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Preoperative assessment and prognostic prediction of gastric cancer patients with peritoneal metastasis using ^{18}F-FDG PET/CT before conversion surgery

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Abstract

Background Conversion therapy followed by conversion surgery (CS) can improve the prognosis of gastric cancer (GC) patients with peritoneal metastasis (PM). However, patients benefit differently. There is no way to confirm the prognostic benefit non-invasively and early. This retrospective study assessed the value of ^{18}F-FDG PET/CT after conversion therapy in preoperative assessment and prognostic prediction of GC patients with PM.

Results Fifty-one GC patients with PM were enrolled. ^{18}F-FDG PET/CT after conversion therapy helped in preoperative assessment. Its diagnostic accuracy for residual peritoneal lesions was slightly better than contrast-enhanced CT (72.5% vs. 61.2%, $P=0.229$), although the difference was not statistically significant. TBR of peritoneal lesions could help preoperative assessment, with TBR of peritoneal lesions to the mediastinal blood pool SUVmax (TBRAmaxp) as the best predictor (cutoff = 0.705, specificity 80%, sensitivity 80%, AUC 0.825, $P<0.001$). Additionally, PET/CT could predict prognosis and assess surgical benefit. SUVmax of peritoneal lesions (SUVmaxp) was the best predictor of 24 months survival (cutoff = 1.466, AUC 0.870, $P=0.002$, Specificity 77.8%, Sensitivity 83.3%) and metabolic parameters of peritoneal lesions could predict OS and the prognosis of patients who underwent CS.

Conclusion ^{18}F-FDG PET/CT provides quantitative imaging indicators for preoperative evaluation and prognostic prediction in GC patients with PM.

Keywords Gastric cancer, Peritoneal metastasis, ^{18}F-FDG PET/CT, Prognosis, Conversion surgery

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Introduction

Gastric cancer (GC) is a common malignant tumour of the digestive tract, and its incidence and mortality rates are among the highest in the world [1, 2]. The most common metastatic site is the peritoneum. About 30% of patients will develop peritoneal metastasis (PM), and nearly 60% of patients with advanced gastric cancer die from PM [3]. Even with guideline-based systemic chemotherapy or optimal supportive care, GC patients with PM have a median survival of 6–15 months [4]. Currently, many medical centres around the world have adopted the treatment strategy of conversion therapy to provide patients with the opportunity for radical resection, called conversion surgery (CS) as well [5]. Regarding this circumstance, we initiated a comprehensive series of retrospective, phase II and phase III clinical trials evaluating the efficacy of neoadjuvant intraperitoneal and systemic chemotherapy (NIPS) for GC with PM. Our findings demonstrated a notable extension in median overall survival, reaching 18.6–19.3 months for all patients in the studied group and up to 27 months specifically for those who underwent CS [6]. However, patients benefit differently from conversion therapy or CS, and laparoscopy, along with follow-up, is the only way to confirm the treatment benefits. Therefore, it is of great clinical significance to use non-invasive methods to effectively evaluate the effect of conversion therapy, select the appropriate timing of radical surgery, and accurately predict the prognosis of GC patients with PM.

^{18}F-FDG PET/CT is valuable in the localisation, benign and malignant identification, clinical staging, efficacy assessment, recurrence monitoring, and prognostic evaluation of various tumours [7, 8]. Previous studies have shown that metabolic parameters of ^{18}F-FDG PET/CT, such as SUVmax and SUVmean of the lesions, correlate with tumour stage and lymph node involvement in early and locally advanced GC [9, 10]; Peak standardised uptake value of lean body weight (SULPeak) can predict pathological response to treatment [11], and SUVmax, MTV and TLG can predict disease-free survival (PFS) and overall survival(OS) of patients [11–13]. In addition, ^{18}F-FDG PET/CT performs better than conventional CT in the diagnosis of distant metastasis of GC [14], and SUVmax, MTV, and TLG of the primary gastric lesion before treatment can be used to predict the occurrence of GC patients with synchronous PM [15]. However, there is a lack of studies on the role of ^{18}F-FDG PET/CT in evaluating the conversion therapy outcome and prognosis of GC patients with PM.

Therefore, this retrospective study aims to investigate whether ^{18}F-FDG PET/CT after conversion therapy can be used in preoperative assessment and prognostic prediction of GC patients with PM. The results will help to personalise the treatment of GC patients with PM.

