



A Retrospective Analysis of the Therapeutic Efficacy of Photodynamic Therapy, Chinese Medicine Paiteling, and CO₂ Laser in High-risk HPV-associated Cervical Low-grade Squamous Intraepithelial Lesion



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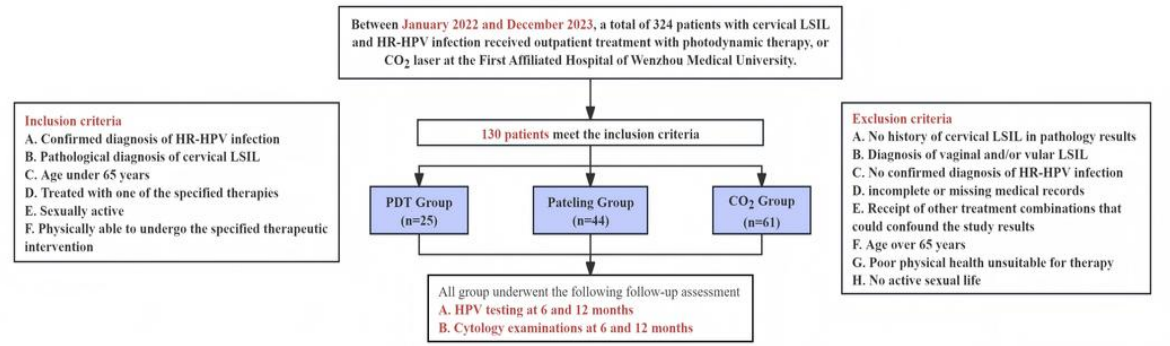
Introduction

- Approximately 80% of CIN1 lesions regress spontaneously, with **a small proportion progressing to higher-grade lesions**. As a result, active treatment is generally not recommended for LSIL.
- Patients diagnosed with HPV infection and pathology not exceeding LSIL (**≤LSIL**) are typically managed with regular follow-up. However, the risk of lesion progression during surveillance can **cause considerable psychological distress**, which may negatively affect recovery.
- There is **no specific drug** available to eliminate HPV infection or reverse LSIL.

To evaluate the therapeutic effectiveness in LSIL associated with HR-HPV infection.

- photodynamic therapy (PDT)
- CO₂ laser therapy
- Chinese medicine Paiteling

Methods



Results

Table 1. Baseline Characteristics of Participants Across the PDT, Paiteling, and CO₂ Laser Treatment Groups

Factors	PDT Group N=25	Paiteling Group N=44	CO ₂ laser Group N=61	X ²	P-value
Cervical cytology					
NILM	13 (52.0%)	32 (72.7%)	32 (52.4%)	9.363	0.123
ASCUS	5 (20.0%)	7 (15.9%)	14 (23.0%)		
LSIL	6 (24.0%)	5 (11.4%)	15 (24.6%)		
ASC-H	1* (4.0%)	0	0		
HPV 16/18 Status					
Positive	8 (32.0%)	9 (20.5%)	15 (24.6%)	1.145	0.575
Negative	17 (68.0%)	35 (79.5%)	46 (75.4%)		
History of LSIL					
≥1 Year	5 (20.0%)	14 (31.8%)	16 (26.2%)	1.160	0.572
<1 Year	20 (80.0%)	30 (68.2%)	45 (73.8%)		

*One ASC-H case was observed in the PDT group at baseline

Table 2: Cervical Cytology Results in the PDT Group at Baseline, 6 Months, and 12 Months After Treatment

	Baseline	6 Months	12 Months
NILM	13 (52.0%)	22 (88.0%)	25 (100.0%)
ASC-US	5 (20.0%)	3 (12.0%)	0
LSIL+ ^a	7 (28.0%)	0	0
X ²		9.814	17.792
P-value		0.007 ^b	<0.001 ^c

