

The Initial Stage of Lymph Node Metastasis in Gastric Cancer: Is Sentinel Node Navigation Surgery Rational for Gastric Cancer?

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(Accepted May 20, 2004)

In consideration of the quality of life of patients, there is a trend in gastric cancer surgery to perform limited rather than extended lymph node dissection. If a sentinel node dissected during surgery is negative for cancer cells pathologically, there is believed to be almost no chance of lymph node metastasis. In this study we focused on gastric cancer cases with lymph node metastasis in order to reveal whether the lymphatic flow is a single stream from the cancerous lesion. Of 145 gastric cancer cases, about 30-40% had lymph node metastasis by multiple routes, and 30% of m, sm cancer, 38% of mp cancer, and 41% of ss cancer cases had multiple routes. Multiple sentinel nodes were involved in gastric cancer, and thus we conclude that it is difficult to identify the sentinel node in gastric cancer.

Key words: gastric cancer, sentinel node, surgery

Introduction

In consideration of the quality of life of patients, there is a trend in stomach cancer surgery to perform limited rather than extended lymph node dissection. The lymph node furthest upstream of the lymphatic drainage from a lesion is referred to as the sentinel node. If a sentinel node dissected during surgery is negative for cancer cells pathologically, there is believed to be almost no chance of lymph node metastasis. However, this methodology is based on three principles: lymphatic drainage occurs in a single stream from the cancerous lesion, lymph node metastasis occurs consecutively from upstream without jumping metastasis, and the pathological diagnosis is sufficiently accurate.

In this study we focused on gastric cancer cases with a small number of metastatic lymph nodes in order to test the hypothesis that the lymphatic flow occurs in a single stream from the cancerous lesion. Otherwise we might miss metastatic lymph nodes under the guidance of sentinel node theory.

Materials and Methods

Of 3,812 operated gastric cancer cases at our institute over the past 15 years, 145 gastric cancer cases which underwent D2 lymph node dissection and had two to four metastatic lymph nodes were included in this study. Lymphatic flow was categorized into three streams: along the greater curvature (# 4sa, 4sb, 4d, 6), along the lesser curvature (# 1, 2, 3, 5, 7, 9), and others (# 8a, 10, 11). Hematoxylin and eosin staining was used for conventional pathological diagnosis. We focused on whether metastatic lymph nodes show a pattern of distribution among groups classified by number of metastatic lymph nodes, site of disease, maximum tumor dimension, and depth of tumor invasion.

Results

1. Number of metastatic lymph nodes (Table 1)

In 64 cases with two metastatic lymph nodes, 24 (37.5%) had metastasis only in the lesser curvature stream, 23 (35.9%) in the greater curvature stream,

Table 1 Lymphatic flow of gastric cancer with lymph node metastasis

number of lymphatic flow	cases (%) of lymph node metastasis		
	2 (n = 64)	3 (n = 52)	4 (n = 29)
one route			
lesser curvature	24 (37.5)	21 (40.4) } 53.9%	11 (37.9)
greater curvature	23 (35.9)		7 (13.5)
two routes	12 (18.8)	14 (26.9)	5 (17.2)
others	5 (7.8)	10 (19.2)	7 (24.2)
total	64 (100)	52 (100)	29 (100)

Table 2 Lymphatic flow by site of the lesion (n = 145)

site	one route	two routes	others
upper			
lesser curvature	75.0	6.3	18.7%
greater curvature	33.3	33.3	33.3
anterior wall	33.3	0.0	66.7
posterior wall	100	0.0	0.0
middle			
lesser curvature	59.1	13.6	27.3
greater curvature	57.1	42.9	0.0
anterior wall	66.7	33.3	0.0
posterior wall	76.5	17.6	5.9
lower			
lesser curvature	43.8	31.2	25.0
greater curvature	83.3	11.1	5.6
anterior wall	54.5	36.4	9.1
posterior wall	44.4	22.2	33.3

Table 3 Lymphatic flow by tumor diameter (n = 145)

lymphatic flow	cases (%) of lymph node metastasis	
	< 4 cm	> 4 cm
one route		
lesser curvature	21 (43.8)	35 (36.1)
greater curvature	10 (20.8)	26 (26.8)
two routes	10 (20.8)	21 (21.6)
others	7 (14.6)	15 (15.5)
total	48 (100)	97 (100)

Table 4 Lymphatic flow by tumor depth (n = 145)

depth	cases (%) of lymph node metastasis		
	one route	two routes	others
m, sm	28 (70.0)	9 (22.5)	3 (7.5)
mp	35 (62.5)	11 (19.6)	10 (17.9)
ss	29 (59.2)	11 (22.4)	9 (18.4)

5 (7.8%) in another stream, and 12 (18.8%) had two routes.

