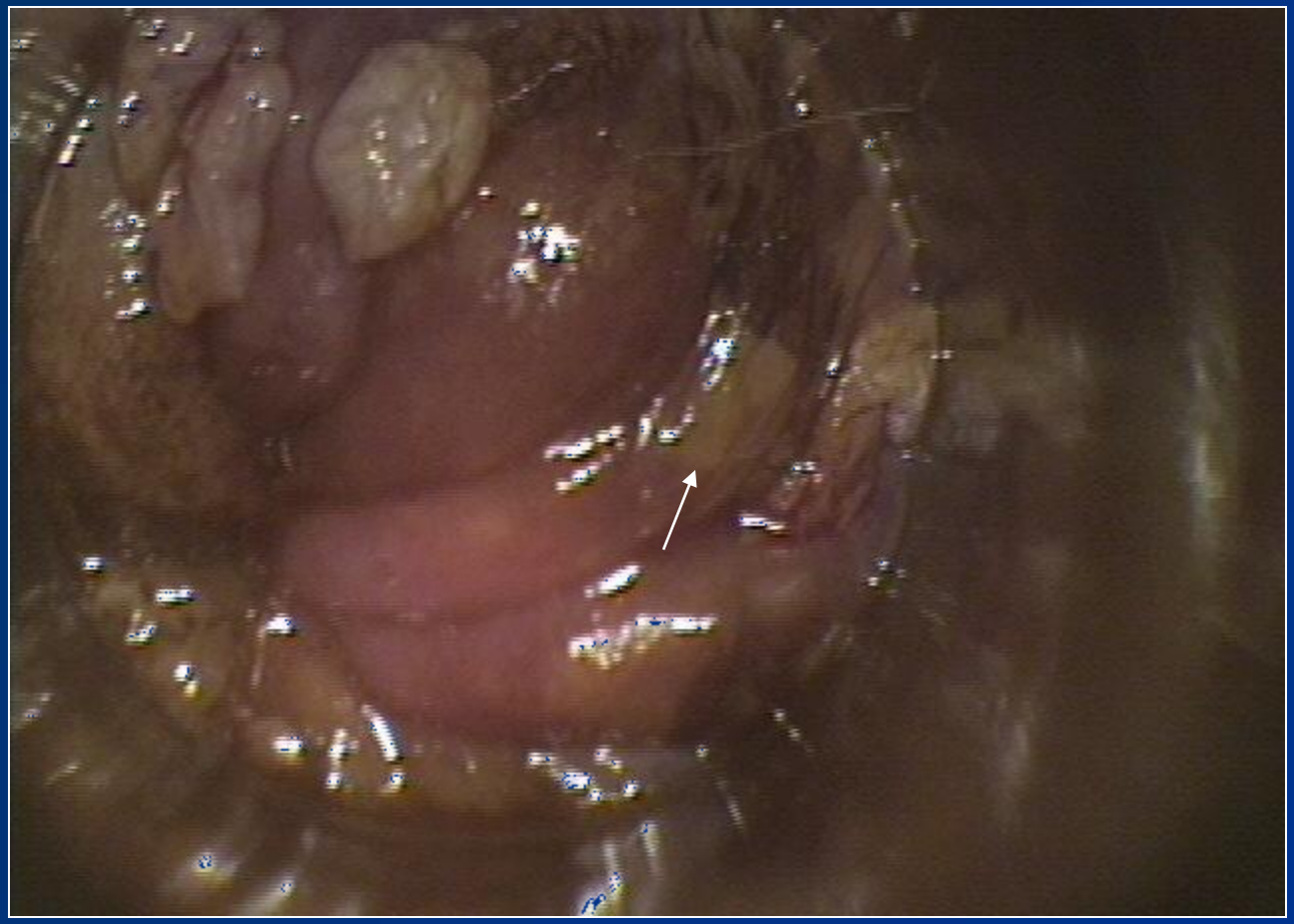
High-Resolution Anoscopy

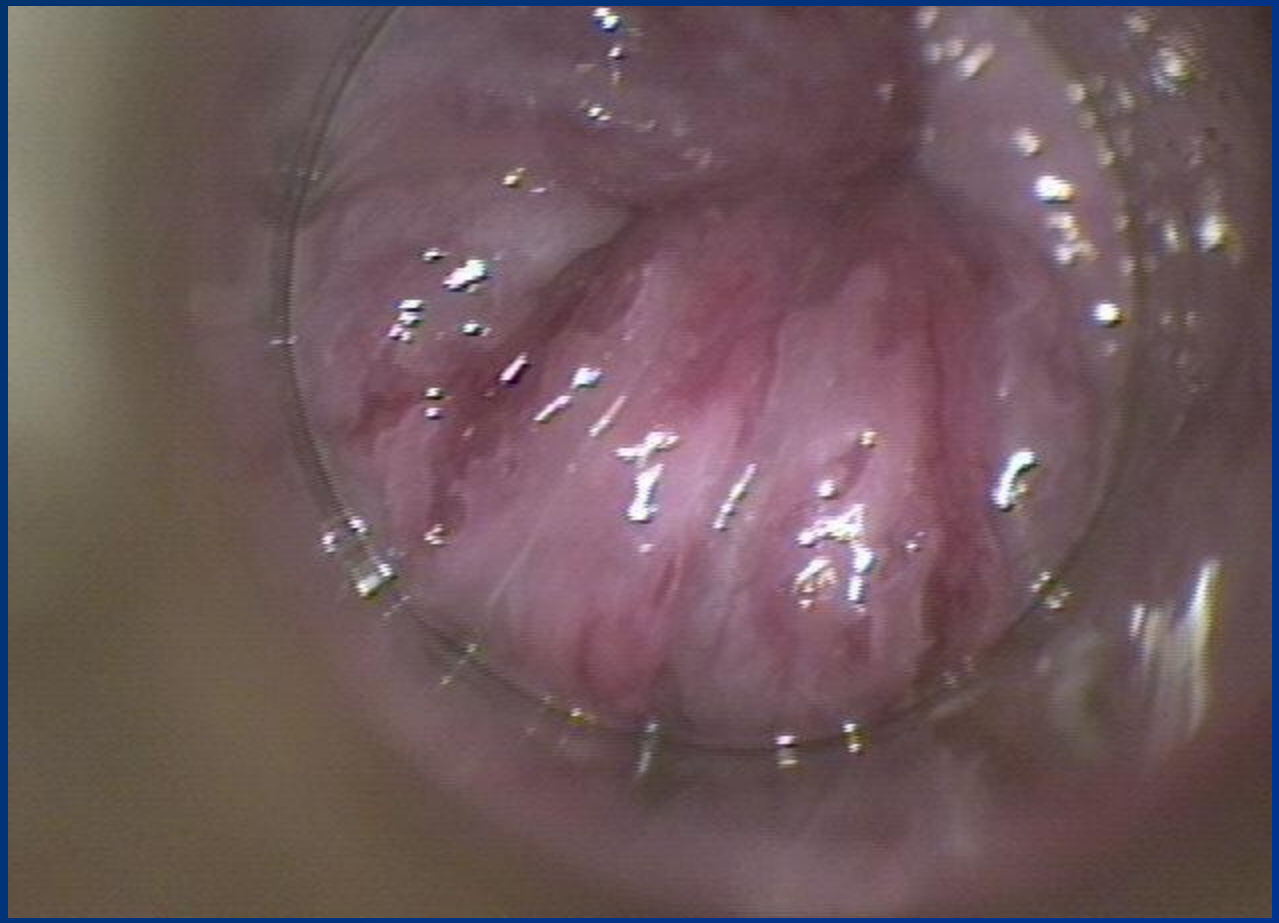
- Any abnormal cytology
  - ASCUS
  - LSIL
  - HSIL
- Any abnormal rectal exam or lesion visible with standard anoscopy

