

STD TREATMENT GUIDELINES TABLES: HEALTH CARE WORKERS

Author/Citation	Study Design	Population, Sample Size, Methods	Outcome measures	Summary Points
Abramson Arch Otolaryngol Head Neck Surg 1990	Cross-sectional	7 patients w laryngeal papilloma 1 had suction tip applied directly to papilloma 6 had tip held above during laser therapy and smoke collected into phosphate buffered saline collection trap 5/6 then had suction tip placed onto papilloma and plume collected	HPV detected via Southern blot	No HPV detected unless contact made directly with papilloma 2 samples had HPV DNA via Southern blot) (not using sensitive techniques, laryngeal papilloma also with low copies of viral DNA compare to EGW)
Andre J Am Acad Dermatol 1990	Case series	3 patients treated by CO2 laser for EGW Biopsies obtained from warts and Plumes collected in buffered saline, DNA extracted	Presence of HPV6 by blot hybridization	2/3 patients had HPV6 DNA detected in both the lesion and laser plume
Bergbrant Acta Derm Venereol 1994	Cross sectional	19 physicians performing electrocoagulation of EGW. 11 physicians CO2 laser of EGW Samples taken from nasolabial fold, nostrils, conjunctiva both pre and post-procedure	Presence of HPV DNA 6, 11, 16,18, or 33 via PCR pre and post procedure	No conjunctival HPV noted Post Electrocoagulation Nasolabial: 2/19 to 6/19 post-procedure Nostril: 0/19 to 3/19 post-procedure Post laser Pre procedure contamination already present in personnel performing laser. Nasolabial 2/11 to 3/11-post Nostril 3/11 pre and 3/11-post
Calero Laryngo-Rhino-Otol 2003	Case report	28 y/o OR nurse who assisted with electrosurgery and laser surgery of EGW developed recurrent laryngeal papillomatosis Report in German. Per online translator: Room was utility room and was "not ventilated"	N/A	HPA-DNA has been detected in laser plume after EGW therapy. Risk of exposure seems worse for EGW than for tx of laryngeal papillomas (author opinion)
CDC-National Institute for Occupational Safety and Health (NIOSH) 1996	Guidelines	NIOSH recommendation on smoke from laser or electrosurgical procedures recommends use of general room ventilation and local exhaust ventilation (LEV)		LEVs (portable smoke evacuator or room suction system) should be used (smoke evacuator preferred), should be held 2 inches from site,
Ding Gynecologic Oncology 2011	Longitudinal	HPV16 pseudoviruses mixed with PBS (phosphate buffered saline) cervicovaginal secretions and serum, also desiccated, to mimic contamination of 1) wet surface by vulval HPV 2) blood, 3) CVS, air dried contamination, vaginal cell debris	Infectivity after 0-7 days	Infectivity at least 30% in PBS for 7d In serum, infectivity was 30-50% for 3 days In CVS, infectivity was lower (18%) for 7 d Purified pseudovirus infectivity was reduced by desiccation

		Incubated w HeLa cells		Virus in crude cell extracts maintained infectivity (10%) for 7 days
Ferenczy Am J Obstet Gynecol 1990	Cross sectional	43 patients (88% female) with EGW, CIN1-3 Swabs collected from surface of lesions and from treated area and normal margin of tissue.	Detection of HPV DNA via dot blot hybridization	34/43 lesions were + for HPV DNA. At laser margins, 4/43 were + HPV before rx (9%) and 7/43 (16%) were + after rx (NS)
Ferenczy Obstetrics/Gynecology 1990	Cross sectional	110 patients (88% female) with EGW and/or flat condyloma treated with CO2 laser Swabs collected from surface of lesions and from vacuum tubes and pre-filter cannisters. Also samples taken from nasopharynx, eyelids and ears of laser operator (Ferenczy)	Detection of HPV 6, 11, 16,18, or 31/33/35 DNA via filter hybridization Virapap)	1/5 pre filter cannister was +for HPV 6 Vacuum tubes samples were negative, and samples from laser operator also negative
Garden Arch Dermatol 2002	Cross sectional	Bovine papillomainduced cutaneous fibropapillomas were treated with CO2 laser at 3 commonly used settings for human EGW Aerosol was suctioned, collected and re- inoculated into skin of calves	Detection of BPV DNA and papilloma at site of inoculation	All laser plume samples were positive (all 3 settings) All calves developed fibropapillomas (2 large, 1 small)
Garden JAMA 1988	Cross sectional	7 patients with plantar/mosaic warts treated with CO2 laser, biopsy performed of lesions	Detection of HPV DNA via hybridization	2/7 patients had Intact HPV DNA present in laser smoke 6/7 had HPV DNA detected in biopsies of lesions
Gloster J Am Acad Dermatol 1995	Prospective	N=570 laser surgeons (AS Laser Med, AS Derm Surg) sent survey on practices, protective equipment and self reported warts # reporting warts/# responding to survey=provider "incidence" # of pts with warts seen at Mayo 1988- 92/population of Olmstead 1988-92 county=incidence	Self reported warts among survey respondents vs warts incidence over 5 year period in Olmstead county	No difference in self reported warts among providers compared to general population of olmstead county 31/570 (5.4%) reported warts. Warts found on Face (8), Hands (18), Nasopharynx (4), Feet (1) % of pts with warts in Olmstead County 4.9%
Hallmo Eur Arch Otorhinolaryngol 1991	Case report	44 yr old laser surgeon who had treated 5 cases of EGW in 2.5 yrs prior presented with laryngeal papillomas. No laser smoke evacuator system was used by hospital where surgeon practiced. Surgeon wore		Patient underwent removal of papillomas with CO2 laser and had a full recovery

