Indications of Lymph Node Metastasis and Survival Analysis in T1N+M0 Gastric Cancer: a Population-Based Study

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Abstract

Background

Since the definition of early gastric cancer (EGC) was first proposed in 1971, the treatment of gastric cancer with or without lymph node metastasis (LNM) has changed a lot. The present study aims to identify risk factors for LNM and prognosis, and to further evaluate the indications for adjuvant chemotherapy (AC) in T1N+M0 gastric cancer.

Methods

A total of 1291 patients with T1N+M0 gastric cancer were retrieved from the Surveillance, Epidemiology, and End Results (SEER) database. Univariate and multivariate analyses were performed to identify risk factors for LNM. The effect of LNM on overall survival (OS) and cancer-specific survival (CSS) was compared with patients grouped into T1N0-1 and T1N2-3, as the indications for AC.

Results

The rate of LNM was 19.52%. Multivariate analyses showed age, tumor size, invasion depth, and type of differentiation and retrieved LNs were associated with LNM (p < 0.05). Cox multivariate analyses indicated age, sex, tumor size, N stage were independent predictors of OS and CSS (p < 0.05), while race was indicator for OS (HR 0.866; 95% CI 0.750–0.999, p = 0.049), but not for CSS (HR 0.878; 95% CI 0.723–1.065, p = 0.187). In addition, survival analysis showed the proportion of patients in N+/N0 was better distributed than N0-1/N2-3b. There were statistically significant differences in OS and CSS between patients with and without chemotherapy in pT1N1M0 patients (p < 0.05).

Conclusions

Both tumor size and invasion depth are associated with LNM and prognosis. LNM is an important predictor of prognosis. pT1N + M0 may be appropriate candidates for AC. Currently, the treatment and prognosis of T1N0M0/T1N+ M0 are completely different. An updated definition of EGC, taking into tumor size, invasion depth and LNM, may be more appropriate in an era of precision medicine.

Background

Gastric cancer is the fifth most common cancer and it is the third leading cause of cancer-related mortality worldwide [1]. In Japan and South Korea, EGC accounts approximately 60% [2]. In other parts of the world, the newly diagnosed EGC is also increasing. EGC was defined as a cancer limited to the mucosa and/or submucosa (T1 stage) regardless of the lymph node status [3]. It does not consider lymph node involvement. Although the definition has sparked controversies over the years, it is still widely
adopted in many clinical studies [4]. Since the indications were first introduced for endoscopic mucosal resection (EMR) in 1987, therapeutic EMR and endoscopic submucosal dissection (ESD) have been accepted as routine option for EGC [5]. However, the presence of LNM is as an absolute contraindication to ESD.

Over the past years, many studies indicated the depth of invasion is the most important factor which is associated with LNM. The incidence of LNM in EGC with submucosal and mucosal invasion is 8–25% and 2–5%, respectively [6–9]. LNM is also considered as one of the most important prognostic factor. The 5-year survival rate for patients with and without LNM is 87.3% and 94.2%, respectively [10]. In addition, the indication for AC in T1N+M0 gastric cancer is T1N2-3bM0, according to the latest Japanese gastric cancer treatment guidelines 2018 (5th edition) [11]. Whether AC is really unnecessary for T1N1M0 gastric cancer remains controversial. Moreover, the majority of gastric cancer occurs in Asia, data regarding LN metastasis for T1 cancer from non-asian patients is rare. Therefore, our study aims to identify risk factors for LNM and to further evaluate the indications for AC in T1N+M0 gastric cancer using Surveillance, Epidemiology, and End Results (SEER) database from USA.

**Methods**

**Patients and Methods**

All analyzed data were collected from SEER database between January 1988 and December 2012. The inclusion criteria included: (1) patients aged at least 20 years with gastric adenocarcinoma confirmed by histology (2) primary gastric cancer, (3) underwent radical surgery (4) The tumor pathological stage was T1M0 according to the 7th AJCC stage, (5) at least 1 lymph node examined; Patients were excluded due to: (1) unknown T and/or N, M category; (2) patients with previous malignancies; (3) patients received radiotherapy or chemotherapy prior to surgery; (4) patients without exact examined lymph node.