Table 3: Cervical Cytology Results in the Paiteling Group at Baseline, 6 Months, and 12 Months After Treatment

	Baseline	6 Months	12 Months	6 vs 12 Months
NILM	32 (72.7%)	40 (90.9%)	43 (97.7%)	/
ASC-US	7 (15.9%)	3 (6.8%)	1 (2.3%)	/
LSIL	5 (11.4%)	1 (2.3%)	0	/
X ²		5.156	2.108	2.108
P-value		0.076 ^a	0.349 ^b	0.346 ^c

Table 4: Cervical Cytology Results in the CO₂ Laser Group at Baseline, 6 Months, and 12 Months After Treatment

	Baseline	6 Months	12 Months	6 vs 12 Months
NILM	32 (52.4%)	46 (75.4%)	55 (90.2%)	/
ASC-US	14 (23.0%)	6 (9.8%)	4 (6.5%)	/
LSIL	15 (24.6%)	9 (14.8%)	2 (3.3%)	/
X ²		7.213	21.577	5.657
P-value		0.029 ^a	<0.001 ^b	0.059 ^c

Table 5: Cervical Cytology Regression Outcomes Across Three Treatment Groups at 6 and 12 Months After Treatment

	6 Months Regression N (%)	12 Months Regression N (%)	6 vs 12 Months Regression N (%)
PDT (N=12)	12 (100.0%)	12 (100.0%)	3 (100.0%)
Paiteling (N=12)	11 (91.7%)	12 (100.0%)	4 (100.0%)
CO ₂ laser (N=29)	20 (69.0%)	24 (82.8%)	12 (80.0%)
X ²	6.465	4.569	1.621
P-value	0.042 ^a	0.182 ^b	0.727 ^c

Table 6: Binary Logistic Regression Adjusted for Age: Association Between Treatment and Cytological Regression at 6 Months

Variable	OR	95%CI	P-value
Age (continues)	0.961	0.879 – 1.050	0.380
Treatment Groups			
PDT	ref ^d		
Paiteling	<0.001	-	0.999
CO ₂ laser	<0.001	-	0.999

Table 7: HR-HPV Results in the PDT Group at Baseline, 6 Months, and 12 Months After Treatment

HR-HPV	Baseline	6 Months	12 Months	6 vs 12 Months
Positive	25 (100.0%)	12 (48.0%)	8 (32.0%)	/
Negative	0	13 (52.0%)	17 (68.0%)	/
X ²		17.571	22.821	1.333
P-value		<0.001 ^a	<0.001 ^b	0.248 ^c

Table 8: HR-HPV Results in the Paiteling Group at Baseline, 6 Months, and 12 Months After Treatment

HR-HPV	Baseline	6 Months	12 Months	6 vs 12 Months
Positive	44 (100.0%)	23 (52.3%)	17 (38.6%)	/
Negative	0	21 (47.7%)	27 (61.4%)	/
X ²		27.582	38.951	1.650
P-value		<0.001 ^a	<0.001 ^b	0.284 ^c

Table 9: HR-HPV Results in the CO₂ Laser Group at Baseline, 6 Months, and 12 Months After Treatment

HR-HPV	Baseline	6 Months	12 Months	6 vs 12 Months
Positive	61 (100.0%)	37 (60.7%)	25 (41.0%)	/
Negative	0	24 (39.3%)	36 (59.0%)	/
X ²		29.878	51.070	4.723
P-value		<0.001 ^a	<0.001 ^b	0.046 ^c

Table 10: HR-HPV test outcomes across three groups at the 6-month and 12-month Follow-Up