Materials and methods

Patients

This single-centre retrospective study was approved by the Ruijin Hospital Ethics Committee of Shanghai Jiao Tong University School of Medicine (Ethics Committee Reference Number: 2024-59). GC patients with PM who underwent ^{18}F-FDG PET/CT scans after conversion therapy between September 2015 and July 2023 in Ruijin Hospital affiliated with the Shanghai Jiao Tong University School of Medicine were enrolled in this study. Inclusion criteria were as follows: (a) adult patients (age > 18 years); (b) histologically confirmed gastric adenocarcinoma; (c)peritoneal metastasis confirmed by laparoscopy or positive peritoneal cytology at initial diagnosis; (d) The lesions were not removed at the time of the scan; (e) The scan was conducted for preoperative assessment following conversion therapy. Exclusion criteria were (a) combined with other distant metastases, such as liver, lung, brain, bone, etc.; b) combined with other malignant tumours within one year or combined with other malignant tumours for which treatment had not yet been completed; (c) less than one-year follow-up. Ultimately, 51 patients who underwent PET/CT for preoperative evaluation after conversion therapy were included in the analysis. Among them, 21 patients underwent conversion surgery within one week after the scan based on comprehensive evaluation, while 30 patients were not eligible for conversion surgery and continued with comprehensive treatment. Figure 1 shows the flow chart of the study design.

Clinical information collection

For all the patients, we recorded the patients' gender, age, time of diagnosis, peritoneal cancer index (PCI) and ascites quantity at the time of initial diagnosis by laparoscopy (if available), tumour location, pathological type, degree of differentiation, clinical T and N stage (according to the eighth edition of the American Joint Committee on Cancer TNM system), conversion therapy regimen (whether it includes intraperitoneal chemotherapy, recorded as NIPS or non-NIPS), end date of follow-up and survival status. The values of the tumour markers (CEA and CA199) were recorded at the same time as the PET/CT scans (not more than one week before and after). The outcome of contrast-enhanced CT for preoperative assessment was recorded. The presence of peritoneal lesions on the CT was considered positive outcome. We recorded the time from onset to the end of follow-up as overall survival (OS).

^{18}F-FDG PET/CT imaging

PET/CT scans were performed from the base of the head to the upper thigh or from the top of the head to the foot using hybrid PET/CT scanners (Biograph Vision