All cases have been recoded using the International Classification of Disease for Oncology third edition (ICD-O-3). The histological types were categorized into intestinal type and diffuse type. According to the ICD-O-3, diffuse type EGC includes signet ring cell carcinoma (M8490), diffuse carcinoma (M8145), and linitis plastica (M8142). Intestinal type EGC includes carcinoma (not otherwise specified; M8010), adenocarcinoma (not otherwise specified; M8140), tubular (M8211), and intestinal type (M8144). The patients were divided into two groups according to age (≤ 84 and > 85 years old) and tumor size (≤ 3 cm and > 3 cm). Tumor sites were divided into eight groups, as follows: cardiac, fundus, body, antrum, pylorus, lesser curve, large curve and overlapping/NOS.

**Statistical Analyses**

Statistical analyses were performed with SPSS 21.0. Fisher’s exact or chi-square tests was used for categorical variables. Logistic regression analyses were performed to identify risk factors for LNM. Cumulative survival rates of OS and CSS were analyzed using the Kaplan-Meier method. Multivariate Cox
regression was performed to explore the potential risk factors for poor OS and CSS. A P value < 0.05 was considered statistically significant.

**Results**

**Patient characteristics**

A total of 1291 patients with T1N + M0 gastric adenocarcinoma were enrolled (Fig. 1). Of those, 1039 (80.5%) were LN negative and 252 (19.5%) were LN positive. Further details are summarized in Table 1.
Table 1
Univariate analysis of risk factors for lymph node metastasis in T1N+ M0 gastric cancer.

| Variables          | LN negative (n = 1039), n(%) | LN positive (n = 252), n(%) | p   |
|--------------------|------------------------------|----------------------------|-----|
| Age, years         |                              |                            | 0.025|
| 20–84              | 978 (94.1)                   | 246 (97.6)                 |     |
| ≥ 85               | 61 (5.9)                     | 6 (2.4)                    |     |
| Sex                |                              |                            | 0.887|
| Female             | 399 (38.4)                   | 98 (38.9)                  |     |
| Male               | 640 (61.6)                   | 154 (61.1)                 |     |
| Race               |                              |                            | 0.103|
| White              | 597 (57.5)                   | 136 (54.0)                 |     |
| Black              | 125 (12.0)                   | 43 (17.1)                  |     |
| others             | 317 (30.5)                   | 73 (29.0)                  |     |
| Primary Site       |                              |                            | 0.021|
| Cardia             | 258 (24.8)                   | 45 (17.9)                  |     |
| Fundus             | 21 (2.0)                     | 4 (1.6)                    |     |
| Body               | 125 (12.0)                   | 36 (14.3)                  |     |
| Antrum             | 380 (36.6)                   | 92 (36.5)                  |     |
| Pylorus            | 27 (2.6)                     | 15 (6.0)                   |     |
| Lesser curve       | 134 (12.9)                   | 27 (10.7)                  |     |
| Greater curve      | 40 (3.8)                     | 13 (5.2)                   |     |
| Overlapping/NOS    | 54 (5.2)                     | 20 (7.9)                   |     |
| Tumor size, cm     |                              |                            | 0.000|
| ≤ 3                | 842 (81.0)                   | 156 (61.9)                 |     |
| > 3                | 197 (19.0)                   | 96 (38.1)                  |     |
| AJCC 7th pT        |                              |                            | 0.000|
| T1a                | 455 (43.8)                   | 37 (14.7)                  |     |
| T1b                | 565 (54.4)                   | 205 (81.3)                 |     |

AJCC, American Joint Committee on Cancer; NOS, not otherwise specific
| Variables                        | LN negative (n = 1039), n(%) | LN positive (n = 252), n(%) | p     |
|---------------------------------|------------------------------|----------------------------|-------|
| T1 NOS                          | 19 (1.8)                     | 10 (4.0)                   |       |
| Lymph nodes examined            |                              |                            | 0.000 |
| 1–15                            | 581 (55.9)                   | 103 (40.9)                 |       |
| >15                             | 458 (44.1)                   | 149 (59.1)                 |       |
| Tumor grade                     |                              |                            | 0.000 |
| Well differentiated             | 171 (16.5)                   | 10 (4.0)                   |       |
| Moderately differentiated       | 389 (37.4)                   | 80 (31.7)                  |       |
| Poorly differentiated           | 462 (44.5)                   | 158 (62.7)                 |       |
| Undifferentiated                | 17 (1.6)                     | 4 (1.6)                    |       |
| Lauren classification           |                              |                            | 0.061 |
| Intestinal                      | 789 (75.9)                   | 177 (70.2)                 |       |
| Diffuse                         | 250 (24.1)                   | 75 (29.8)                  |       |

