



Vagina vasorum dissection during D2 lymphadenectomy for gastric carcinoma

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Abstract

AIM: To explore the relationship between metastasis and vagina vasorum in the progress of gastric carcinoma and to find some facts and references for gastric surgeons.

METHODS: One hundred and seven specimens of left or right gastric arteries (55 left and 52 right) were gathered from 59 patients undergoing radical gastrectomy for gastric carcinoma. All the frozen specimens were cut into 3 μm -thick sections and stained with hematoxylin-eosin (HE) and immunohistochemical method separately. Cytokeratin (CK) and mesothelial cells (MC) were stained with immunohistochemical method. Cancer cells inside vagina vasorum were detected and the structure of artery wall was observed under microscope.

RESULTS: Metastatic cancer cells or tubercles were found inside vagina vasorum in some stage III or IV specimens, but not in stage I or II specimens. Tumor cells in vagina vasorum were CK positive in 26 specimens of 14 tumors. Among them, stage III was found in 4 specimens of 2 tumors, and stage IV in 22 specimens of 12 tumors. None of these specimens was positive for MC. The positive rate of CK increased with TNM staging. Compared with the lower part, tumors in the upper and middle parts of stomach were more likely to metastasize into vagina vasorum.

CONCLUSION: Vagina vasorum dissection should be performed during D2 lymphadenectomy for TNM stage III or IV gastric carcinoma.

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Key words: Gastric carcinoma; Radical gastrectomy;

Vagina vasorum; Lymphadenectomy; Cytokeratin

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INTRODUCTION

Whether vagina vasorum should be dissected is a hot problem. Extended lymphadenectomy (D2) is the standard radical gastrectomy for gastric carcinoma^[1,2]. Now more and more gastric surgeons want to reach a consensus on this. However, vagina vasorum is a layer with tough dense connective tissue surrounding vessels. We want to know the function of vagina vasorum around gastric arteries during the progress of gastric carcinoma. We designed this study to elucidate the function of vagina vasorum around gastric arteries during the progress of gastric carcinoma and to find the relationship between vagina vasorum and metastasis of gastric cancer cells.

MATERIALS AND METHODS

Materials

One hundred and seven specimens of left or right gastric arteries (55 left and 52 right) were collected consecutively from 59 gastric cancer patients. All patients underwent radical gastrectomy for gastric carcinoma in the First Affiliated Hospital of Sun Yat-Sen University. These cases included TNM stages I-IV gastric cancer. Thirty-three patients were male (55.93%) and twenty-six were female (45.07%). Their average age was 55.2 ± 13.4 years. Pathologic grading was done after each radical gastrectomy for gastric cancer (Table 1).

Methods

All the 107 frozen specimens were cut into 3 μm -thick sections. The sections were divided into 3 groups (A-C). All the specimens were stained with hematoxylin-eosin (HE) to find metastatic cancer cells inside vagina vasorum of the left and right gastric arteries. Cytokeratin was used in immuno-histochemical method for its sensitivity to epithelial tumor. At the same time, we also used mesothelial cells (MC) to eliminate mesothelial cell cancer.

Table 1 Pathologic grading of specimens

TNM stage	Patients (n)	Gastric arteries		%
		GLA	GRA	
I	6	5	5	10.2
II	13	11	12	22.0
III	17	16	14	28.9
IV	23	23	21	38.9

GLA: Gastric left artery; GRA: Gastric right artery.

Table 2 CK positive rate in different stages of gastric cancer

TNM staging	CK		Total	CK positive rate (%)	P	P
	Positive	Negative				
I	0	6	6	0		
II	0	13	13	0		
III	2	15	17	11.8		
IV	12	11	23	52.2		
Total	14	45	59	23.7		

Table 3 CK positive rate for lymph nodes

Lymph node	CK		Total	CK positive rate (%)	P
	Positive	Negative			
Positive	12	12	24	50.0	
Negative	2	33	35	5.7	

Table 4 CK positive rate for different locations of stomach

Location	CK		Total	CK positive rate (%)	P
	Positive	Negative			
Upper	4	8	12	33.3	
Middle	4	9	13	30.8	
Lower	5	28	33	15.2	
Total	13	45	58	22.4	

The sections were examined under light microscope.

Statistical analysis

All data were analyzed with SPSS11.0 for windows. The comparison of two sets of discrete differential counts was done with chi square test. $P < 0.05$ was considered statistically significant.

RESULTS

HE staining

Vagina vasorum structure and red blood cells in vessels could be found in 107 specimens with HE staining. Even metastatic cancer tubercles were found inside vagina vasorum (Figure 1).

Immunohistochemistry staining

Metastatic cancer cells or tubercles inside vagina vasorum were cytokeratin (CK) positive in 26 specimens of 14 tumors. Among them, stage III was found in 4 specimens of 2 tumors, and stage IV in 22 specimens of 12

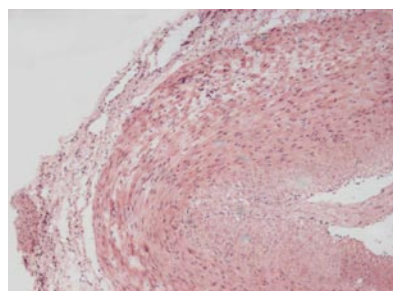


Figure 1 HE staining showing vagina vasorum and the structure of artery wall (x 200).