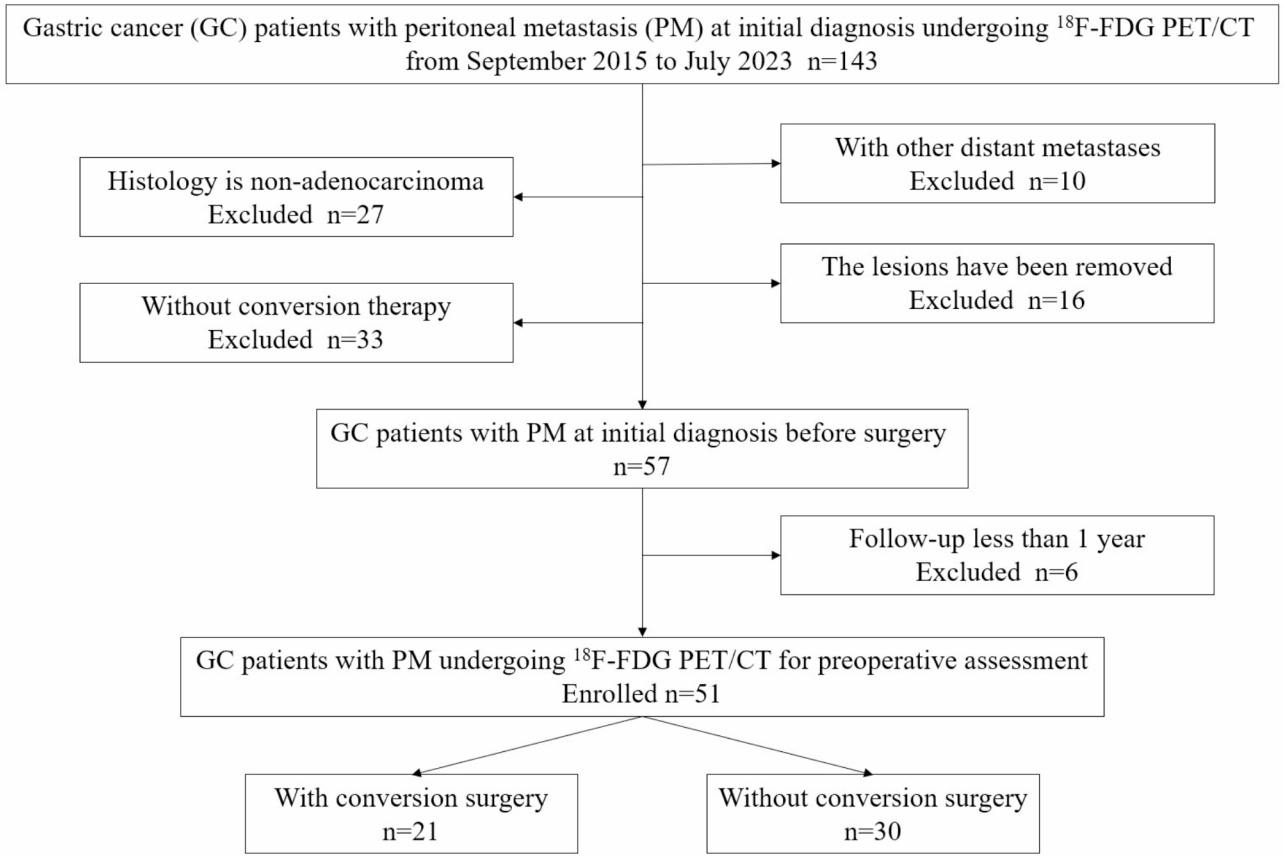

Fig. 1 Flowchart of summarising eligibility/exclusion criteria

450, Siemens Healthineers; Discovery MI, GE Healthcare; uEXPLORER, United imaging). Detailed information on PET/CT scanners is shown in supplementary materials. Patients were instructed to fast for at least 6 h before their PET/CT scans, ensuring an average blood glucose level below 11.0 mmol/L. All patients rested for 60–90 min after being injected with ^{18}F-FDG (3.7–4.44 MBq/kg) and drank approximately 500 mL of water to distend the stomach before scanning.

Image analysis

PET and whole-body CT images in DICOM format were imported into LIFEx software (v 7.3.0, https://www.lifexsoft.org). Two experienced nuclear medicine physicians (X.D. and M.Y.) independently observed the primary lesions of the stomach and peritoneal lesions, delineated the lesion range with 3D volume of interest (VOI), and then used 40% of SUVmax as the threshold for semi-automatic delineation. In cases where peritoneal lesions were multiple or presented as diffuse infiltrative patterns, the entire extent of the lesions was delineated, and the SUVmax of the area with the highest uptake was recorded. If there was divergence in confirming the lesions, a more senior physician (H.J.J.) would join the discussion and reach a consensus. The SUVmax of each lesion were recorded. A 20-mm diameter VOI was also set on the aortic arch (without involving the vessel wall) and right liver lobe to obtain the SUVmax and SUVmean of the mediastinal and liver blood pool background. The tumour-to-background ratio (TBR) was displayed as TBRAmax, TBRAmean, TBRLmax, and TBRLmean, which were calculated as follows: TBRAmax = SUVmax of lesions / SUVmax of the mediastinal, TBRAmean = SUVmax of lesions / SUVmean of the mediastinal, TBRLmax = SUVmax of lesions / SUVmax of the liver, TBRLmean = SUVmax of lesions / SUVmean of the liver. To distinguish the lesions in different sites, our abbreviations end with various letters. "g" means gastric lesion, and "p" means the peritoneal lesion (For example, "SUVmaxg" means the SUVmax of the gastric lesion.).

Statistical analysis

Statistical analysis was performed using R version 4.2.0 (https://www.R-project.org). All continuous variables were verified for normal distribution with the Shapiro–Wilk test and for homogeneity of variance with Levene's test. Normally distributed variables were summarised as mean ± standard deviation (SD), and non-normally distributed variables were summarised as the median and interquartile range (IQR). Categorical variables were

Table 1 Clinical characteristics of 51 gastric cancer patients with peritoneal metastasis

Variable	Number	%
No. of patients	51	
Age(years)		
Median	49	
Range	20–71	
Sex		
Male	20	39.2
Female	31	60.8
Histologic		
Tubular adenocarcinoma	3	5.9
Adenocarcinoma with mixed subtypes	1	2.0
Mucinous adenocarcinoma	2	3.9
Adenocarcinoma	45	88.2
Degree of differentiation		
Moderately	1	2.0
Poorly-moderately	5	9.8
Poorly	33	64.7
N/A	12	23.5
T stage		
2	1	2.0
3	2	3.9
4a-4b	48	94.1
N stage		
1	2	3.9
2	15	29.4
3a-3b	14	27.5
N/A	20	39.2
Tumor location		
Angular incisure	4	7.8
Body of stomach	33	64.7
Body of stomach + Pyloric part	2	4.1
Cardia	2	3.9
Cardia + Body of stomach	2	3.9
Pyloric part	8	15.7
PCI score		
Median	20	
Range	2–39	
Ascites(ml)		
Median	200	
Range	0-9000	
Treatment strategy		
NIPS	42	82.4
Non-NIPS	9	17.6
Surgery or not		
No	30	58.8
Yes	21	41.2
Survival status		
Alive	36	70.6
Dead	15	29.4

PCI Peritoneal Cancer Index, *N/A* not applicable, *NIPS* neoadjuvant intraperitoneal and systemic chemotherapy

summarised with frequency and proportion. Mann-Whitney U test is used to compare differences in non-normally distributed continuous variables, and Student's t-tests are used to compare differences in normally distributed continuous variables. Differences in categorical variables were analysed using chi-square or Fisher's test. Receiver operating characteristic (ROC) curve analysis was used to evaluate the performance of metabolic parameters in predicting the conversion therapy outcome and prognosis. The Youden index determined the cutoff values for the ROC curve analysis. Area under the ROC curve (AUC), sensitivity, specificity, and accuracy were estimated. All tests were two-sided, and the statistical significance was $P < 0.05$.

