**Materials and Methods**

*Study Population*

The study was approved by the Ethics Committee of the Institute of Dermatology, Chinese Academy of Medical Sciences and Peking Union Medical College (2015-KY-013). All subjects or their authorized representatives provided written informed consent prior to sample collection. The original study consisted of 18 participants, and another 24 individuals in HPV infection groups were enrolled for a subsequent validation analysis (Fig. 1). All patients were recruited from the Institute of Dermatology, Chinese Academy of Medical Sciences and Peking Union Medical College. The diagnosis of CA was initially evaluated by clinicians in dermatology and venereology based on the presence of exophytic warts, regardless of whether a pathological examination was performed. All subjects were divided into three HPV-matched groups according to the HPV genotyping: group 1, patients coinfected with both LR-HPV and HR-HPV; group 2, patients infected with LR-HPV; group 3, healthy control individuals who were undergoing plastic surgery on the chest and showed none of the clinical symptoms or evidence of HPV infection. The resected exophytic warts or normal skin were flash frozen immediately and stored at –80°C for subsequent experiments.

*HPV Genotyping Test*

Before collecting the excised tissue samples, total DNA was extracted from the anogenital exfoliated cells to amplify the HPV DNA. Laboratory examination of the HPV genotype and viral load measurements was conducted via polymerase chain reaction (PCR) using a PCR Diagnostic Kit (Daan Gene Ltd. of Sun Yat-Sen University and LBP Medicine Science and Technology (ambiping), Guangzhou, China) according to the manufacturer’s protocol. The kit can detect and quantify different genotypes of HPV, including HR-HPV types (HPV 16, 18, 26, 31, 33, 35, 39, 45, 51, 52, 53, 56, 58, 59, 66, 68, 73 and 82) and LR-HPV types (HPV 6 and 11) via a fluorescent quantitative PCR technique.

*RT2 Profiler PCR Array*

The gene expression-profiling analysis of 84 genes involved in autophagy was conducted using samples from the original 18 individuals. Total RNA was isolated with Trizol reagent (Invitrogen, Carlsbad, CA, USA), and the concentration and purity of the total RNA were measured using a NanoDrop® ND-1000 spectrophotometer. Reverse transcription of the RNA was performed with 1 µg RNA in a final volume of 20 µl using a SuperScript® III RT-PCR Kit (Invitrogen, Carlsbad, CA, USA) according to the manufacturer’s protocol. A prepared PCR mixture containing 1,050 µl SuperArray PCR master mix, 105 µl cDNA template and 945 µl RNase-free water was added to each well of a 96-well PCR plate at a volume of 20 µl/well. Quantitative real-time PCR (qPCR) was performed to screen the 84 ATGs using the Human Autophagy RT2 Profiler PCR Array (PAHS-084Z; SABiosciences, Frederick, MD, USA) according to the manufacturer's instructions. Expression levels of target genes were normalized to those of housekeeping genes (ACTB, B2M, GAPDH, HPRT1 and RPLP0), which were calculated using an Excel-based PCR Array data analysis approach (Qiagen, Hilden, Germany).

*Quantitative Real-Time PCR*

Differentially expressed ATGs were identified by the initial screening, and the subsequent validation was conducted with another 24 patients in HPV infection groups via real-time PCR. The control group was chosen as the initial 6 individuals. The method of RNA extraction from the tissue samples and the system for reverse transcription into cDNA were performed under the same conditions as described above. The primers were designed using Primer 5.0 software and are listed in Table 3. Each sample was analyzed in triplicate, and the method of 2−ΔΔCT was used to quantify the relative expression of the target genes in the different groups.

*Statistical Analysis*

Data are presented as the mean ± SE. Statistical significance was determined by one-way analysis of variance with Tukey’s post hoc test and the nonparametric Kruskal-Wallis test. All data were analyzed using GraphPad Prism 6.0 software with a significance level of p < 0.05.