



Original Article

# Expressions of HPV 16-E6 in esophageal carcinoma and it's clinical significance

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## Keywords:

Cervicitis;  
Carcinoma;  
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## ABSTRACT

**Background:** Gastrointestinal cancer is the most common malignant tumor in China. This research aims to explore the association between HPV16-E6 protein and esophageal squamous cell carcinoma.

**Materials and methods:** SP immunohistochemical method was used to examine the expression of HPV 16-E6 in 50 cases of esophageal squamous cell carcinoma, 10 cases of normal esophageal squamous cell and 10 cases of adjacent tissue.

**Result:** The expressions of HPV 16-E6 was significantly higher in esophageal carcinoma than in normal esophageal mucosa and in adjacent tissue. The expressions of HPV 16-E6 had correlation with invasive depth ( $P < 0.05$ ), but not with patient age, lymph node metastasis, tumor size ( $P > 0.05$ ).

**Conclusion:** HPV 16-E6 can promote the growth and metastasis of esophageal squamous cell carcinoma and can be a prognostic factor of esophageal squamous cell carcinoma.

## INTRODUCTION

Gastrointestinal cancer is the most common malignant tumor in China. In the recent years, the etiology and prognostic of gastrointestinal cancer have become gradually one of the modern medical research topic. This research aims at studying the etiology and prognosis of esophageal carcinoma. The role of high-risk human papilloma virus (HPV) was discussed in many other cancer research processes. Studies showed that HPV had a coding region, including gene E1, E2, E4, E5, E6 and E7. Among them, E6

can activate the transcription of genes. Meanwhile, it can promote the proliferation of cells.<sup>1,2</sup> There were also studies showing that cervical diseases were relate to HPV16 E6 mRNA.<sup>3,4</sup> The role of HPV in cervix cancer had been widely recognized. HPV18 and HPV16 may be pathogenic factors of mammary invasive ductal carcinomas, and the former may be also related to benign breast lesions.<sup>5,6</sup> However, this correlation with esophageal epithelial cells are not studied well. Using immunohistochemical techniques, we studied the expressions of HPV 16-E6 in normal esophageal mucosa, esophageal carcinoma and adjacent tissue, to explore its effect in esophageal epithelial cells infected with HPV, furthermore, we hope to analyze the prognostic factor of esophageal squamous cell carcinoma.

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**Table 1: Expression of HPV16-E6 protein in esophageal carcinoma, adjacent tissue and normal esophageal squamous cell**

| Variables            | Case No. | positive | negative | $\chi^2$          | P                 |
|----------------------|----------|----------|----------|-------------------|-------------------|
| normal mucosa        | 10       | 3        | 7        | 2.26 <sup>a</sup> | 0.17 <sup>a</sup> |
| adjacent tissue      | 10       | 5        | 5        | 0.83 <sup>b</sup> | 0.65 <sup>b</sup> |
| esophageal carcinoma | 50       | 28       | 22       | 0.73 <sup>c</sup> | 0.74 <sup>c</sup> |
| Case No.             | 440      | 200      | 240      |                   |                   |

*a esophageal carcinoma versus normal mucosa*

*b normal mucosa versus adjacent tissue*

*c esophageal carcinoma versus adjacent tissue*

## MATERIAL AND METHODS

A total of 50 esophageal squamous cell carcinoma specimens, 10 normal esophageal mucosa specimens (negative resection margin) and 10 adjacent tissue specimens (a field that contains genetically abnormal cells, can be large 3 cm in diameter around the carcinoma) underwent esophagectomy with lymph node dissection, at Affiliated Hospital of Chengde Medical College between the period from 2008 to 2011 were included in this study. All specimens were formalin-fixed and paraffin embedded. None of the cases underwent radiotherapy, chemotherapy and immunotherapy. Patient's gender, age, lymph node metastasis, tumor size and invasive depth are included in the study. The histologic subtypes of esophageal carcinoma were subclassified by experienced Pathologists.