AJCC, American Joint Committee on Cancer; NOS, not otherwise specific

**Risk factors for LNM**

The characteristics were compared between LN negative group and LN positive group (Table 1). The results showed that there were no significant differences between the groups in sex, race and Lauren classification (p > 0.05). The diffuse histologic type showed no more frequent LNM than the intestinal type (P = 0.061). But the two groups significantly differed in age, primary site, tumor size, invasion depth (T stage), tumor grade and retrieved LNs (p < 0.05). The proportion of patients with LNM was lower in elder patients (≥ 85) than younger patients (p = 0.025). A greater tumor size (> 3 cm), deeper invasion depth (T1b) were related with more frequent LNM (p < 0.001). In the patients with poorly differentiated type cancer, the rate of LNM was much higher than the differentiated type (p < 0.001). Multivariate analysis showed that age, tumor size, invasion depth, type of differentiation, and retrieved LNs were associated with LNM in T1N + M0 gastric cancer patients (Table 2).
Table 2
Multivariate analysis of risk factors for lymph node metastasis in T1N+M0 gastric cancer.

| Variables                              | OR    | 95% CI       | p     |
|----------------------------------------|-------|--------------|-------|
| Age, years (≥ 85)                      | 0.324 | 0.135–0.799  | 0.012 |
| Primary Site                           | 1.056 | 0.981–1.136  | 0.150 |
| Tumor size, (≤3 cm)                    | 2.024 | 1.471–2.786  | 0.000 |
| AJCC 7th pT, T1b                       | 3.238 | 2.340–4.479  | 0.000 |
| Lymph nodes examined (≤15)             | 1.678 | 1.247–2.259  | 0.001 |
| Tumor grade                            | 1.744 | 1.358–2.240  | 0.000 |
| Lauren classification<sup>a</sup>       | 0.983 | 0.679–1.422  | 0.927 |

CI, confidence interval; OR, Odds ratio; <sup>a</sup>, Intestinal and diffuse type; AJCC, American Joint Committee on Cancer;

OS and CSS analyses in T1N+M0 gastric cancer patients

Univariate and multivariate analysis identified age, sex, tumor size, and LNM as significant predictors of OS and CSS (Table 3 and Table 4). Race was associated with OS (HR 0.866; 95% CI 0.750–0.999, p = 0.049), but not with CSS (HR 0.878; 95% CI 0.723–1.065, p = 0.187). In addition, there was significant difference on CSS in patients with or without chemotherapy (HR 0.474; 95%CI 0.265–0.848, p = 0.012). Therefore, we further evaluated the OS and CSS with patients divided into N0/N+ groups or N0-1/N2-3b groups (Fig. 2 and Fig. 3), which are the indications for AC according to the latest Japanese gastric cancer treatment guidelines 2018 (5th edition).
Table 3
Predictors of overall survival for T1N + M0 gastric cancer patients

| Variable        | Univariate              |          | Multivariate            |          |
|-----------------|-------------------------|----------|-------------------------|----------|
|                 | HR (95% CI)             | p        | HR (95% CI)             | p        |
| Age, years (≥80)| 2.367 (1.790–3.132)     | 0.000    | 2.347 (1.763–3.125)     | 0.000    |
| Sex             |                         |          |                         |          |
| Female          | 1.000                   |          |                         |          |
| Male            | 1.174 (1.320–2.295)     | 0.000    |                         |          |
| Race            |                         |          |                         |          |
| White           | 1.000                   |          |                         |          |
| Black           | 1.476 (1.082–2.014)     | 0.014    | 0.866 (0.750–0.999)     | 0.049    |
| others          | 2.177 (1.476–3.212)     | 0.000    |                         |          |
| Primary Site    |                         | 0.468    |                         |          |
| Cardia          | 1.000                   |          |                         |          |
| Fundus          | 0.776 (0.471–1.278)     | 0.319    |                         |          |
| Body            | 0.802 (0.301–2.137)     | 0.659    |                         |          |
| Antrum          | 0.582 (0.327–1.039)     | 0.067    |                         |          |
| Pylorus         | 0.632 (0.389–1.027)     | 0.064    |                         |          |
| Lesser curve    | 0.626 (0.265–1.481)     | 0.286    |                         |          |
| Greater curve   | 0.550 (0.307–0.985)     | 0.044    |                         |          |
| Overlapping/ NOS | 0.681 (0.326–1.421)   | 0.306    |                         |          |