Methods:

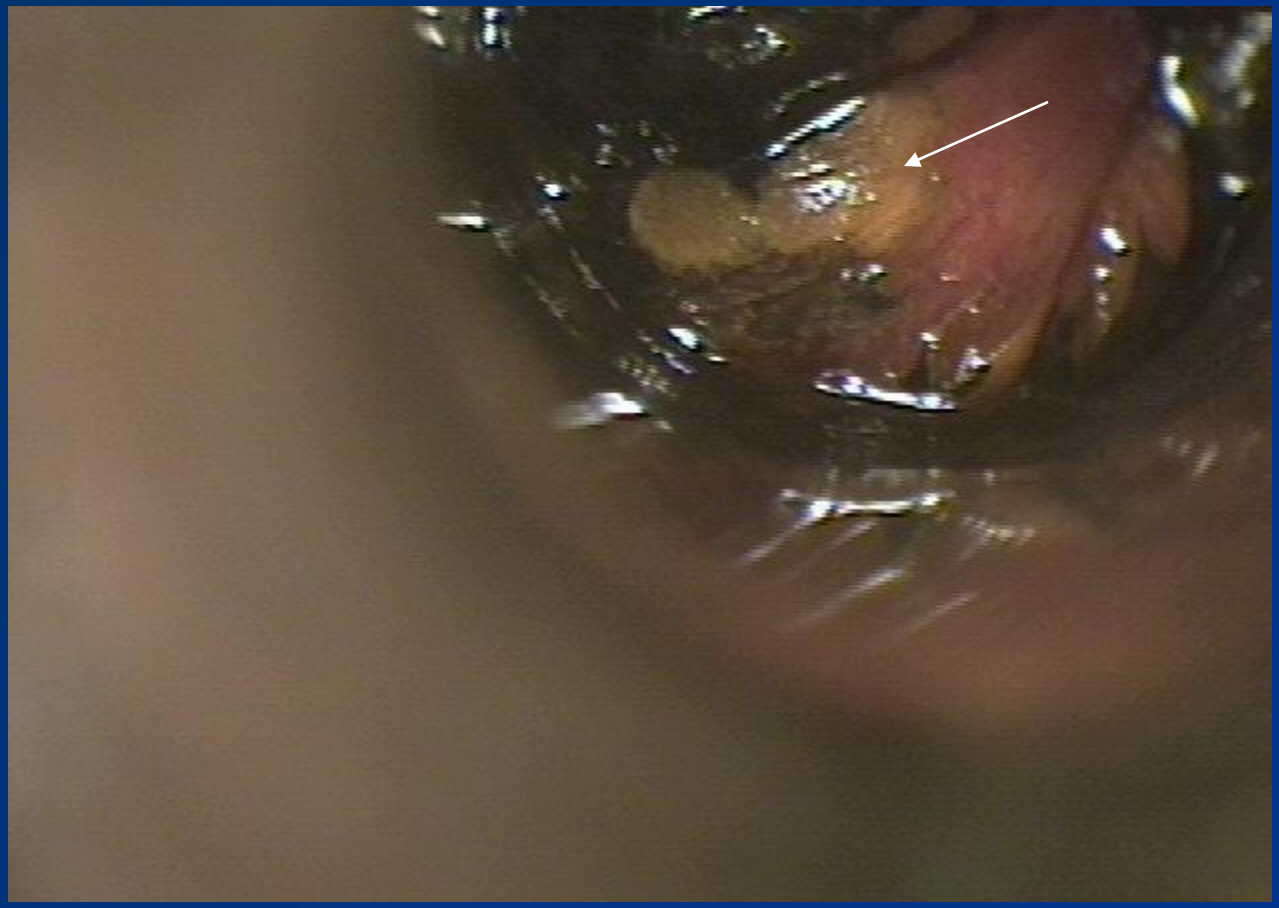
- Lubricated clear plastic anoscope (topical anesthetic optional)
- Acetic acid
- Magnification with colposcope, microscope or loops
- Lugol's Solution
- Biopsy of all lesions suspicious for HSIL
- Hemostasis