Results

Clinical characteristics of patients

We ultimately included 51 eligible patients (20 males and 31 females; median age, 49 years; range, 20–71 years) in Ruijin Hospital affiliated with the Shanghai Jiao Tong University School of Medicine. Patients were diagnosed between July 2017 and September 2023. They underwent PET/CT for preoperative assessment before conversion surgery (CS), with median OS was 20.6 months (range 5.8–75.7 months). Table 1 summarises the clinical and pathologic characteristics of 51 patients. Detailed information regarding diagnosis dates and end date of follow-up are available in the supplementary materials.

^{18}F-FDG PET/CT outperform contrast-enhanced CT in preoperative assessment

If conversion therapy is effective, significant regression of peritoneal metastasis will occur, meeting the key criteria for CS, based on previous experience [6]. Therefore, to investigate the role of PET/CT in preoperative assessment, we grouped them based on whether they eventually underwent CS. The Metabolic parameters of peritoneal lesions, such as SUVmaxp, TBRAmaxp, TBRLmaxp, and so on, were significantly lower in surgical groups than in non-surgical groups (Table 2). The proportion of PET-positive peritoneal (P_metastasis) lesions also differed between the two groups, but the outcome of contrast-enhanced CT had no difference (Table 3). PET/CT was more accurate in determining the presence of residual peritoneal lesions before CS (72.5% vs. 61.2%, $P = 0.229$), but the difference was not statistically significant (Supplemental Table S1). Through ROC analysis, we found that the TBRAmaxp was the best indicator for preoperative assessment (cutoff = 0.705, specificity 80.0%, sensitivity 80.0%, AUC 0.825, $P < 0.001$) (Fig. 2, Supplemental Table S2). Therefore, PET/CT before CS could assess residual peritoneal lesions more accurately, and its metabolic parameters could help quantitative assessment of surgical indications of CS.

Table 2 Differences in clinical indicators and imaging parameters between surgical and non-surgical patients

Variable	Non-surgical patients($n=30$)		Surgical patients($n=21$)		*P*.value
	Number	Median (P25, P75)	Number	Median (P25, P75)	
OS	30	18.9(14.067,23.542)	21	22.833(20.6,35.4)	**0.001**
age	30	46(35,56.75)	21	59(40,63)	0.067
PCI	24	21(11.75,30)	16	14.5(10.25,22)	0.332
ascites	22	200(62.5,900)	14	200(62.5,875)	0.974
CEA	30	2.495(1.485,3.825)	21	2.23(1.51,3.61)	0.547
CA199	30	10.65(5.675,42.1)	21	12.7(6,21.3)	0.818
SUVmaxg	30	4.898(3.492,7.134)	21	4.891(2.273,7.198)	0.274
TBRAmaxg	30	2.785(1.989,3.722)	20	1.719(1.219,3.509)	0.080
TBRAmeang	30	3.511(2.518,4.874)	20	2.272(1.539,5.104)	0.177
TBRLmaxg	30	1.928(1.414,2.768)	21	1.476(0.995,2.441)	0.090
TBRLmeang	30	2.53(1.668,3.086)	21	2.051(1.056,2.77)	0.185
SUVmaxp	30	2.244(1.196,4.543)	21	1.139(0.929,1.483)	**0.001***
TBRAmaxp	30	1.597(0.75,2.338)	20	0.596(0.48,0.664)	**0.000***
TBRAmeanp	30	1.83(0.82,3.051)	20	0.742(0.629,0.873)	**0.000***
TBRLmaxp	30	1.086(0.528,1.685)	21	0.436(0.377,0.517)	**0.000***
TBRLmeanp	30	1.204(0.587,1.968)	21	0.534(0.43,0.647)	**0.000***

*$P<0.05$

OS overall survival, *PCI* Peritoneal Cancer Index, *SUVmaxg* maximum standardised uptake value of gastric lesions, *TBRAmaxg* the ratio of SUVmax of gastric lesions to SUVmax of the aorta, *TBRAmeang* the ratio of SUVmax of gastric lesions to SUVmean of aorta, *TBRLmaxg* the ratio of SUVmax of gastric lesions to SUVmax of liver, *TBRLmeang* the ratio of SUVmax of gastric lesions to SUVmean of liver, *SUVmaxp* maximum standardised uptake value of peritoneal lesions, *TBRAmaxp* the ratio of SUVmax of peritoneal lesions to SUVmax of the aorta, *TBRAmeanp* the ratio of SUVmax of peritoneal lesions to SUVmean of aorta, *TBRLmaxp* the ratio of SUVmax of peritoneal lesions to SUVmax of liver, *TBRLmeanp* the ratio of SUVmax of peritoneal lesions to SUVmean of liver

Table 3 Chi-Square test to analyse the relationship between categorical variables and conversion surgery status in patients