AJCC, American Joint Committee on Cancer; NOS, not otherwise specific; CI, confidence interval; HR, hazard ratio
| Variable                  | Univariate | Multivariate |
|---------------------------|------------|--------------|
| Tumor size, cm            | 0.000      | 1.814 (1.391–2.367) | 0.000 |
| ≤ 3                       | 1.000      |              |      |
| >3                        | 2.106 (1.629–2.723) |              |      |
| AJCC 7th pT               | 0.001      | 1.137 (0.886–1.461) | 0.313 |
| T1a                       | 1.000      |              |      |
| T1b                       | 0.870 (0.352–2.154) | 0.764      |      |
| T1 NOS                    | 1.451 (0.597–3.531) | 0.412      |      |
| AJCC 7th pN               | 0.000      | 1.812 (1.368–2.400) | 0.000 |
| N0                        | 1.000      |              |      |
| N1-N3b                    | 1.984 (1.516–2.597) |              |      |
| Lymph nodes examined      | 0.154      | -            | -    |
| >15                       | 1.000      |              |      |
| 1–15                      | 1.199 (0.934–1.538) |              |      |
| Tumor grade               | 0.981      | -            | -    |
| Well differentiated        | 1.000      |              |      |
| Moderately differentiated  | 0.955 (0.339–2.687) | 0.930 |      |
| Poorly differentiated      | 0.927 (0.341–2.522) | 0.882 |      |
| Undifferentiated           | 0.894 (0.330–2.420) | 0.825 |      |
| Lauren classification      | 0.005      | 0.748 (0.544–1.030) | 0.075 |

AJCC, American Joint Committee on Cancer; NOS, not otherwise specific; CI, confidence interval; HR, hazard ratio
| Variable       | Univariate | Multivariate |
|----------------|------------|--------------|
| Intestinal     | 1.000      |              |
| Diffuse        | 1.560 (1.142–2.131) |              |
| Radiotherapy   | 0.383      | -            |
| After surgery  | 0.842 (0.572–1.239) |              |
| Chemotherapy   | 0.476      | -            |
| No/not known   | 1.000      |              |
| Yes            | 0.892 (0.652–1.222) |              |

AJCC, American Joint Committee on Cancer; NOS, not otherwise specific; CI, confidence interval; HR, hazard ratio
Table 4
Predictors of cancer specific survival for T1N + M0 gastric cancer patients

| Variable      | Univariate |          |          | Multivariate |          |
|---------------|------------|----------|----------|--------------|----------|
|               | HR (95% CI)| p        | HR (95% CI)| p            |          |
| Age, years (≥ 80) | 1.683 (1.125–2.517) | 0.011 | 1.564 (1.027–2.381) | 0.037 |          |
| Sex, Male     | 1.563 (1.091–2.238) | 0.015 | 1.597 (1.109–2.300) | 0.012 |          |
| Race          | 0.003      |          | 0.878 (0.723–1.065) | 0.187 |          |
|               | others     | 1.000    |          |              |          |
| White         | 1.579 (1.037–2.406) | 0.033 |          |              |          |
| Black         | 2.448 (1.463–4.096) | 0.001 |          |              |          |
| Primary Site  | 0.021      |          | 0.947 (0.872–1.029) | 0.196 |          |
| Cardia        | 1.000      |          |          |              |          |
| Fundus        | 0.844 (0.456–1.599) | 0.587 |          |              |          |
| Body          | 0.993 (0.324–3.045) | 0.990 |          |              |          |
| Antrum        | 0.506 (0.241–1.063) | 0.072 |          |              |          |
| Pylorus       | 0.401 (0.213–0.757) | 0.005 |          |              |          |
| Lesser curve  | 0.694 (0.247–1.948) | 0.488 |          |              |          |