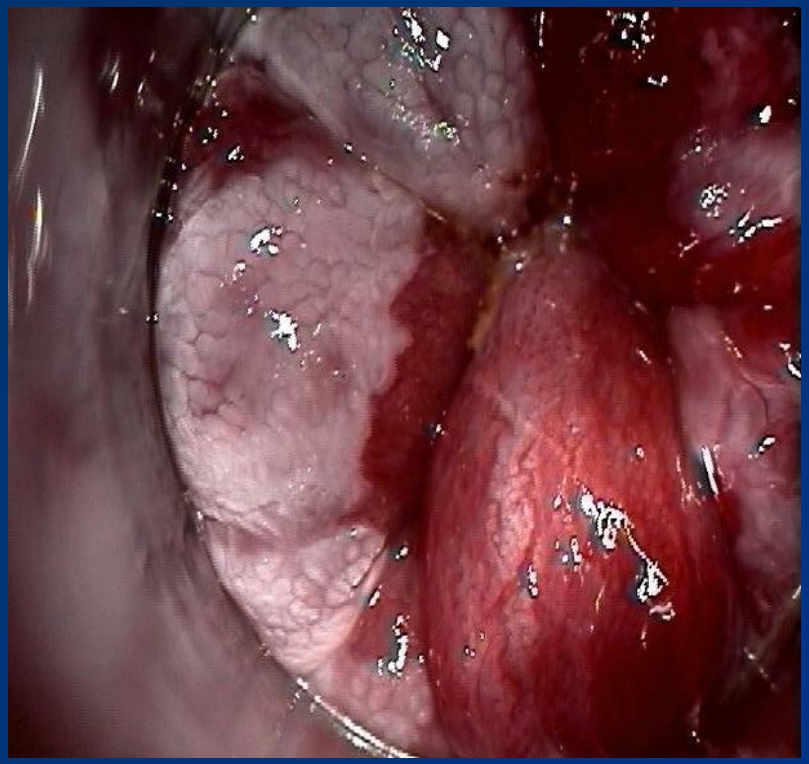


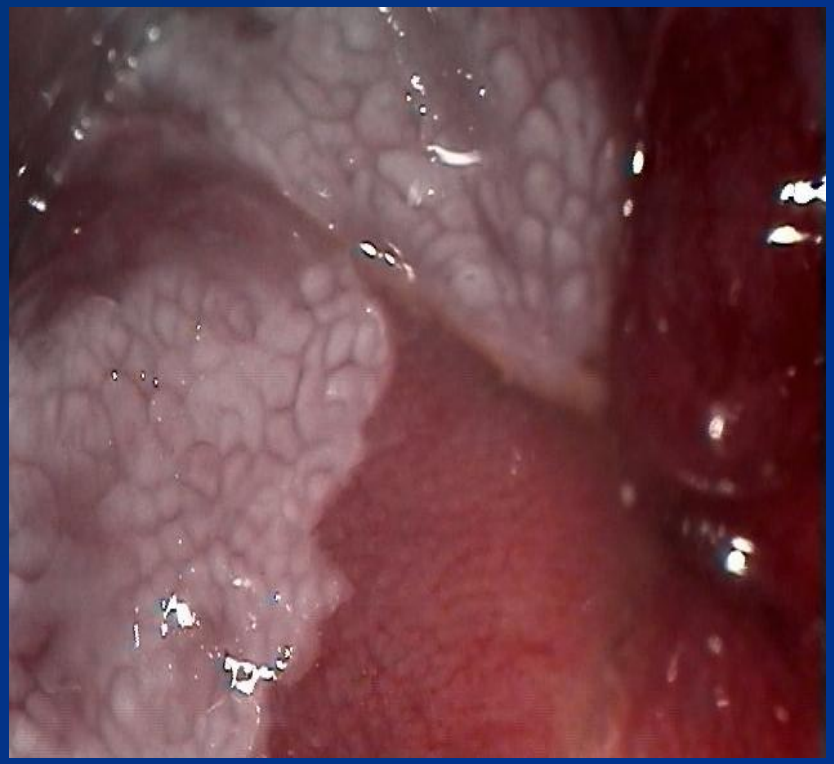


Punctation



Mosaicism





Management of Anal Dysplasia

Treating HSIL

- Treatment of CIN is removal of the squamocolumnar transition zone and that can't be done in the anus

- If you can identify a lesion you can treat it

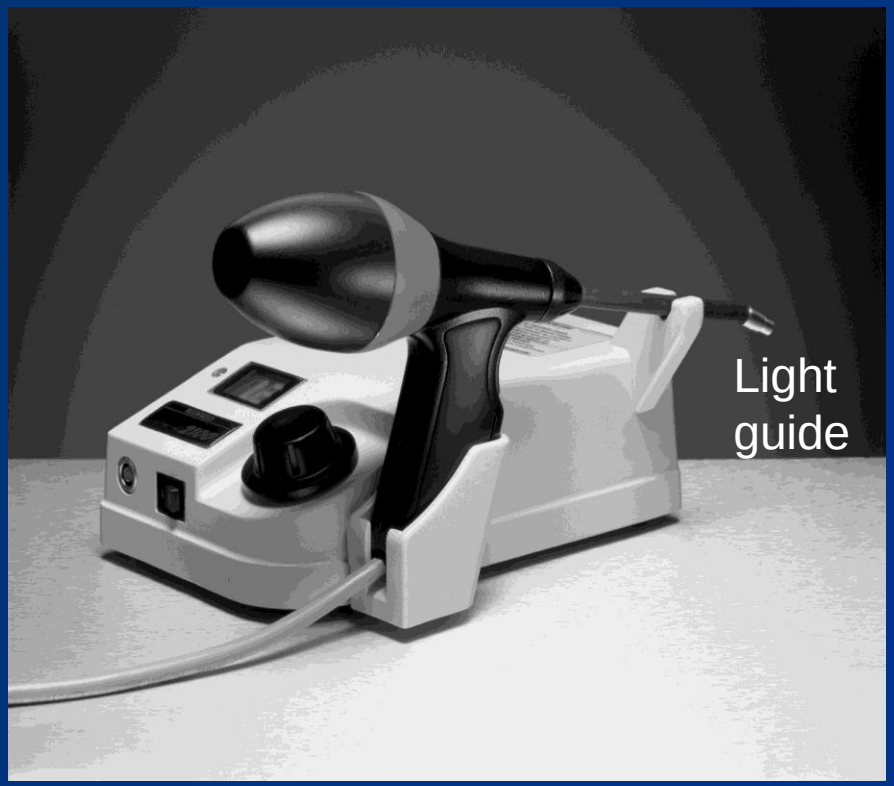
Anal Dysplasia: Treatment Modalities[1]

- External lesions
  - Chemical or pharmacologic treatment
  - Cryotherapy
- Intra-anal lesions
  - Infrared coagulation
  - Electrocautery
  - Laser therapy
- Extensive AIN
  - Surgery

AIN = anal intraepithelial neoplasia.