In 52 cases with three metastatic lymph nodes, 21 (40.4%) had metastasis only in the lesser curvature stream, 7 (13.5%) in the greater curvature stream, 10 (19.2%) in another stream, and 14 (26.9%) had two routes.

In 29 cases with four metastatic lymph nodes, 11

(37.9%) had metastasis only in the lesser curvature stream, 6 (20.7%) in the greater curvature stream, 7 (24.2%) in another stream, and 5 (17.2%) had two routes.

About 30-40% of cases had lymph node metastasis by multiple routes.

2. Site of the disease

The whole stomach was categorized into twelve

blocks as listed in Table 2. Cancers in the upper part of the posterior wall and lower part of the greater curvature are more likely to have a single route than others, but no significance was seen.

3. Dimension of the tumor

We set the cut-off size at 4 cm and divided the cases into two groups. About 40% of the cases had multiple routes, and no significant difference was recognized between the two groups (Table 3).

4. Tumor depth

Thirty percents of m, sm cancer, 38% of mp cancer, and 41% of ss cancer cases had multiple routes (Table 4).

Discussion

In the 20th century surgeons made great efforts in the establishment of systematic lymphadenectomy for stomach cancer, resulting in good patient prognosis. However, 21st century social demands warrant the development of less invasive treatment for the improvement of patient quality of life.

Naturally the effectiveness of systematic lymphadenectomy for curative surgery has been reconsidered¹⁾. This has led to the concept of sentinel node navigation surgery, which is based on the hypothesis that metastasis occurs first in the node that first receives lymph flow from a neoplasm. If this hypothesis is true, excess lymphadenectomy can be avoided by examining the sentinel node pathologically²⁾³⁾. In cases with a negative sentinel node, no more lymphadenectomy is necessary. In accordance with this concept, surgery for malignant melanoma, breast cancer and colorectal cancer has become minimized with equivalent results in many clinical trials^{4)–6)}. Also in gastric cancer, many multicenter trials have been conducted to prove this hypothesis⁷⁾. However we are skeptical about this hypothesis in gastric cancer, because studies have shown that lymphatic drainage of gastric cancer flows in multiple directions, unlike in breast and colorectal cancer, and it is therefore difficult to identify the sentinel node⁸⁾⁹⁾.

The present study proves that the lymphatic flow of gastric cancer is multidirectional even in the

early stage, and that there is no significant difference in the pattern of lymphatic flow according to the site of disease, tumor dimension, or depth of tumor invasion. We previously reported that endoscopically injected RI in gastric cancer flowed downstream to the paraaortic lymph nodes via several routes. Also in this study over 30-40% of cases had two or more drainage routes, and thus there seemed to be multiple sentinel nodes. It was therefore considered difficult to identify the sentinel node in gastric cancer¹⁰⁾.

If pathological diagnosis of multiple sentinel lymph nodes must be performed during gastrectomy for gastric cancer, there may be no difference in effort between conventional lymphadenectomy and tailor-made lymphadenectomy under the sentinel lymph node navigation system. We conclude that sentinel node navigation surgery is not recommended for gastric cancer at this time.

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胃癌リンパ節転移初期像の検討
—見張りリンパ節を指標とした胃癌手術は有効か—

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胃癌外科治療におけるリンパ節廓清術は、術後 QOL を考慮して、拡大廓清から縮小廓清の方向へ転化している。さらに近年では症例個々の癌病巣からのリンパ流を確認し、流れの最上流に位置するリンパ節を sentinel node とし、このリンパ節を術中病理検索して転移のない場合は、転移なしと考え縮小手術を行う sentinel node navigation surgery が広く行われ始めている。しかし、本法はほとんどの症例で癌局在部位からのリンパ流が単一流でないと多数のリンパ節を術中に検索する必要性があり、また転移リンパ節を見落とす可能性がある。そこで今回我々は、胃癌においてリンパ節転移の初期症例として少数個リンパ節転移例を対象に、そのリンパ流が単一かを検討した。[対象]標準的 2 群リンパ節までの廓清が行われ治癒切除となった深達度 ss までの胃癌症例で、転移リンパ節個数が 2 個から 4 個までの 145 症例を対象とした。[結果]全症例の 30~40% に複数のリンパ流によるリンパ節転移が存在し、早期癌においても 30%、mp 癌では 38%、ss 癌では 41% に複数リンパ流による転移が存在した。[考察]胃癌はリンパの流れが多方向にあるため、すべての sentinel node を同定することは困難と考えられた。