### Immunohistochemistry

All the esophageal tissue were fixed in 40g/L formaldehyde fixative and embedded in paraffin. Sections were dewaxed and rehydrated according to a standard procedure, incubated with 3ml/L hydrogen peroxide in methanol for 15 min at room temperature. After washing twice with phosphate-buffered saline (PBS) for 5 min, tissue sections were incubated at 37<sup>o</sup> C for 20 min with blocking solution. Sections were incubated at 37<sup>o</sup> C for 2 hours with primary antibody HPV 16-E6 (SC-584, Santa Cruz Biotechnology, Inc). After washing twice with PBS (0.01mol/L, pH7.4) for 10 min, tissue sections were incubated at 37<sup>o</sup> C for 30 min with biotin-anti-rabbit IgG. After washing twice with PBS for 5 min, tissue sections were incubated with streptavidin-HRP for 30 min. Then the sections were washed twice in PBS, and they were incubated with metal-enhanced 3,3-diaminobenzidine solution for 15 min, then they were washed two times in distilled water and counterstained with hematoxylin. Negative control sections were incubated with PBS instead of primary antibody. The positive staining for HPV 16-E6 –synthesizing cells was expressed as red brown granules, which were mainly located in cell nucleus under

microscopy. At least 5 high-power ( $\times 400$ ) were chosen randomly for cell counting. The ratio of the positive staining for HPV 16-E6–synthesizing cells were calculated by dividing the number of positive cells over the total number of cells. Tumors were then classified according to their expression of HPV 16-E6 upon overview of the section. The percentage of positive cells was divided into five grades (percentage cores):

$\leq 5\%$ =score 0;

6%-20%=score 1;

21%-50%=score 2;

51%-75%=score 3; and

$> 75\%$ =score 5.

HPV 16-E6 staining positivity was determined by the scores, the scores  $\leq 1$  was defined as negative, and  $> 1$  as positive.

### Statistical analysis

The  $\chi^2$  test was used to compare the relationship in frequency distributions of Statistical analysis between the expression of HPV 16-E6 and clinical indicators. Significance was defined as  $p < 0.05$ . All the calculations were performed using SPSS18.0.

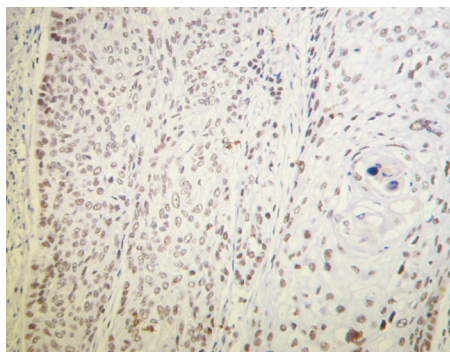
## RESULTS

The positive staining for HPV16-E6 –synthesizing cells was mainly located in the nucleus. Immunohistochemistry of different group showed that, of the 50 cases of esophageal squamous cell carcinoma, the rates of positive expression were 56.00%. The rate of HPV16-E6 positive expression was lower in adjacent tissue and normal esophageal squamous cell (50.00%, 30.00%) respectively than in esophageal squamous cell carcinoma. (Table 1)

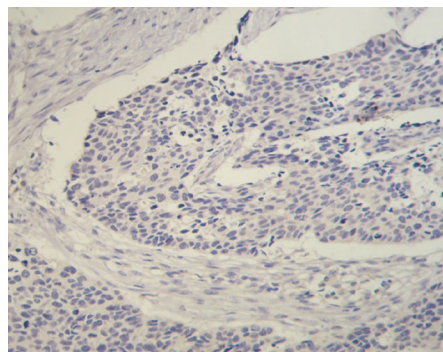
Relationship of HPV16-E6 protein expression to clinicopathologic features Out of the 50 cases of esophageal squamous cell carcinoma, the expressions of HPV 16-E6 had been correlation invasive depth  $P < 0.05$ , but not with patient age, lymph node metastasis, tumor size with P value  $> 0.05$ . (Table 2; fig. 1&2)

## DISCUSSION

Human papilloma virus is a group of DNA-containing virus, notable for the double-stranded structures. Currently identified more than 100 types of HPV are described in detail. More than 70 types of HPV can infect a strictly defined type of epithelium and cause specific changes. There are many methods to diagnose papillomavirus:



**Figure 1:** HPV16-E6 expression is more in cases with lymphatic metastasis squamous cell carcinoma (SP, X200)



**Figure 2:** HPV16-E6 expression is less in cases without lymphatic metastasis squamous cell carcinoma (SP, X200)

**Table 2: Relationship of HPV16-E6 protein expression to clinicopathologic features in 50 cases of esophageal squamous cell carcinoma**

| Group                       | Case No. | HPV16-E6 expression |          | $\chi^2$ | P Value |
|-----------------------------|----------|---------------------|----------|----------|---------|
|                             |          | positive            | negative |          |         |
| <b>Age</b>                  |          |                     |          |          |         |
| >60                         | 23       | 14                  | 9        | 0.41     | 0.58    |
| ≤60                         | 27       | 14                  | 13       |          |         |
| <b>Tumor size(cm)</b>       |          |                     |          |          |         |
| <3                          | 18       | 7                   | 11       | 4.09     | 0.13    |
| 3~5                         | 23       | 14                  | 9        |          |         |
| >5                          | 9        | 7                   | 2        |          |         |
| <b>Depth of Invasion</b>    |          |                     |          |          |         |
| Mucosa and submucosa        | 5        | 0                   | 5        | 65.71    | 0.13    |
| Muscularis                  | 10       | 5                   | 5        |          |         |
| Serosa                      | 35       | 23                  | 12       |          |         |
| <b>Lymphnode metastasis</b> |          |                     |          |          |         |
| Positive                    | 22       | 14                  | 8        | 0.93     | 0.39    |
| Negative                    | 28       | 14                  | 14       |          |         |

for example, histological morphological examination, Immunohistochemistry and PCR. The most sensitive method currently recognized is the polymerase chain reaction (PCR). The histological criterion for the diagnosis of HPV is koilocytic changes. The method have some advantages, for example convenience, with many disadvantages such as subjective and limitations. Immunohistochemistry allows the identification of capsid protein expression, which exists in a period of virus replication, and ending in false negatives. So immunohistochemistry is also not ideal.<sup>7</sup> There were many reporting on the HPV, for example in cervix, urethra, pharynx, nasal cavity, oral cavity, bronchus and oesophagus.<sup>8-10</sup> Recently, there were so much focus on the relationship of HPV and esophageal carcinoma.<sup>11,12</sup> It was reported that HPV-E6, E7 protein played a part in the occurrence and development of esophageal cancer.

According to the carcinogenicity, HPV were divided into low and high risk groups. HPV16 was considered to be at high risk. Studies showed that HPV had a coding region, including gene E1, E2, E4, E5, E6 and E7. Among them, E6 can activate the transcription of genes and promote cell multiplication leading to runaway cell division and eventually tumor formation. Open reading frame encodes the protein of E6 and E7. The increased expression of E6 and E7 in cervical carcinoma are indispensable for maintaining the transition states of tumour cells.<sup>13,14</sup> Immunohistochemical method was used in this experiment to examine the expression of HPV 16-E6 protein.

HPV 16-E6 protein contained 151 amino acids and 2 zinc finger. It's carcinogenesis is reflected as follow: E6 protein expressed by high- risk- HPV16, 18 inhibit the action of P53 by accelerating degradation and inhibiting to enter its nucleus. On the other hand, HPV16-E6 plays an important role in the immortalization of normal cells induced by HPV16. The essential attribute of immortalization is the loss of control in the cell cycle regulation.

Li T et al<sup>7</sup> have reported that loss of HPV 16-E6 protein expression is significantly associated with esophageal squamous cell carcinoma. They using PCR and ISH protocols reported that the prevalence of expression of HPV 16-E6 protein gene in the high incidence area was higher than that low incidence area. In addition, an association of HPV with esophageal carcinoma has been reported in China.<sup>15,16</sup> We using SP immunohistochemical method examined the expression of HPV 16-E6 in 50 cases of esophageal squamous cell carcinoma, 10 cases of normal esophageal squamous cell and 10 cases of adjacent tissue. Our analysis found an association of HPV with esophageal cancer.

Esophageal cancer is the most common malignant tumor in China, HPV play an important role in the development of the esophageal cancer. Next stage, more experimental methods are needed to search the factor.

**CONCLUSION**

Mast cell was higher in polypoidal cervicitis than in any other non neoplastic lesion. Large cell non Keratinizing squamous cell carcinoma was the most common neoplastic lesion encountered in the department of pathology, BPKIHS. Mast cell was higher among the metastatic lesion of cervix among the neoplastic lesion. There is a statistical significant correlation between the mast cell count of non neoplastic and neoplastic lesion of cervix with least number of mast cell present in the neoplastic lesion. There is no relation between the age of the patient and the mast cell count. There is no relation between the age of the patient and the nature of cervical disease (non neoplastic or neoplastic). Mitotic figures and the mast cell count doesn't have statistical significant relation.

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