

## Meta-analysis of double contrast-enhanced ultrasonography for preoperative gross classification of gastric cancer

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**ADMINISTRATIVE INFORMATION****Support** - 234561.**Review Stage at time of this submission** - Completed but not published.**Conflicts of interest** - None declared.**INPLASY registration number:** INPLASY202380058**Amendments** - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 13 August 2023 and was last updated on 13 August 2023.**INTRODUCTION**

**Review question / Objective** This systematic review aims to evaluate the diagnostic value of double contrast-enhanced ultrasonography in preoperative gross classification of gastric cancer. The method of choice was diagnostic tests.

**Condition being studied** Gastric cancer is an important disease worldwide. According to the 2020 statistics of the International Agency for Research on Cancer of the World Health Organization, gastric cancer ranks fifth in the incidence of malignant tumors and fourth in the case fatality rate. With an estimated more than 1 million new cases each year, gastric cancer is the fifth most diagnosed malignancy worldwide. In China, the incidence and mortality of gastric cancer rank third among malignant tumors. Because it is often in an advanced stage at diagnosis, gastric cancer has a high mortality rate, making it the third most common cause of cancer-related death. Despite optimized surgical and

chemoradiotherapy regimens, the survival outcome of patients with advanced GC remains unsatisfactory. Therefore, identification of prognostic factors is necessary to further provide appropriate treatment strategies for patients with advanced gastric cancer. Some scholars have found in the analysis of prognostic factors in patients with gastric cancer that the gross classification, tumor size and TNM stage are independent prognostic factors. Therefore, the clinical application value of contrast-enhanced ultrasonography in preoperative gross classification of gastric cancer was studied in this paper.

**METHODS**

**Participant or population** 1) All patients were diagnosed with gastric cancer by biopsy and surgical pathology before enrollment = 1432.

**Intervention** Double contrast-enhanced ultrasonography.

**Comparator** Pathology.

**Study designs to be included** Diagnostic tests.

**Eligibility criteria** (1) All patients were diagnosed with gastric cancer by biopsy and surgical pathology before enrollment; (2) no distant metastasis of liver, lung, abdominal cavity; (3) Did not receive radiotherapy, chemotherapy or other immunotherapy before the examination; (4) Comparison of preoperative stage and postoperative pathological stage of patients undergoing surgery; (5) Patients and their families were informed and consented to the study.

**Information sources** We systematically searched several online electronic databases including CNKI, Wanfang Medical Database, VIP, CBM, Pubmed, Embase, Cochrane Library, and Web of Science.

**Main outcome(s)** The results of meta-analysis showed that the pooled SEN, SPE, PLR, NLR, DOR and AUC of double contrast-enhanced ultrasonography in diagnosing Borrmann I were 0.91,1.00,185.5,0.09,2075,0.92, respectively. The pooled SEN, SPE, PLR, NLR, DOR and AUC of double contrast-enhanced ultrasonography in diagnosing Borrmann II were 0.88,0.95,16.7,0.12, 137,0.95, respectively. The pooled SEN, SPE, PLR, NLR, DOR and AUC of double contrast-enhanced ultrasonography in diagnosing Borrmann III were 0.90,0.93,12.8,0.11,120,0.98, respectively. The pooled SEN, SPE, PLR, NLR, DOR and AUC of double contrast-enhanced ultrasonography in diagnosing Borrmann IV were 0.92,0.98,51.7, 0.08,642,0.99, respectively.

**Quality assessment / Risk of bias analysis** Quality Assessment of Diagnostic Accuracy Studies 2 tool.

**Strategy of data synthesis** Using Meta-disc and Stata 16.0 software to performed data analysis. Heterogeneity of threshold effects should be checked before using fixed or random effects models. The spearman correlation coefficient between Sen logarithm and (1 - Spe) logarithm is analyzed, to observe whether  $P \leq 0.05$ , and observe the summary receiver operating characteristic (sROC) curve whether was "shoulder-arm." If  $P \leq 0.05$  or the sROC curve was "shoulder-arm," revealed that there was heterogeneity caused by threshold effect, but not otherwise. Spearman correlation analysis was used if the heterogeneity was caused by threshold effects. If heterogeneity is caused by non-

threshold effects, I<sup>2</sup> and Cochran-Q tests are used to test for the presence of heterogeneity due to non-threshold effects, combined with Galbraith plots. The  $\chi^2$  test was used to analyze the heterogeneity among the results, and the size of the heterogeneity was determined quantitatively by combining with I<sup>2</sup>. If  $P > 0.05$ , there was no statistical significance in inter-study heterogeneity, and a fixed effect model was used for meta-analysis. On the contrary, the random effects model was used for meta-analysis. Then, stata 16.0 software was used to calculate the combined SEN, SPE, PLR, NLR and DOR of different types with corresponding modes. The sROC curve was plotted and the area under the curve (AUC) value was calculated. If the AUC value is larger and closer to 1, the diagnostic accuracy of preoperative gross classification of gastric cancer will be higher. The likelihood ratio matrix and Fagan diagram was used to evaluate its clinical utility. Finally, analyze the Sen of the including literatures, tested the stability and reliability of the study. Draw the Deeks funnel plot, the symmetry of the funnel plot was detected by linear analysis to evaluate whether there was publication bias in the study.

**Subgroup analysis** Subgroups of gastric cancer were classified into Borrmann I, II, III and IV, respectively.

**Sensitivity analysis** The sensitivity analysis was carried out using stata 16 software, and the data included in the literature were excluded one by one, and no significant changes were found in the meta-analysis summary results, suggesting that the stability of the included literature was good and the reliability of the combined results was high.

**Country(ies) involved** China.

**Keywords** gastric cancer; ultrasonography; Contrast medium; gross classification; meta-analysis.

**Contributions of each author**

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