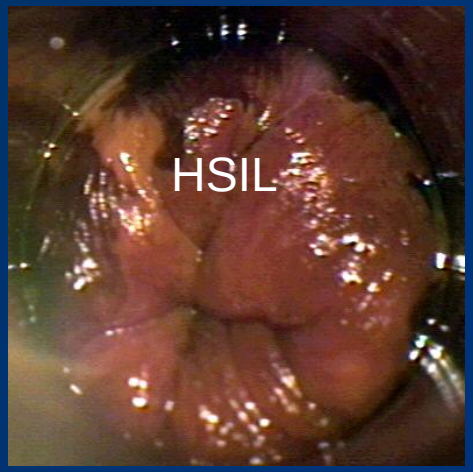
1. Palefsky JM et al. *Obstet Gynecol Clin N Am.* 2009;36:187–200.

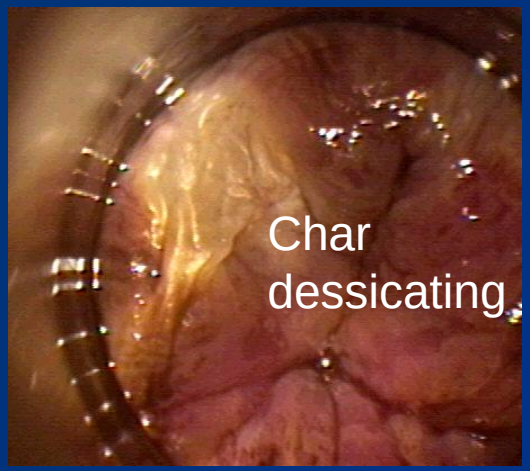
IRC2100 “TM” Infrared Coagulator



Redfield Corporation, Rochelle Park, N.J.

Procedure


HSIL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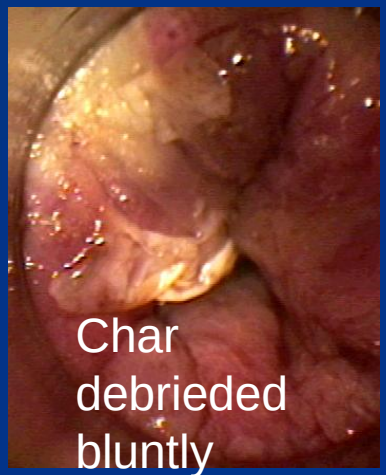
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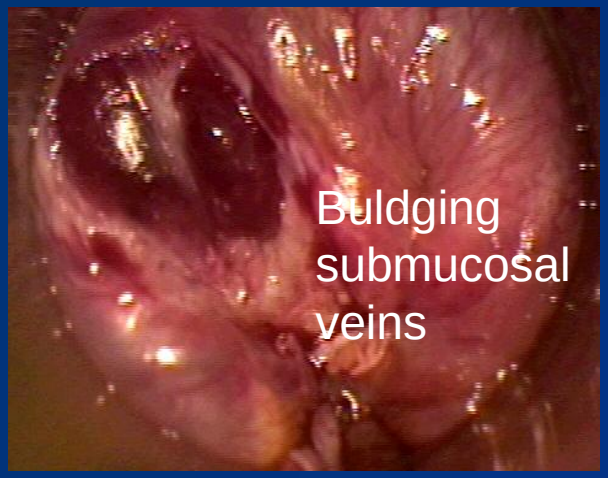
Buldging
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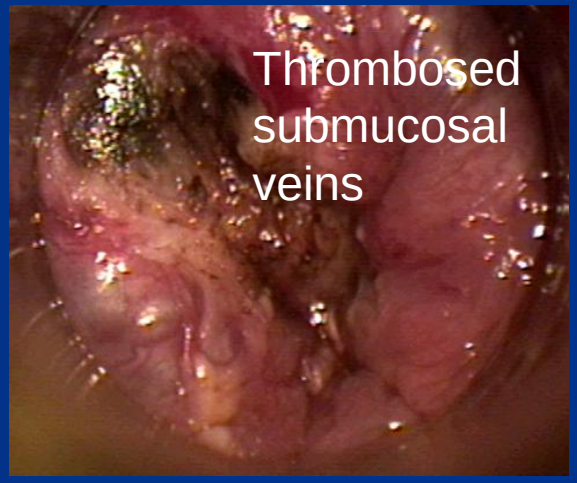
veins


Thrombosed
submucosal
veins

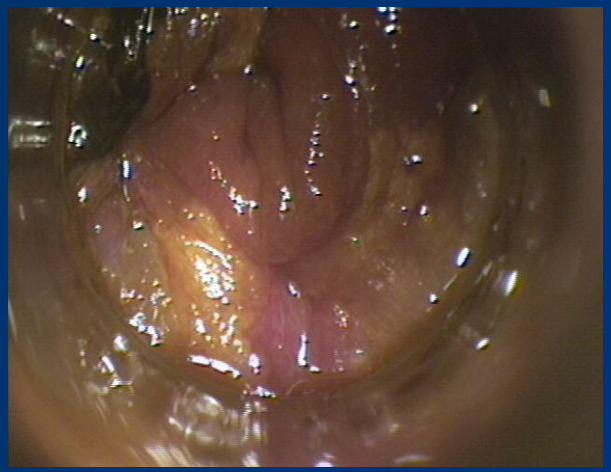
IRC Ablation in HIV+ and HIV- MSM

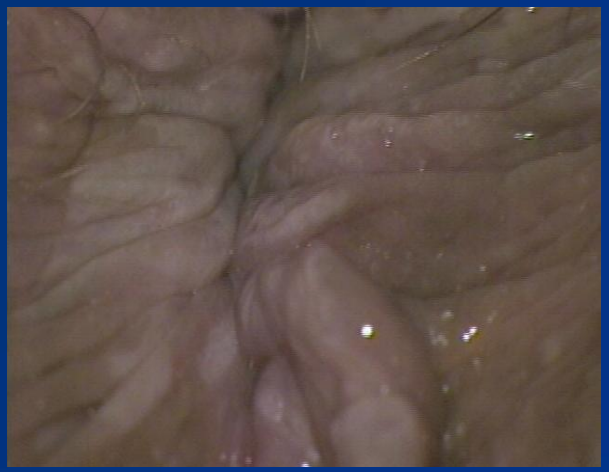
	HIV+	HIV-
Subjects	68	75
Disease free after		
1st treatment	35%	47%
2nd treatment	42%	72%
3rd treatment	60%	100%
Cure rate of an individual lesion		
1st treatment	72%	87%
2nd treatment	72%	93%
Median time to metachronous lesion		
1st treatment	217 days	237days
2nd treatment	203 days	244 days
3rd treatment	287 days	N/A