Variable	Number	Non-surgical patients	Surgical patients	X-squared	*P*.value
NIPS†					
NIPS (0)	9	5 (55.6%)	4 (44.4%)	0.000	1.000
NIPS (1)	42	25 (59.5%)	17 (40.5%)		
P_metastasis**					
P_metastasis (0)	33	13 (39.4%)	20 (60.6%)	14.753	**0.000***
P_metastasis (1)	18	17 (94.4%)	1 (5.6%)		
CT_outcome¶					
CT_outcome (0)	7	3 (42.9%)	4 (57.1%)	0.285	0.593
CT_outcome (1)	42	26 (61.9%)	16 (38.1%)		
Sex§					
Sex (0)	20	9 (45.0%)	11 (55.0%)	2.596	0.107
Sex (1)	31	21 (67.7%)	10 (32.3%)		

* $P<0.05$

†*NIPS* neoadjuvant intraperitoneal and systemic chemotherapy, '0' means 'The conversion therapy regimen isn't NIPS', '1' means 'The conversion therapy regimen is NIPS'

** *P_metastasis* positive or negative findings for peritoneal lesions in PET/CT scan, '0' means negative, '1' means positive

¶ *CT_outcome* positive or negative findings for peritoneal lesions in contrast-enhanced CT, '0' means negative, '1' means positive. The contrast-enhanced CT records for two patients were missing

§*sex* '0' represents male, '1' represents female

Metabolic parameters of peritoneal lesions can predict the prognosis

We divided the patients into groups based on their survival status at 24 months for analysis (some patients were excluded from the analysis due to insufficient follow-up time). SUVmaxp and the TBR of peritoneal lesions differed between patients with different survival (Supplemental Table S3). Among all imaging parameters, the SUVmaxp was the best imaging predictor of survival at 24 months (cutoff = 1.466, AUC 0.870, $P=0.002$, Specificity 77.8%, Sensitivity 83.3%) (Fig. 3, Supplemental Table S4). Through Kaplan-Meier survival analysis, we found that patients with lower metabolic parameters of peritoneal lesions, such as SUVmaxp, TBRAmaxp, TBRLmaxp (cutoff = 3.439, 1.803, and 1.605, respectively), and so on, had better OS (Fig. 4, Supplemental Table S6). Among the clinical indicators, PCI differed among the patients with different survival and was the best clinical predictor