Groups	6 Months			12 Months			
	Remission N (%)	Persistence N (%) [*]	Reinfection N (%) [*]	Remission N (%)	Persistence N (%) [*]	Recurrence N (%)	Reinfection N (%) [*]
PDT (N=25)	13 (52.0%)	9 (36.0%)	4 (16.0%)	17 (68.0%)	4 (16.0%)	1 (4.0%)	3 (12.0%)
Paiteling (N=44)	21 (47.7%)	20 (45.5%)	3 (6.8%)	27 (61.4%)	11 (25.0%)	2 (4.5%)	5 (11.3%)
CO ₂ laser (N=61)	24 (39.3%)	36 (59.0%)	2 (3.3%)	36 (59.0%)	20 (32.8%)	2 (3.3%)	3 (4.9%)
X ²	1.410	4.307	4.455	0.606	2.665	0.113	0.871
P-value	0.496	0.115	0.318	0.749	0.292	1.000	0.410

* Some patients had both persistence and reinfection, so they were counted in both categories. This is why the total number may be more than the actual number of patients.

Table 11: HPV16/18 Results in the PDT Group at Baseline, 6 Months, and 12 Months After Treatment

HPV16/18 status	Baseline	6 Months	12 Months	6 vs 12 Months
Positive	8 (32.0%)	2 (8.0%)	0	/
Negative	17 (68.0%)	23 (92.0%)	25 (100.0%)	/
X ²		4.500	7.292	0.521
P-value		0.074 ^a	0.007 ^b	0.470 ^c

Table 12: HPV16/18 Results in the Paiteling Group at Baseline, 6 Months, and 12 Months After Treatment

HPV16/18 status	Baseline	6 Months	12 Months	6 vs 12 Months
Positive	9 (20.5%)	6 (13.6%)	3 (6.8%)	/
Negative	35 (79.5%)	38 (86.4%)	41 (93.2%)	/
X ²		0.723	3.474	0.495
P-value		0.572 ^a	0.118 ^b	0.482 ^c

Table 13: HPV16/18 Results in the CO₂ Laser Group at Baseline, 6 Months, and 12 Months After Treatment

HPV16/18 status	Baseline	6 Months	12 Months	6 vs 12 Months
Positive	15 (24.6%)	7 (11.5%)	5 (8.2%)	/
Negative	46 (75.4%)	54 (88.5%)	56 (91.8%)	/
X ²		3.549	5.980	0.370
P-value		0.098 ^a	0.026 ^b	0.762 ^c

Conclusions

- Our study **evaluated and compared the effectiveness of three treatment modalities, PDT, Paiteling, and CO₂ laser, in managing HR-HPV infections and cervical LSIL**. These findings provide meaningful insights into how each treatment impacts cytological and virological outcomes at 6- and 12-month follow-up intervals.
- In summary, **PDT** demonstrated statistically significant improvements in both cytological outcomes, HR-HPV and HPV16/18 clearance from baseline to 12 months. **Paiteling** showed significant improvements in cytological outcomes and HR-HPV clearance over time; however, the clearance of HPV16/18 did not reach statistical significance. In contrast, **CO₂ laser therapy** achieved significant cytological improvement and HR-HPV clearance over time, with HPV 16/18 negativity reaching statistical significance at 12 months.
- From a clinical perspective, **selecting the optimal treatment modality** may depend on various factors, including patient-specific HPV infection profiles, clinical objectives, cost considerations, and reproductive health priorities. While **PDT and Paiteling show advantages in achieving cytological normalization and reducing HPV persistence**, the CO₂ laser remains a viable, cost-effective option, particularly for patients seeking a single-session treatment approach. However, the higher costs associated with PDT and Paiteling could influence patient decision-making, especially among those prioritizing affordability over potentially superior short-term outcomes.
- Overall, **these findings reinforce the efficacy of PDT, CO₂ laser, and Paiteling in managing cervical LSIL and HR-HPV infections**. Future studies with extended follow-up periods and larger sample sizes may provide further insights into the long-term effectiveness and recurrence patterns associated with each treatment modality. Additionally, exploring patient-centered outcomes such as treatment tolerability, satisfaction, and quality of life could further inform personalized therapeutic decision-making in clinical practice.

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