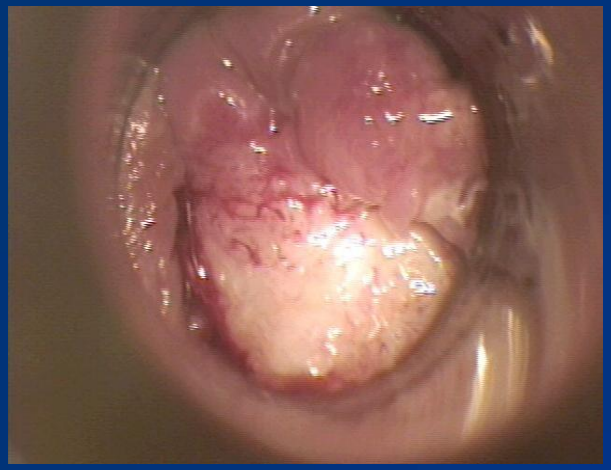
Anal Dysplasia Treatment Considerations

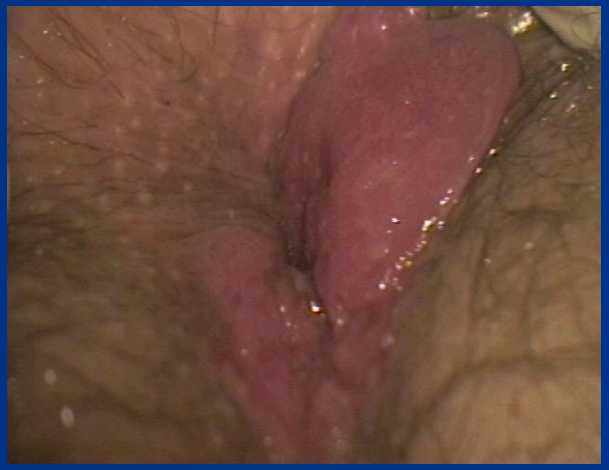
- HSIL can be treated in office but requires special skill sets
  - Anesthesia is required
- Targeted destruction is the only treatment at present
- There is postprocedure pain
- There is a chance for postsurgical complications including bleeding
- Recurrence rates are high and patients need to be followed
- Other methods of destruction need to be studied
- Immune-based therapy may be the best treatment
- **We need to know if treatment is beneficial**

Anal HSIL: Progression Over 3 Years







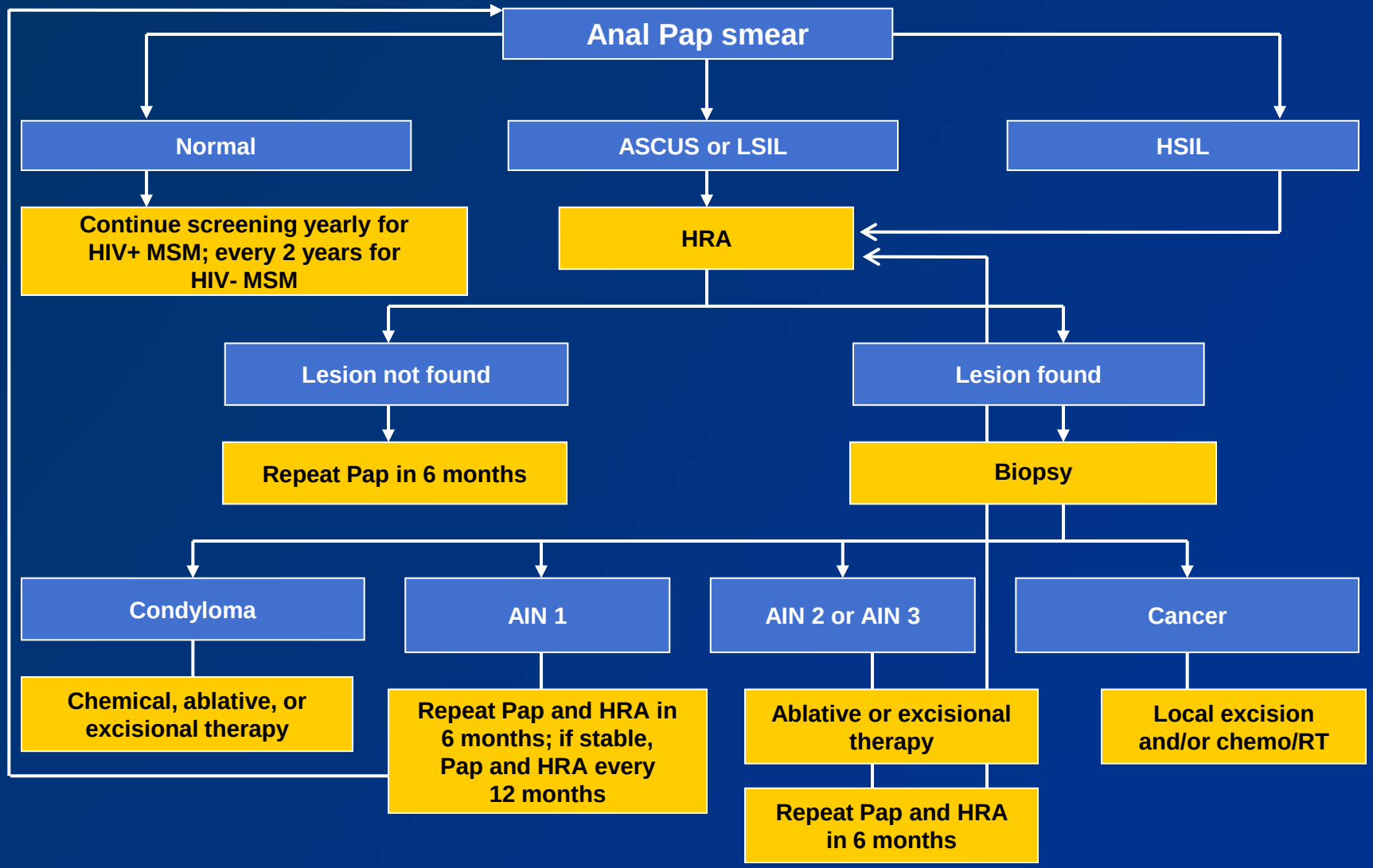


Screening Recommendations for Anal Dysplasia: At-Risk Groups

- All HIV+ MSM
- All HIV- MSM
- All HIV+ men and women
- Men with condyloma
- Women with vulvar dysplasia
- Women who engage in anal sex
- Women with CIN 2/3 (??)