AJCC, American Joint Committee on Cancer; NOS, not otherwise specific; CI, confidence interval; HR, hazard ratio
| Variable                  | Univariate       | Multivariate   |
|---------------------------|------------------|----------------|
| Greater curve             | 0.531 (0.255–1.103) | 0.090          |
| Overlapping/NOS           | 0.770 (0.319–1.858) | 0.561          |
| Tumor size, > 3 cm        | 2.105 (1.498–2.958) | 0.000          | 1.797 (1.260–2.565) | 0.001 |
| AJCC 7th pT               | 0.000            | 1.528 (1.078–2.166) | 0.017 |
| T1a                       | 1.000            |                |
| T1b                       | 0.488 (0.173–1.380) | 0.176          |
| T1 NOS                    | 1.124 (0.414–3.050) | 0.818          |
| AJCC 7th pN,N+            | 2.987 (2.137–4.173) | 0.000          | 3.662 (2.382–5.631) | 0.000 |
| Lymph nodes examined, ≤ 15| 0.923 (0.664–1.282) | 0.633          |
| Tumor grade               | 0.411            | -              | -               |
| Undifferentiated          | 1.000            |                |
| Well differentiated        | 0.993 (0.230–4.282) | 0.993          |
| Moderately differentiated  | 0.885 (0.214–3.650) | 0.866          |
| Poorly differentiated      | 1.208 (0.297–4.916) | 0.792          |
| Lauren classification      | 0.300            | -              | -               |

AJCC, American Joint Committee on Cancer; NOS, not otherwise specified; CI, confidence interval; HR, hazard ratio
### Subgroups analysis on OS and CSS

We divided the patients into different groups according to the number of LNMs (Fig. 2 and Fig. 3). Kaplan-Meier survival analysis showed that there were statistically significant differences in OS and CSS between pN0/N+ or pN0-1/N2-3b categories (p < 0.001), but an overlap in survival curves was found between categories pN0-1/N2-3b. The proportion of patients in pN0/N+ was better distributed and pN0/N+ category showed improved prognostic performance in predicting OS and CSS. A statistical assessment of the predictive performance of the two category methods revealed that the pN0/N+ category had a higher χ² (26.06 vs. 18.39) for OS, and the difference is much higher (45.47 vs. 24.37) for CSS. The pN0/N+ classifications for T1N+M0 seem to have an optimal prognostic stratification.

In addition, Kaplan-Meier survival analysis showed that there were statistically significant differences in OS and CSS between patients with and without chemotherapy in pT1N1M0 patients (p < 0.05). Therefore, pT1N1M0 may be an indication for AC in gastric cancer patients.

### Discussion

Early gastric cancer (EGC) is defined as tumor confined to the mucosa or submucosa, regardless of LNM in 1971 by Murakami[3]. Even though, other classifications, such as Kodama’s classification[12] and Paris’s classification[13] were also proposed to define EGC, the Murakami definition is the still the most widely adopted one in recent studies. In an era of precision medicine, the diagnosis, treatment and prognosis of EGC with or without LNM are completely different. Currently, EMR and ESD are first alternative choice for patients without LNM, while radical surgery is necessary for patients with LNM. Several reports have focused on the risk factors of LNM and indicated that the lymph node status was an important prognostic factor[6, 9, 14–16]. In addition, the indications for AC in T1N+M0 gastric cancer is T1N2-3bM0, according to the latest Japanese gastric cancer treatment guidelines 2018 (5th edition)[17].

| Variable                    | Univariate |         | Multivariate          |
|-----------------------------|------------|---------|-----------------------|
| Intestinal                  | 1.000      |         |                       |
| Diffuse                     | 1.229      | 0.300   |                       |
|                             | (0.833–1.813) |         |                       |
| Radiotherapy, after surgery | 0.574      | 0.015   | 1.084 (0.576–2.040)   |
|                             | (0.367–0.898) |         | 0.803                 |
| Chemotherapy, after surgery | 0.710      | 0.084   | 0.474 (0.265–0.848)   |
|                             | (0.481–1.047) |         | 0.012                 |

AJCC, American Joint Committee on Cancer; NOS, not otherwise specific; CI, confidence interval; HR, hazard ratio
Whether AC is really unnecessary for T1N1M0 gastric cancer remains to be decided, but few studies have focused on this topic. Therefore, we investigated the incidence and risk factors of LNM, and evaluate the survival of T1N+M0 gastric cancer using the SEER database.

In the present study, we found the LNM rate for patients with T1N+M0 gastric cancer is 19.5%, which is comparable to previously reported 4%-24%[14, 18–20]. Our study also indicated that age, tumor size, invasion depth, type of differentiation and number of retrieved LNs were independent risk factors for LNM in EGC. Depth of invasion is the most important risk factors for LNM. Previous studies have reported the relationship of age and LNM. Higher risk for LNM was more indentified in young patients [21], and a lower risk in old patients [22]. However, other studies reported that LNM was not associated with age [23]. In the present study, old age (≥ 85) had a lower risk for LNM. Many previous reports have also confirmed that undifferentiated type is more aggressive[24], which was confirmed in our study.