		conventional mask, gloves.		
Hughes J Am Acad Dermatol 1998	Cross sectional	5 patients with common warts on the extremities were treated with YAG laser, laser plume collected	HPV DNA detection via PCR of plume	All 5 specimens were + for HPV2 0/5 YAG laser plume had HPV DNA
Illmarinen Eur Arch Otorhynolaryngol 2012	Cross Sectional	N=5 patients with laryngeal papilloma and 5 with urethral warts underwent Co2 laser Oral mucosa specimens obtained from patients, surgery team pre/post op Wart biopsies and masks/gloves also sampled	Detection of HPV DNA via PCR	Glove samples after laryngeal papilloma tx had HPV DNA in 1/5 surgeons and 3/5 nurses After EGW 5/5 had HPV on gloves 0/18 employees had HPV in oral mucosa and surgical masks were all HPV negative
Kashima Otolaryngol Head neck Surg 1991	Cross sectional	N=22 patients- 19 RRP, 2 laryngeal CA, 1 non-specific laryngitis. CO2 vapor was collected and compared to tissue specimens	HPV DNA via PCR	HPV 6 or 11 was detected in 17/27 vapor plume specimens from RRP pts, none from any other specimens
Lobraico J Laser Applications 1988	Cross sectional	N=824 physicians, convenience sample multiple specialists who did laser therapy	Self reported warts or lesions	Response rate 18.7% 3% report lesions on hands, arms, or body
Lobraico J Gynecol Surg 1989	Cross sectional	N=902 physicians, convenience sample multiple specialists who did laser therapy.	Self reported "HPV lesions"	Response rate 17% 2.8% of overall sample reported lesions on the hands
Sawchuk J Am Acad Dermatol 1988	Cross sectional	8 people with plantar warts underwent CO2 laser on ½ of the wart and electrocoagulation on the other half, vapor from procedure and	HPV DNA detected via dot blot hybridization	HPV 1 and 2 DNA found in 5/8 laser vapors and 4/7 electrocoagulation vapors (1 vapor unable to be analyzed)
Roden JID 1997	Cross sectional	In vitro infectivity of HPV-16 pseudovirions Dessicated Reconstituted and then adsorbed to cultured mouse cells for 1h at 37 C	Infectivity of reconstituted dessicated samples	HPV16 pseudovirion infectivity was 100%, 50%, and 30% after 1 day, 3, and 7 days of dessication Completely inactivated by autoclave and 70% ethanol
Sood Infectious Diseases in OBGYN, 1994	Cross- sectional	49 women undergoing LEEP for CIN smoke plumes collected via filters 2 control filters also collected Filters digested tested for HPV PCR Lesions also tested for HPV	Detection of HPV DNA via PCR	39/49 LEEP specimens were + for HPV 18/49 (37%) of filters were positive for HPV All + filters came from specimens + for HPV Control filters were negative

Strauss STI 2002 STI 2003	Cross sectional	Environmental sites in genitourinary medicine (GUM) clinic sampled for HPV Staff leisure center and fitness center also sampled Follow up study performed of GUM clinic A using different types of detergent/cleaning products	Detection of HPV DNA via PCR	HPV 6, 11, 16, 31, 42 (varying combinations) found at more than 50% of sites in GUM clinic A, a high volume clinic which cleaned treatment rooms once/week and exam tables at the end of each day. No HPV in clinic B or in fitness center or staff leisure center In follow up study, only cryoguns and light switch positive for HPV (6, 11, 16, 18)
Weyandt Arch Dermatol Res 2011	Cross sectional	Argon plasma coagulation (APC) and CO2 laser ablation of 18 EGW cases Petri dishes in OR 1m and 2 m f/ tx field Swabs taken from glasses and nasolabial folds from MD in 10 cases	Detection of HPV DNA via PCR	APC-No HPV DNA matching with patients found in dishes and swabs (one HPV12 & 107 but patient had HPV6) CO2 laser: HPV6 detected in 3/10 suction filters but not in petri dishes
Wisniewski Journal of Reproductive Medicine 1990	Cross sectional	8 patients with vulvar condyloma and 2 with CIN, treated with CO2 laser, ejecta specimens collected	Detection of HPV DNA via Southern blot	Insufficient DNA for Southern blot, no HPV detected.