CIN = cervical intraepithelial neoplasia; MSM = men who have sex with men.

Management of Anal Pap Results[1]



AIN = anal intraepithelial neoplasia; ASCUS = atypical squamous cells of undetermined significance; HRA = high-resolution anoscopy; HSIL = high-grade squamous intraepithelial lesion; LSIL = low-grade SIL; MSM = men who have sex with men; RT = radiotherapy.

1. Adapted with permission from Panther LA et al. *AIDS Read.* 2005;15:79–91.

Prophylactic Vaccine in Males

Study design

- Randomized (1:1), double-blind, placebo-controlled
- 3 doses of qHPV Vaccine or placebo at 0, 2, and 6 months
- Planned 36 month follow-up (mean 30.1 months in current analysis)
- Enrolled subjects:
  - 3463 heterosexual men (HM)
    - 16-23 years old
  - 602 men having sex with men (MSM)
    - 16-26 years old

Key Inclusion/Exclusion Criteria

- No evidence of genital lesions
- No history of genital warts
- Lifetime sexual partners:
  - MSM: <5; identify themselves as MSM and engaged in oral sex or receptive/insertive anal sex with another man within the last year

POPULATIONS STUDIED

- Per-protocol population
  - This population consisted of individuals who:
    - Were seronegative to the relevant HPV type(s) at Day 1
    - Were PCR negative to the relevant HPV type(s) through Month 7
    - Received all 3 vaccinations within pre-specified day ranges
    - Did not deviate from the study protocol
    - Cases were counted starting after month 7
- Intention-to-treat population
  - This population consisted of individuals who:
    - Received at least one dose of vaccine/placebo
    - Returned for follow-up
    - Cases were counted starting after day 1

Results

Baseline Demographics of Total Population

	qHPV (n = 2,029)	Placebo (n = 2,036)	Total (n = 4,065)
	n (%)	n (%)	n (%)
Gender			
Male	2,029 (100)	2,036 (100)	4,065 (100)
Age (years)			
Mean +/- SD	20.5 +/- 2.0	20.5 +/- 2.0	20.5 +/- 2.0
Median (range)	20 (15-26)	20 (16-27)	20 (15-27)
Race/Ethnicity			
Asian	201 (9.9)	205 (10.1)	406 (10.0)
Black	412 (20.3)	393 (19.3)	805 (19.8)
Hispanic American	388 (19.1)	447 (22.0)	835 (20.5)
Native American	2 (0.1)	1 (0.0)	3 (0.1)
White	734 (36.2)	697 (34.2)	1,431 (35.2)
Other	292 (14.4)	293 (14.4)	585 (14.4)
Circumcision			
Yes	794 (39.1)	749 (36.8)	1,543 (38.0)
No	1,232 (60.7)	1,286 (63.2)	2,518 (61.9)
Missing or Unknown	3 (0.1)	1 (0.0)	4 (0.1)
HPV positivity (sero or DNA)			
≥1 vaccine HPV type	321 (15.9)	326 (16.1)	647 (16.0)
All 4 vaccine HPV types	3 (0.1)	6 (0.3)	9 (0.2)

N = Number of subjects randomized.
Percent calculated as 100(n/N)*

Natural History of HPV in Males
Cross-Sectional Analysis
Day 1 HPV Prevalence (PCR and Serology)

HPV DNA Prevalence

- **12.2%** PCR positive to at least 1 of the 4 vaccine types
  - **87.8%** naïve to all 4 types
  - HM: 8.8%
  - MSM: 30.5%

Serology

- **7.6%** seropositive to at least 1 of the 4 vaccine types
  - HM: 5.0%
  - MSM: 22.8%

HPV Type	PCR Prevalence (%)	Seroprevalence (%)
HPV 6	4.7	4.4
HPV 11	1.4	1.5
HPV 16	5.1	2.3
HPV 18	2.8	1.1

*14 tested types – 6/11/16/18 vaccine types and 31/33/35/39/45/51/52/56/58/59

Immune Response of Males Aged 16-26 Years to qHPV vaccine

	Vaccine (N=2,025)			Placebo (N=2,030)			
	n	GMT (mMU/mL)	95% CI	n	GMT (mMU/mL)	95% CI	P-value†
Anti-HPV 6	1,093	**447.0**	(422.1, 473.5)	1,110	**< 7**	(<7, <7)	<0.001
Anti-HPV 11	1,093	**624.2**	(594.4, 655.6)	1,109	**< 8**	(<8, <8)	<0.001
Anti-HPV 16	1,136	**2,402.5**	(2,270.6, 2,542.0)	1,128	**< 11**	(<11, <11)	<0.001
Anti-HPV 18	1,175	**402.2**	(380.2, 425.6)	1,205	**< 10**	(<10, <10)	<0.001

Seroconversion rates of 90-97% (highest for HPV 6 &11 and lowest for HPV 18) GMT peaking at M 7 with some falloff at month 24

The estimated GMTs and associated CIs are calculated using an ANOVA model with a term for vaccination group.

N = Number of subjects randomized to the respective vaccination group who received at least 1 injection; n = Number of subjects contributing to the analysis; ANOVA = Analysis of variance; CI = Confidence interval; cLIA = Competitive Luminex immunoassay; GMT = Geometric mean titer; HPV = Human papillomavirus; mMU = Milli Merck units.