In our study, the tumor size and depth of invasion are independent risk factors for LNM, which was consistent with previous studies [25]. Another important risk factor for LNM is the presence of lymphovascular invasion. However, among all these risk factors, depth of invasion might have the greatest impact.

In the present study, multivariate analyses showed age, sex, tumor size, invasion depth and LNM were related with OS and CSS. LNM has been identified as a significant predictor of OS by many studies. A study showed that the 5-year survival rate was 87.3% and 94.2% in EGC patients with LNM and without LNM, respectively. Roviello et al. reported that the 10-year OS in EGC patients was different for patients with different number of LNM. Patients with 1–3 LNM had a lower risk of recurrence, while in cases with four or more LNM, the risk of recurrence increased. Therefore, increased LNM was associated with decreased survival and higher recurrence rate.

If lymph node metastases are present, patients should receive AC after radical surgery according to the recommendations of the Chinese Society of Clinical Oncology and the European Society of Medical Oncology [17, 26]. However, AC are not recommended for patients with pT1N0M0 and pT1N1M0 according to the latest Japanese gastric cancer treatment guidelines 2018 (5th edition)[11]. Our study revealed that there were statistically significant differences in OS and CSS between pN0/N+ or pN0-1/N2-3b categories (p<0.001), but an overlap in survival curves was found between categories pN0-1/N2-3b. The proportion of patients in pN0/N+ was better distributed and pN0/N+ category showed improved prognostic performance in predicting OS and CSS. Moreover, multivariate analyses showed AC was associated with CSS. Therefore, pT1N1M0 may be appropriate candidate for AC, other studied have also showed these patients[27–29].

There are some limitations to our study. First, the retrospective study is based on SEER database, which represents only 28% of the U.S. population and lacks data on many medical details. Second, we just investigated the major risk factors in terms of LNM and prognosis, suggesting modification of the definition with tumor size, invasion depth and LNM. Further clinical studies are warranted to investigate more definitive parameters. The biological behavior and molecular mechanism of LNM in gastric cancer
needs to be clarified. An updated definition, which combines macroscopic types, pathological morphology and molecular classification, may be useful to make appropriate treatment decisions and follow-up plans. Furthermore, a unified and standardized definition makes different studies comparable.

**Conclusions**

In conclusion, both tumor size and invasion depth are associated with LNM and prognosis. LNM is an important predictor of prognosis. pT1N + M0 may be appropriate candidates for AC. Currently, the treatments and prognosis for patients with T1N0M0/T1N + M0 are completely different. An updated definition of EGC, taking into tumor size, invasion depth and LNM, may be more appropriate in an era of precision medicine.

**Abbreviations**

EGC, early gastric cancer; LNM, lymph node metastasis; AC, adjuvant chemotherapy; SEER, the Surveillance, Epidemiology, and End Results; OS, overall survival; CSS, cancer-specific survival; HR: hazard ratio; CI: confidence interval; EMR, endoscopic mucosal resection; ESD, endoscopic submucosal dissection; ICD-O-3, International Classification of Disease for Oncology third edition

**Declarations**

**Ethics approval and consent to participate** Data from a public database, with no private information disclosure.

**Consent for publication** All authors approved the final version submitted.

**Competing interests** The authors declare that they have no conflicts of interest.

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**Authors' contributions** PJ and YL contributed equally to this work and they were involved in study concept, data acquisition, analysis, and interpretation, and production of tables, wrote the first draft, and revised it critically in light of comments from other authors; YTT was involved in study conception and design, data interpretation, manuscript revision, and discussion; SM, WZK, HL, and FHM were involved in data acquisition and literature review; HTH and WKL were involved in the manuscript revision and discussion.

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Figures
Figure 1

Kaplan-Meier survival analysis showed that there were statistically significant differences in OS and CSS between patients with and without chemotherapy in pT1N1M0 patients (p<0.05).
Figure 2

CSS analysis of patients with T1N+M0 gastric cancer according to different lymph node status. There were statistically significant differences in CSS between pN0/N+ or pN0-1/N2-3b categories (p<0.001), but an overlap in survival curves was found between categories pN0-1/N2-3b.
Figure 3

OS analysis of patients with T1N+M0 gastric cancer according to different lymph node status. There were statistically significant differences in OS between pN0/N+ or pN0-1/N2-3b categories (p<0.001), but an overlap in survival curves was found between categories pN0-1/N2-3b.
Figure 4

Flowchart of T1M0 gastric cancer patients included process