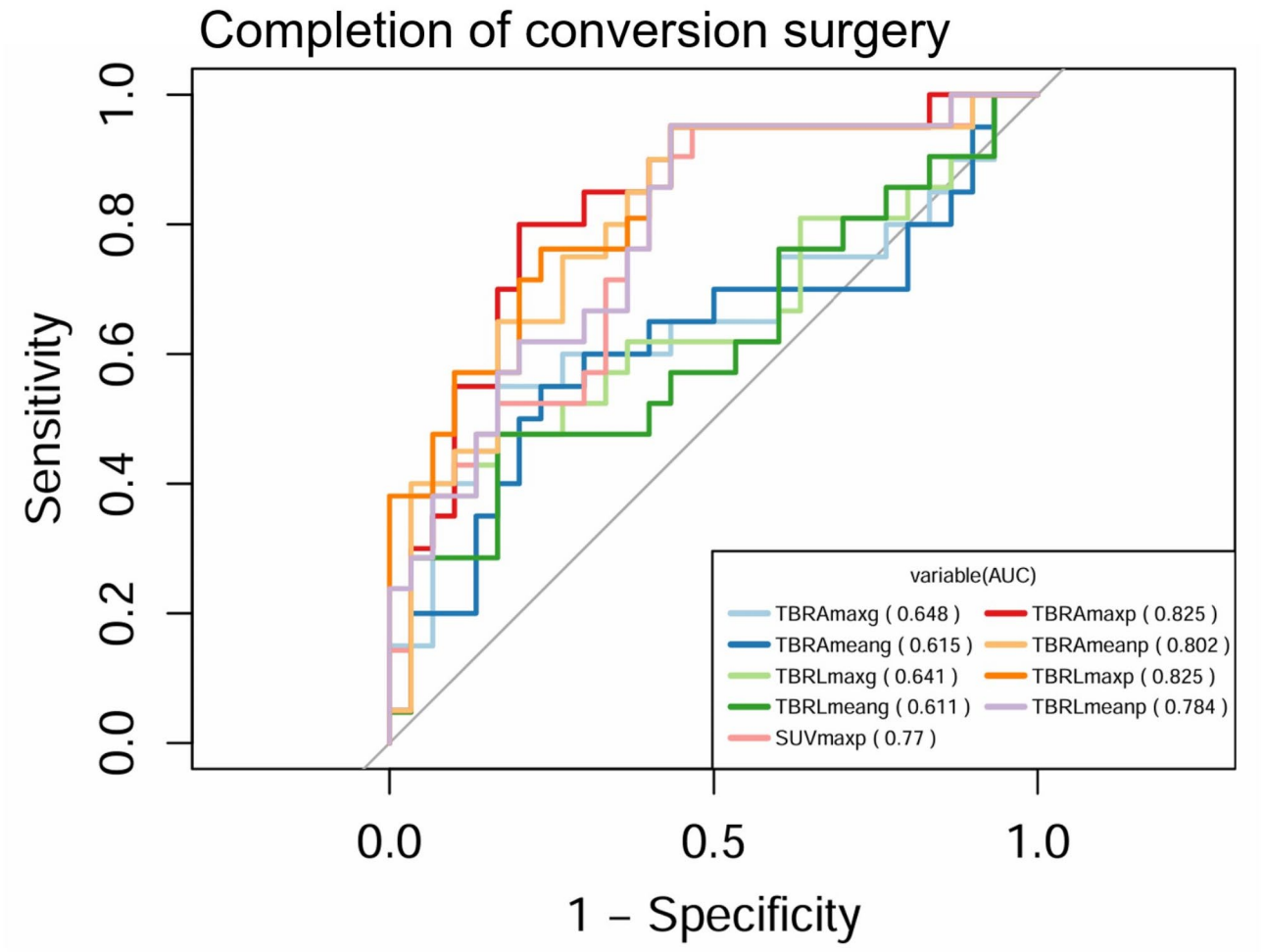

Fig. 2 Receiver operating characteristic curves analysis evaluating the ability of imaging parameters in preoperative assessment (only variables with $p < 0.05$ are shown)
TBRAmaxg the ratio of SUVmax of gastric lesions to SUVmax of the aorta, *TBRLmaxg* the ratio of SUVmax of gastric lesions to SUVmax of liver, *SUVmaxp* maximum standardised uptake value of peritoneal lesions, *TBRAmaxp* the ratio of SUVmax of peritoneal lesions to SUVmax of the aorta, *TBRAmeanp* the ratio of SUVmax of peritoneal lesions to SUVmean of aorta, *TBRLmaxp* the ratio of SUVmax of peritoneal lesions to SUVmax of liver, *TBRLmeanp* the ratio of SUVmax of peritoneal lesions to SUVmean of liver

of survival at 24 months (Fig. 3, Supplemental Table S3-4). Additionally, ascites and CA199 were also correlated with survival, while T and N stages did not show significant associations (Supplemental Table S5-6, Supplemental Figure S1).

Metabolic parameters of ^{18}F-FDG PET/CT can evaluate conversion surgery benefit

We conducted a separate analysis of patients who ultimately underwent CS to investigate the ability of metabolic parameters to predict CS benefit. Kaplan-Meier survival analysis showed that SUVmaxp, TBRAmeanp, and TBRLmaxp (cutoff = 1.448, 0.829, and 0.642, respectively; $P = 0.03$, 0.039, and 0.03, respectively) were associated with prognosis in surgical patients, and patients with indicators below cutoff had a better prognosis than those with higher ones (Fig. 5). It suggested that the metabolic parameters of ^{18}F-FDG PET/CT before CS could aid in the clinical selection of patients more likely to benefit from CS, potentially helping in therapeutic decision-making and avoiding unnecessary surgical risks. However, as this study is based on a small sample size, further studies with larger cohorts are needed to validate these preliminary findings.

Discussion

In this study, we found that metabolic parameters of ^{18}F-FDG PET/CT after conversion therapy in peritoneal lesions before conversion surgery (CS) could help preoperative assessment. TBRAmaxp at the cutoff value of 0.705 was the best indicator in preoperative assessment. In addition, we found that the metabolic parameters of peritoneal lesions, such as SUVmaxp and TBRLmaxp, could be used to predict short-term survival and OS.