References

1. Abramson AL, DiLorenzo TP, Steinberg BM. Is papillomavirus detectable in the plume of laser-treated laryngeal papilloma? Arch Otolaryngol Head Neck Surg. 1990 May;116(5):604-7.
2. Andre P, Orth G, Evenou P, Guillaume JC, Avril MF. Risk of papillomavirus infection in carbon dioxide laser treatment of genital lesions. J Am Acad Dermatol. 1990 Jan;22(1):131-2.
3. Bergbrant IM, Samuelsson L, Olofsson S, Jonassen F, Ricksten A. Polymerase chain reaction for monitoring human papillomavirus contamination of medical personnel during treatment of genital warts with CO2 laser and electrocoagulation. Acta Derm Venereol. 1994 Sep;74(5):393-5.
4. Calero L, Brusis T. [Laryngeal papillomatosis - first recognition in Germany as an occupational disease in an operating room nurse]. Laryngorhinootologie. 2003 Nov;82(11):790-3. German.
5. CDC-National Institute for Occupational Safety and Health. Control of Smoke from Laser/Electric Surgical Procedures. NIOSH Publication Number 96-128, available at <http://www.cdc.gov/niosh/docs/hazardcontrol/hc11.html>, Accessed 4/17/2013.

6. Ding DC, Chang YC, Liu HW, Chu TY. Long-term persistence of human papillomavirus in environments. *Gynecol Oncol*. 2011 Apr;121(1):148-51. doi:10.1016/j.ygyno.2010.11.040. Epub 2011 Jan 3.
7. Ferenczy A, Bergeron C, Richart RM. Carbon dioxide laser energy disperses human papillomavirus deoxyribonucleic acid onto treatment fields. *Am J Obstet Gynecol*. 1990 Oct;163(4 Pt 1):1271-4.
8. Ferenczy A, Bergeron C, Richart RM. Human papillomavirus DNA in CO2 laser-generated plume of smoke and its consequences to the surgeon. *Obstet Gynecol*. 1990 Jan;75(1):114-8.
9. Garden JM, O'Banion MK, Bakus AD, Olson C. Viral disease transmitted by laser-generated plume (aerosol). *Arch Dermatol*. 2002 Oct;138(10):1303-7.
10. Garden JM, O'Banion MK, Shelnitz LS, Pinski KS, Bakus AD, Reichmann ME, Sundberg JP. Papillomavirus in the vapor of carbon dioxide laser-treated verrucae. *JAMA*. 1988 Feb 26;259(8):1199-202.
11. Gloster HM Jr, Roenigk RK. Risk of acquiring human papillomavirus from the plume produced by the carbon dioxide laser in the treatment of warts. *J Am Acad Dermatol*. 1995 Mar;32(3):436-41.
12. Hallmo P, Naess O. Laryngeal papillomatosis with human papillomavirus DNA contracted by a laser surgeon. *Eur Arch Otorhinolaryngol*. 1991;248(7):425-7.
13. Hughes PS, Hughes AP. Absence of human papillomavirus DNA in the plume of erbium:YAG laser-treated warts. *J Am Acad Dermatol*. 1998 Mar;38(3):426-8.
14. Ilmarinen T, Auvinen E, Hiltunen-Back E, Ranki A, Aaltonen LM, Pitkäranta A. Transmission of human papillomavirus DNA from patient to surgical masks, gloves and oral mucosa of medical personnel during treatment of laryngeal papillomas and genital warts. *Eur Arch Otorhinolaryngol*. 2012 Nov;269(11):2367-71.
15. Kashima HK, Kessis T, Mounts P, Shah K. Polymerase chain reaction identification of human papillomavirus DNA in CO2 laser plume from recurrent respiratory papillomatosis. *Otolaryngol Head Neck Surg*. 1991 Feb;104(2):191-5.
16. Lobraico RV, Grossweiner LI. Clinical experiences with photodynamic therapy for recurrent malignancies of the lower female genital tract. *J Gynecol Surg* 1993;9(1):29-34.
17. Roden RB, Lowy DR, Schiller JT. Papillomavirus is resistant to desiccation. *J Infect Dis*. 1997 Oct;176(4):1076-9.

18. Sawchuk WS, Weber PJ, Lowy DR, Dzubow LM. Infectious papillomavirus in the vapor of warts treated with carbon dioxide laser or electrocoagulation: detection and protection. *J Am Acad Dermatol*. 1989 Jul;21(1):41-9.
19. Sood AK, Bahrani-Mostafavi Z, Stoerker J, Stone IK. Human papillomavirus DNA in LEEP plume. *Infect Dis Obstet Gynecol*. 1994;2(4):167-70.
20. Strauss S, Stephen H, Sonnex C, Gray J. Contamination of environmental surfaces by genital human papillomaviruses (HPV): a follow up study. *Sex Transm Infect*. 2003 Oct;79(5):426-7.
21. Weyandt GH, Tollmann F, Kristen P, Weissbrich B. Low risk of contamination with human papilloma virus during treatment of condylomata acuminata with multilayer argon plasma coagulation and CO₂ laser ablation. *Arch Dermatol Res*. 2011 Mar;303(2):141-4.
22. Wisniewski PM, Warhol MJ, Rando RF, Sedlacek TV, Kemp JE, Fisher JC. Studies on the transmission of viral disease via the CO₂ laser plume and ejecta. *J Reprod Med*. 1990 Dec;35(12):1117-23.