EFFICACY AGAINST HPV 6/11/16/18-RELATED EGL

Per-protocol population

Severity	VACCINE (n = 1,397)		Placebo (n = 1,408)		% Efficacy	95% CI
	Cases	Rate	Cases	Rate		
All EGLs	3	0.1	32	1.0	90.4	70.1, 98.2
Condyloma	3*	0.1	28	1.0	89.3	65.3, 97.9
PIN 1	0	0.0	2	0.1	--	--
PIN 2/3	0	0.0	2	0.0	--	--
PPP cancer	0	0.0	0	0.0	--	--

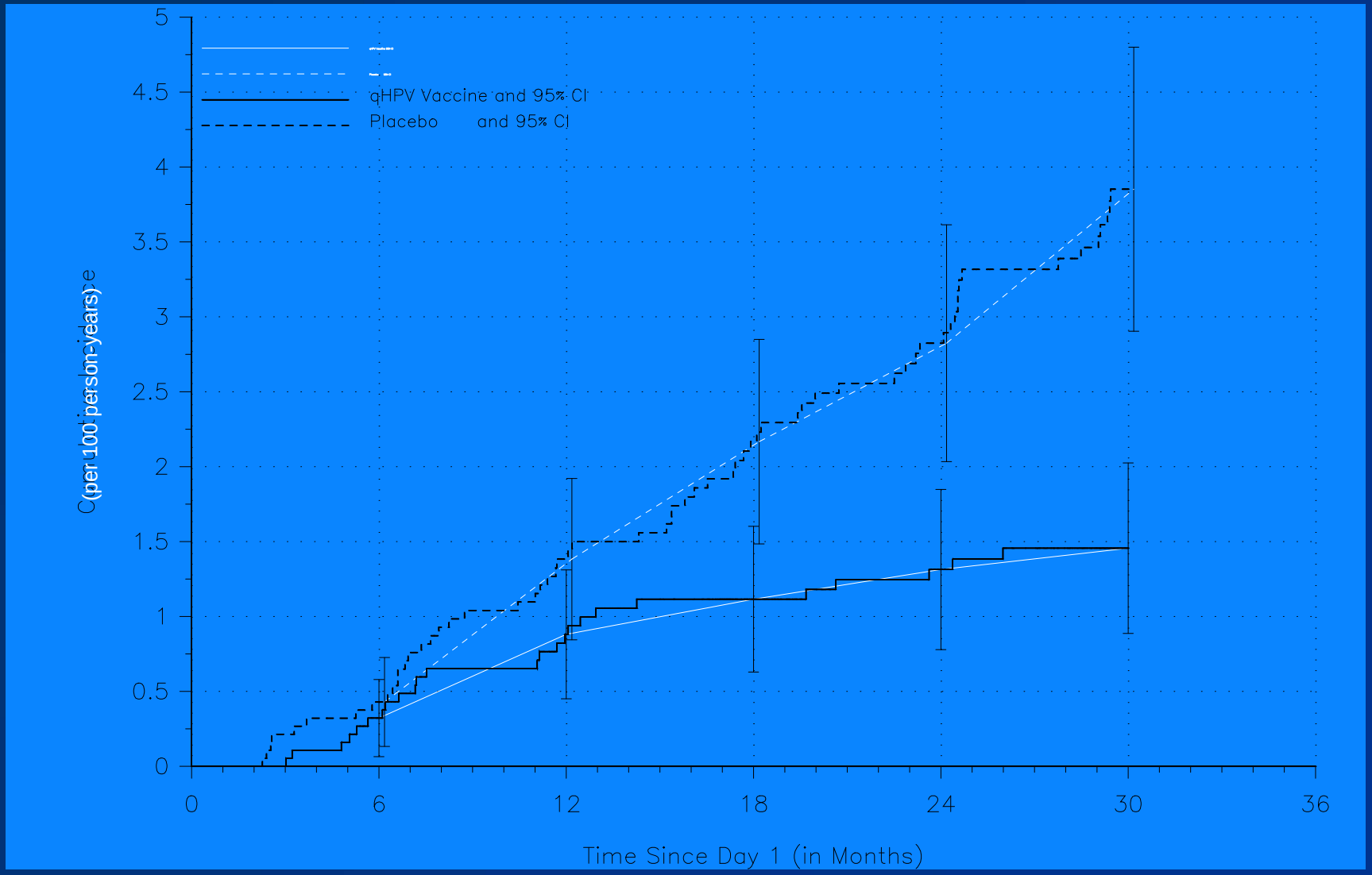
*Two cases related to HPV 6 alone, and one case related to HPV 6/11/35

n = number of subjects randomized who received at least one injection and have follow-up after month 7; rate= incidence per 100 person years at risk; CI = confidence interval; EGL = external genital lesion; PPP = penile, perianal, perineal; PIN = penile/perianal/perineal intraepithelial neoplasia; case counting began after month 7.

ANALYSIS OF TIME TO ANY HPV 6/11/16/18-RELATED EGL

Intention-to-treat population

Efficacy at month 30 = 65.5%
(95% CI: 45.8, 78.6)



EFFICACY AGAINST PERSISTENT INFECTION

Per-protocol population

PERSISTENT INFECTION*	Vaccine		Placebo		Efficacy	95% CI
	Cases	Inc. per 100 PY	Cases	Inc. per 100 PY		
HPV 6/11/16/18 related	15	0.6	101	4.1	85.6%	(73.4, 92.9)
HPV 6 related	4	0.2	33	1.4	88.0%	(66.3, 96.9)
HPV 11 related	1	0.0	15	0.6	93.4%	(56.8, 99.8)
HPV 16 related	9	0.4	41	1.8	78.7%	(55.5, 90.9)
HPV 18 related	1	0.0	25	1.0	96.0%	(75.6, 99.9)

**HPV 6, 11, 16, and/or 18 DNA detected by a PCR assay on for the same HPV type in 2 consecutive anogenital swab or biopsy samples collected at least 4 months apart; or external or anal disease and HPV 6, 11, 16, or 18 DNA detected by PCR in an adjacent section of the same biopsy block (and HPV 6, 11, 16, or 18 DNA detection by PCR assay for the same HPV type at an adjacent visit)*