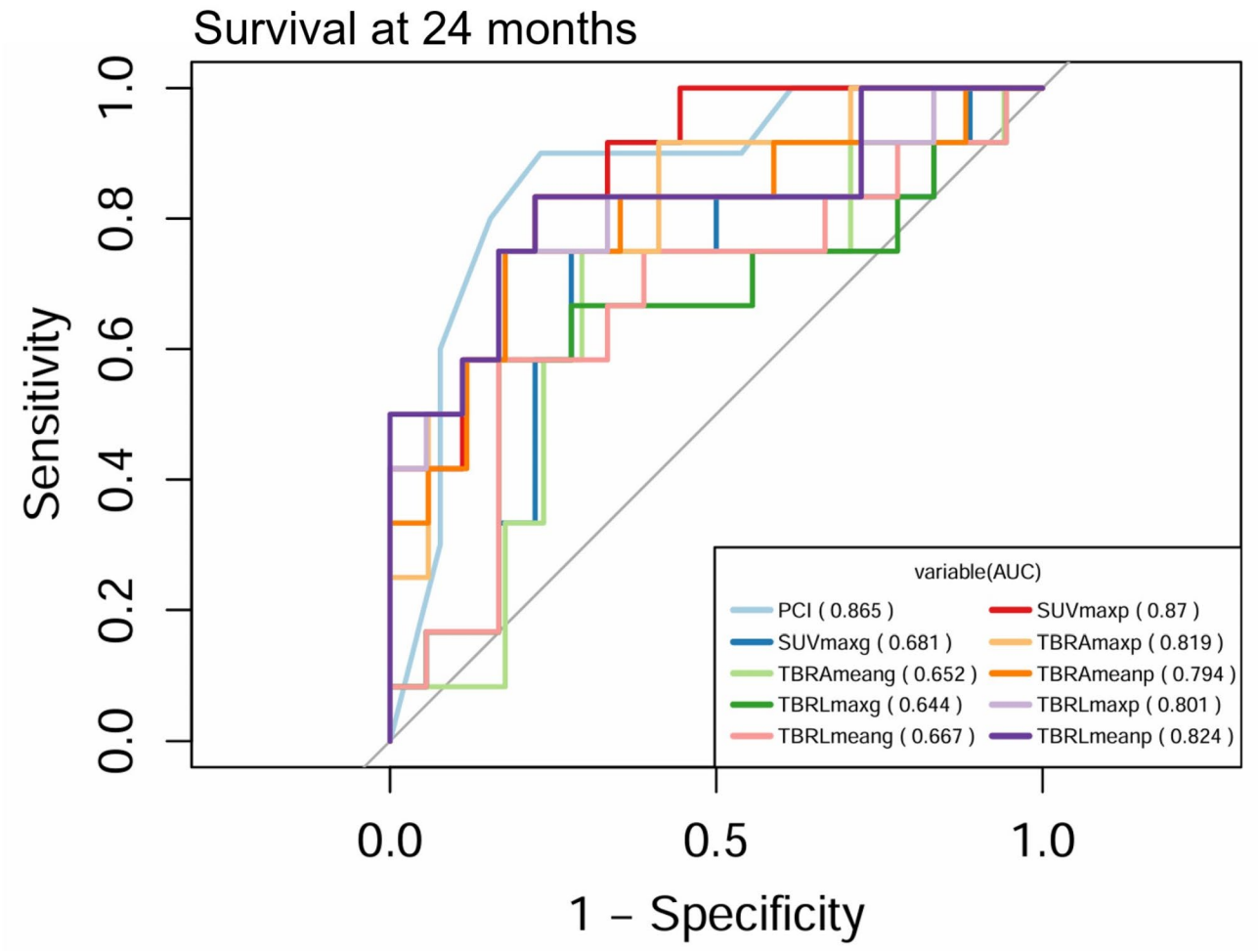

Fig. 3 Receiver operating characteristic curves for the ability of clinical indicators and imaging parameters to predict 24-month survival (only variables with $p < 0.05$ are shown)

PCI Peritoneal Cancer Index, *SUVmaxp* maximum standardised uptake value of peritoneal lesions, *TBRAmaxp* the ratio of SUVmax of peritoneal lesions to SUVmax of the aorta, *TBRAmeanp* the ratio of SUVmax of peritoneal lesions to SUVmean of aorta, *TBRLmaxp* the ratio of SUVmax of peritoneal lesions to SUVmax of liver, *TBRLmeanp* the ratio of SUVmax of peritoneal lesions to SUVmean of liver

Meanwhile, we conducted a separate analysis of patients who eventually underwent CS and found that the SUVmaxp, TBRAmeanp, and TBRLmeanp were predictive of the prognosis of patients undergoing CS, which could help to select the patients with greater surgical benefit before CS and aid in better clinical decision-making.

Compared with systemic chemotherapy, conversion therapy followed by CS has been proven to improve the OS of GC patients with PM [4–6, 16–21]. However, as gastric cancer is a highly heterogeneous tumour, patients' response to conversion therapy and the surgical benefit is inconsistent. Currently, TRG and pathological lymph node staging are known to be related to prognosis, which need to be obtained with the help of surgery [4]. Considering the risks of postoperative complications, we sought to obtain imaging parameters from ^{18}F-FDG PET/CT to assist preoperative assessment and prognostic prediction to non-invasively select the patients who would benefit more from conversion therapy and CS early.

The role of ^{18}F-FDG PET/CT in predicting the treatment outcome in other solid tumours has been reported [7]. In early and locally advanced gastric cancer, SUVmax and SULPeak have been suggested to help predict the response to treatment and the prognosis of patients [11–13]. The treatment strategies for GC patients with PM are different from those for patients with early and locally advanced gastric cancer. Therefore, the basis for evaluating treatment efficacy may also differ. Our study was a preliminary exploration of the role of ^{18}F-FDG PET/CT in the preoperative assessment and prognosis in GC patients with PM and provided some quantitative indicators.

This study included some clinical indicators, such as the tumour markers during the PET/CT scans, PCI, etc. Some analyses were similar to those already reported