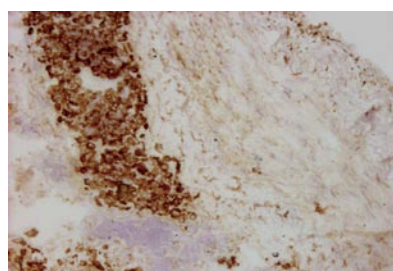


Figure 2 CK positive gastric cancer cells metastasized into vagina vasorum (IHC x 200).

tumors (Figure 2). No cancer cell was found in stage I or II specimens of vagina vasorum. All the cancer cells were stained brown with CK. However, no malignant mesothelium was found, as none of them was MC positive.

With the progression of gastric cancer, cancer cells would move into the vagina vasorum around gastric arteries. In this study, we compared CK positive rates in different TNM stages (Table 2). Fifty-nine specimens met the criteria for the TNM staging in CK positive cases. The positive rate of CK was higher in stages III and IV than in stages I and II ($P < 0.05$). Moreover, there was a significant difference between stages III and IV ($P < 0.05$).

D2 lymphadenectomy is to dissect lymph nodes. Lymph nodes in the left gastric artery, common hepatic artery and celiac artery were dissected during extended lymphadenectomy. The dissected lymph nodes were counted. The criteria for positive and negative lymph nodes were metastatic cancer cells found in any lymph node and no cancer cells found in lymph nodes, respectively. The CK positive rate in positive lymph nodes was higher than that in negative lymph nodes (Table 3).

The stomach is anatomically divided into upper, middle, and lower thirds. Cases were divided into three groups according to the location of the tumors, except for one case of diffuse infiltrative gastric cancer (Table 4). Metastasis of vagina vasorum tumor in the upper and middle thirds was more common than that in the lower third.

DISCUSSION

Several factors can produce a good prognosis of gastric cancer. However, the only way to improve survival rate is to remove the carcinoma tissues thoroughly. During radical gastrectomy for gastric carcinoma, *en bloc* excision of tumor, dissection of lymph nodes and elimination of dissociative cancer cells in abdominal cavity are the

three goals^[3]. The Japanese Gastric Cancer Association advised that D2 lymphadenectomy is the standard operation for gastric cancer^[1,2]. This has been approved by more and more surgeons in the world. The comparison between D2 and less D2 lymphadenectomy has been reported^[4-7]. The 5-year overall survival rate for patients treated with D2 lymphadenectomy is higher than that for those not treated with D2 lymphadenectomy^[7-9]. It was reported that modified D2 lymphadenectomy sparing the spleen and pancreas could be performed safely and may prolong the survival of patients^[10]. However, the postoperative mortality and morbidity are corresponding in two groups^[5,11]. Whether the vagina vasorum of gastric artery should be removed during D2 lymphadenectomy remains controversial. The vagina vasorum is a layer with tough dense connective tissue surrounding vessels containing a large number of capillaries, lymphangion and a few of neurofibrae^[12]. It was reported that if the vagina vasorum was reserved, metastatic cancer cells inside vagina vasorum may be residual, although whether gastric cancer cells metastasize through vagina vasorum cannot be confirmed^[3,13]. Rovertson *et al*^[14] reported a prospective randomized trial comparing R1 with R3 gastrectomy in 1994, showing that skeletonization of the vessels in R3 gastrectomy for gastric cancer could lead to a high morbidity because of intra-abdominal sepsis. Dong *et al*^[15] presumed that pseudoaneurysm of gastroduodenal artery following radical gastrectomy for gastric carcinoma is caused by the weakness in arterial wall due to the skeletonization resulting from lymphadenectomy.

In the earlier stage of gastric cancer, no cancer cells could be found inside vagina vasorum of gastric artery. However, tumor cells appeared in stage III or IV vagina vasorum tumors, and even cluster of cancer cells could be found in vagina vasorum of artery in some more advanced cancer samples, suggesting that tumor cells have the tendency to metastasize into vagina vasorum during the progression of carcinoma. By comparing results in Table 2 and 3, metastasis of cancer cells inside vagina vasorum increased with the development of gastric carcinoma, especially in patients accompanying lymph node metastasis.

Tumors in the upper and middle thirds of stomach had a greater tendency to metastasize into vagina vasorum compared to gastric cancer in the lower third of stomach. Though we cannot explain the differences, the prognosis of tumors in the lower third of stomach is better than that in any other locations of stomach^[16-18]. We presume that the prognosis of gastric cancer is associated with the metastasis of gastric cancer cells into the vagina vasorum.

In conclusion, vagina vasorum around gastric arteries should be dissected during D2 lymphadenectomy for gastric cancer. Metastatic gastric cancer cells should be removed thoroughly. Accurate pre-operative and operative pathologic staging is essential.

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