Efficacy against HPV 6/11/16/18-related AIN and anal cancer

Per-protocol population

	qHPV Vaccine (N=299)			Placebo (N=299)					
	n	Cases	Rate	n	Cases	Rate	Efficacy (%)	CI	P-value
HPV 6/11/16/18-Related AIN and Anal Cancer	194	5	1.3	208	24	5.8	**77.5**	(39.6, 93.3)	< 0.001
By lesion type									
AIN 1	194	4	1.0	208	16	3.9	**73.0**	(16.3, 93.4)	
Condyloma Acuminatum	194	0	0.0	208	6	1.4	**100**	(8.2, 100)	
Non-acuminate	194	4	1.0	208	11	2.6	**60.4**	(-33.5, 90.8)	
AIN 2 or worse	194	3	0.8	208	13	3.1	**74.9**	(8.8, 95.4)	
AIN 2	194	2	0.5	208	9	2.2	**75.8**	(-16.9, 97.5)	
AIN 3	194	2	0.5	208	6	1.4	**63.7**	(-103.0, 96.4)	
Anal Cancer	194	0	0.0	208	0	0.0	**NA**	NA	

†Cases found from performing an HRA due to the presence of perianal external lesions are not included in this analysis to eliminate potential ascertainment bias.

A p-value<0.0245 (one-sided) corresponds to a lower bound of the confidence interval for vaccine efficacy greater than 0% and supports the conclusion that the vaccine is efficacious against the given endpoint

N = Number of subjects in the MSM substudy randomized to the respective vaccination group who received at least 1 injection.

n = Number of subjects in the MSM substudy who have at least one follow-up visit after Month 7.

AIN = Anal intraepithelial neoplasia.

Efficacy against HPV 6/11/16/18-related AIN and anal cancer

Full analysis set

	qHPV Vaccine (N=299)			Placebo (N=299)				
	n	Cases	Rate	n	Cases	Rate	Efficacy (%)	CI
HPV 6/11/16/18-Related AIN and Anal Cancer	275	38	6.3	276	77	12.6	**50.3**	(25.7, 67.2)
By lesion type								
AIN 1	275	31	5.0	276	62	9.9	**49.6**	(21.2, 68.4)
Condyloma Acuminatum	275	13	2.0	276	31	4.7	**57.2**	(15.9, 79.5)
Non-acuminate	275	27	4.2	276	48	7.5	**43.3**	(7.3, 66.0)
AIN 2 or worse	275	18	2.7	276	39	6.0	**54.2**	(18.0, 75.3)
AIN 2	275	11	1.6	276	29	4.3	**61.9**	(21.4, 82.8)
AIN 3	275	10	1.5	276	19	2.8	**46.8**	(-20.2, 77.9)
Anal Cancer	275	0	0.0	276	0	0.0	**NA**	NA

N = Number of subjects in the MSM substudy randomized to the respective vaccination group who received at least 1 injection.

n = Number of subjects in the MSM substudy who have at least one follow-up visit after Day 1.

Efficacy against HPV 6/11/16/18-related AIN and anal cancer

Per-protocol population

	qHPV Vaccine (N=299)			Placebo (N=299)					
	n	Cases	Rate	n	Cases	Rate	Efficacy (%)	CI‡	P-value
HPV 6/11/16/18-Related AIN and Anal Cancer	194	5	1.3	208	24	5.8	**77.5**	(39.6, 93.3)	< 0.001
By HPV Type									
HPV 6-Related AIN and Anal Cancer	141	3	1.1	144	10	3.4	**67.5**	(-26.4, 94.2)	
HPV 11-Related AIN and Anal Cancer	141	0	0.0	144	6	2.0	**100**	(9.3, 100)	
HPV 16-Related AIN and Anal Cancer	167	2	0.6	170	6	1.8	**65.5**	(-92.8, 96.6)	
HPV 18-Related AIN and Anal Cancer	173	0	0.0	193	4	1.0	**100**	(-70.0, 100)	

†Cases found from performing an HRA due to the presence of perianal external lesions are not included in this analysis to eliminate potential ascertainment bias.

‡ A 95.1% CI is reported for the HPV 6/11/16/18-related AIN and anal cancer endpoint. For all analyses by HPV type and lesion type, a 95% CI is reported. The CI reported for the HPV 6/11/16/18-related AIN and anal cancer endpoint differs from the other analyses due to the alpha adjustment applied.

A p-value<0.0245 (one-sided) corresponds to a lower bound of the confidence interval for vaccine efficacy greater than 0% and supports the conclusion that the vaccine is efficacious against the given endpoint

N = Number of subjects in the MSM substudy randomized to the respective vaccination group who received at least 1 injection.

n = Number of subjects in the MSM substudy who have at least one follow-up visit after Month 7.

AIN = Anal intraepithelial neoplasia.

ADVERSE EXPERIENCE SUMMARY

Days 1-15 following any vaccination visit

	Vaccine		Placebo	
	n	%	n	%
Subjects in analysis population	2,020		2,029	
Subjects with follow-up	1,945		1,950	
Number of subjects:				
With one or more adverse experiences	1,345	69.2	1,244	63.8
injection-site adverse experience	1,169	60.1	1,047	53.7
systemic adverse experience	615	31.6	613	31.4
With vaccine-related adverse experiences	1,242	63.9	1,134	58.2
injection-site adverse experiences	1,169	60.1	1,046	53.6
systemic adverse experiences	274	14.1	284	14.6
With serious adverse experiences*	5	0.3	1	0.1
serious vaccine-related adverse experiences	0	0.0	0	0.0

n = number of subjects in given category.
**Serious adverse experiences in vaccine group included: appendicitis, cellulitis, chest pain, varicella convulsion, and peanut allergy.*
Serious adverse experiences in the placebo group included traffic accident.

Conclusions

Prevalence of vaccine HPV types at baseline was relatively low; seroconversion following vaccination was high

qHPV vaccine was highly efficacious in reducing the incidence of external genital lesions in men aged 16-26 years

- qHPV vaccine was highly efficacious in preventing AIN 1, 2 and 3 related to HPV 6/11/16/18 in MSM subjects naïve to vaccine HPV types at enrollment

- Efficacy was seen against AIN1, condyloma , AIN 2, AIN 3 in both the per protocol and the full analysis populations

- qHPV vaccine was generally well tolerated


my ass hurts
what?
D.Rewby 2005