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The prognostic nutritional index is a predictive indicator of prognosis and postoperative complications in gastric cancer: A meta-analysis

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Abstract

Background: The clinical value of the prognostic nutritional index (PNI) in gastric cancer (GC) remains controversial. Therefore, we performed the meta-analysis to determine the prognostic and clinicopathological values of PNI in patients with GC.
Methods: A literature search was performed in the PubMed, Embase, and Web of Science databases. Hazard ratios (HRs) and odds ratios (ORs) were extracted to estimate the association of PNI with survival and clinicopathological characteristics, respectively.
Results: Ten studies involving 3396 patients with GC were analyzed. The pooled results indicated that a low PNI was a significant predictor of poor overall survival (OS) (HR = 1.89, 95% confidence interval [CI] = 1.67−2.13, P < 0.01) and postoperative complications (OR = 1.74, 95% CI = 1.41−2.16, P < 0.01). In the subgroup analysis, a low PNI was significantly associated with poor OS in patients with GC at stage I, II and III, but not at stage IV (HR = 1.14, 95% CI = 0.84−1.55, P = 0.40). Moreover, a low PNI was significantly associated with more advanced tumor features, such as older age, deeper depth of tumor, positive lymph node metastasis, more advanced TNM stages, and positive vessel and lymphatic invasion.
Conclusion: PNI was a predictive indicator of survival and postoperative complications, and was associated with clinicopathological features in GC patients. However, a low PNI was not significantly associated with poor OS in patients with GC at stage IV.

Keywords: Gastric cancer; Prognostic nutritional index; Survival

Introduction

Gastric cancer (GC) is one of the most frequent causes of cancer death worldwide, with an estimated occurrence of 951,600 new cases and 723,100 deaths in 2012.[1] Despite developments in early diagnosis, surgery, adjuvant chemotherapy, and targeted therapies, the long-term survival is still unsatisfactory,[2] perhaps owing to local recurrence and distant metastasis. Curative resection is still the most effective treatment for GC. On the other hand, some studies reported that postoperative complications, such as anastomotic leakage, can lead to poor prognosis in patients with GC.[3,4] It is valuable to identify patients who are likely to have unfavorable postoperative outcomes. Therefore, a method for the accurate prediction of postoperative complications and prognosis is needed to guide clinical decisions and improve the survival of patients.

The immune and nutritional status of patients was reported to be associated with the postoperative outcomes in malignant tumors.[5,6] The prognostic nutritional index (PNI), which was first designed by Buzby et al.,[7] was calculated based on the serum albumin concentration and lymphocyte count in the peripheral blood.[8] Recently, emerging evidence has demonstrated the prognostic value of PNI in different types of malignant tumors, including hepatocellular carcinoma,[9] nasopharyngeal carcinoma,[10] and colorectal cancer.[11] Moreover, Sun et al.[12] have performed

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a pooled analysis to estimate the prognostic value of PNI in cancer. However, owing to limited number of studies and their small sample sizes, the clinical value of PNI in GC has not reached a consensus. Therefore, whether the PNI can be a supplementary index together with the current TNM staging system to predict prognosis remain unknown. For this reason, a quantitative pooled study on PNI needs to be performed.

The aim of this study was to perform a meta-analysis to assess the prognostic value of PNI and the correlation between PNI and clinicopathological features in patients with GC.

Materials and methods

Literature search strategy

A comprehensive literature search was performed using the PubMed, Embase, and Web of Science databases up to November 30, 2015. The main search terms were "prognostic nutritional index" and "gastric cancer/stomach cancer/gastrointestinal cancer." In addition, potentially relevant searches were performed by screening the references of the relevant articles.

Inclusion and exclusion criteria

The eligible studies were selected on the basis of the following criteria: (1) diagnosis of GC was based on pathological examination; (2) clinicopathological or/and prognostic values of PNI in GC were reported; and, (3) outcome measures were extracted directly or estimated from the studies indirectly. Only the most informative article was included in cases of duplicated studies based on the same patient population. The articles whose study samples involved patients with recurrent GC were not included. Abstracts, case reports, and reports from meetings were excluded. Articles from which it was impossible to estimate outcomes from the original data were not included.

Data extraction and quality assessment

Two authors (Yuchong Yang and Peng Gao) reviewed each eligible study and extracted the data independently. The following data were extracted from each study: first author, year of publication, country of the study population, sample size, patient characteristics, tumor clinicopathological characteristics, duration of follow-up, cut-off value, and outcomes. In the included studies, PNI was calculated on the basis of pretreatment laboratory data and was using the formula: $10 \times$ albumin value (g/dl) $+ 0.005 \times$ total lymphocyte count in the peripheral blood. The quality of the included studies was assessed using the Newcastle-Ottawa quality assessment scale (NOS).[13] NOS scores of >5.5 (median scores) were assigned as high quality studies.

Statistical analysis

We used odds ratios (ORs) and 95% confidence intervals (CIs) as measures to evaluate the association between PNI and tumor clinicopathological characteristics. To assess the relationship between PNI and prognosis of GC, hazard ratios (HRs) and 95% CIs were used as effect measures. We used the method designed by Tierney to estimate the HR and 95% CI for those studies in which the HR was not reported directly.[14] Cochran's Q test and I^2 statistics were used to assess heterogeneity. $I^2 > 50\%$ or/and $P < 0.10$ were used to indicate statistically significant heterogeneity and a random effect model could be used. Otherwise, a fixed-effect model was used.[15] We used Begg's and Egger's tests to assess the effect of publication bias.[16,17]

All analyses were performed using STATA software (version 12.0; Stata Corporation, College Station, TX, USA). All statistical tests were two-sided and the P value threshold was set at 0.05.

Results

Search results and study characteristics

A total of 639 potentially relevant studies were initially identified via database searches. After the initial review, 596 articles were excluded. Then, 33 studies were excluded after a full text review. Finally, 10 cohort studies involving 3396 patients were included in this meta-analysis[18–27] (Fig. 1).

These 10 studies were published between 2010 and 2015, and investigated the prognosis or clinicopathological features of GC, and their sample sizes ranged between 99

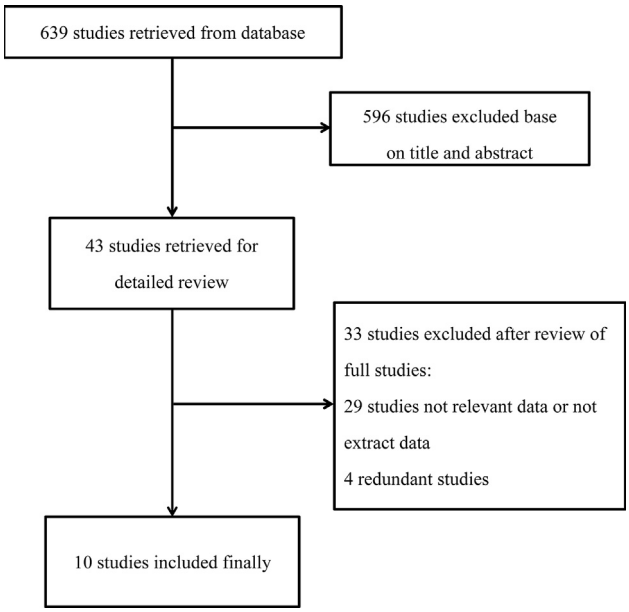

Fig. 1. Flow diagram of study selection procedure.