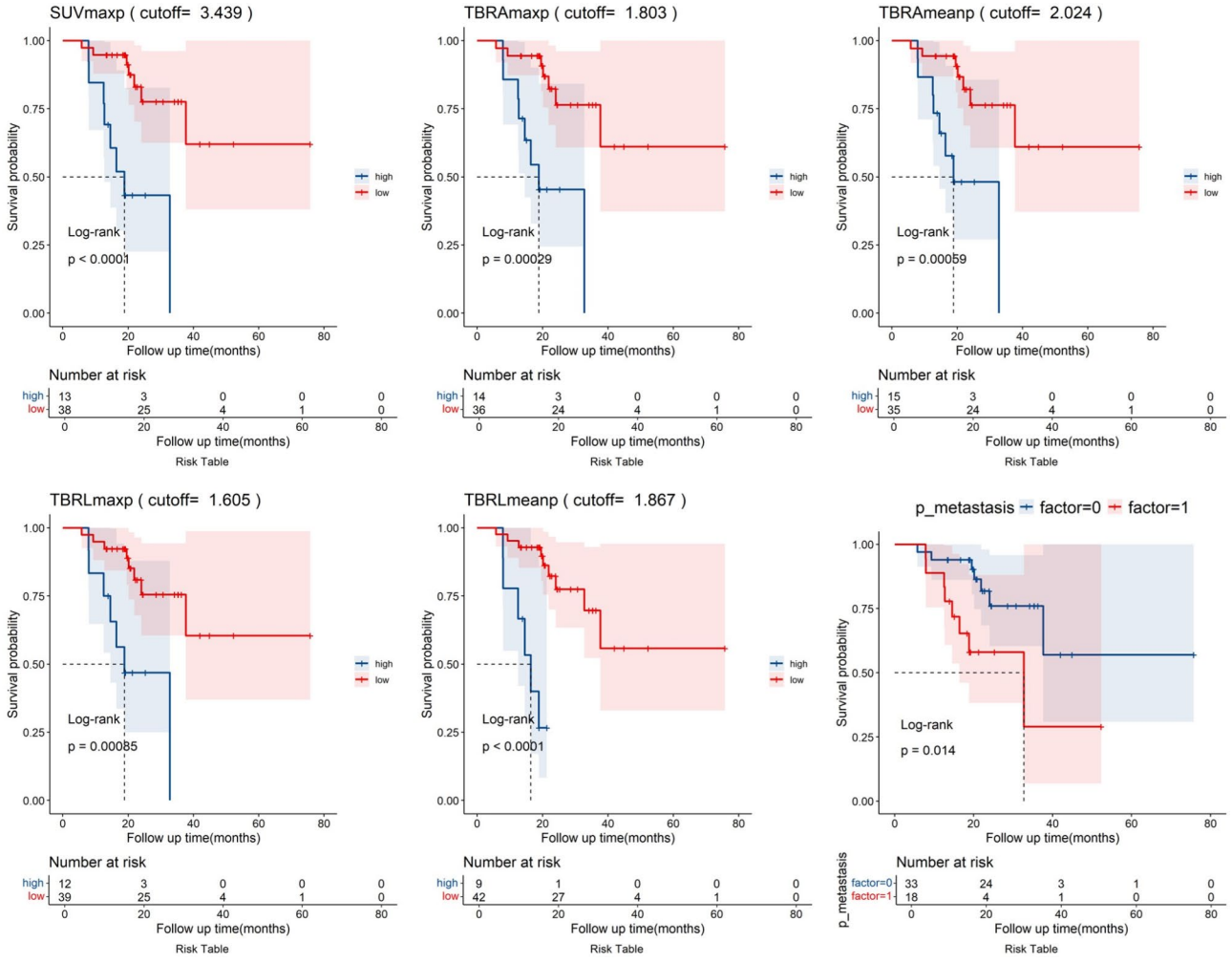

Fig. 4 Kaplan–Meier survival analysis for OS by imaging parameters (only variables with $p < 0.05$ are shown)
SUVmaxp maximum standardised uptake value of peritoneal lesions, *TBRAmaxp* the ratio of SUVmax of peritoneal lesions to SUVmax of the aorta, *TBRAmeanp* the ratio of SUVmax of peritoneal lesions to SUVmean of aorta, *TBRLmaxp* the ratio of SUVmax of peritoneal lesions to SUVmax of liver, *TBRLmeanp* the ratio of SUVmax of peritoneal lesions to SUVmean of liver, *p_metastasis* positive or negative findings for peritoneal lesions in PET/CT scan, '0' means negative, '1' means positive

[3, 4]. PCI, tumour markers, and ascites could predict the prognosis of patients. For imaging parameters, we included the parameters of the primary and peritoneal lesions with the highest metabolic uptake. However, we did not include metabolic parameters for each lymph node. Existing studies have mentioned that lymph node metastasis is vital in prognostic prediction [22]. Due to the specificity of the peritoneal structure, we used TBR instead of conventional indicators such as MTV and TLG, which also helped reduce the impact caused by different PET/CT scanners, we used the TBR of lesions to analyse. In calculating TBR, scholars have not yet agreed on the definition of background [7, 23, 24]. We calculated the ratio of the SUVmax of lesions to the SUVmax and SUVmean of the mediastinal and hepatic blood pools, respectively. From the results, they were almost all valuable, and we had not yet been able to compare which one was more beneficial. Considering that conversion surgery can significantly improve survival [6], we conducted prognosis analysis for all patients as well as for the subgroup who underwent conversion surgery. The results indicated that SUVmax and peritoneal TBR were prognostic factors, with similar significance observed in the subgroup that did not undergo conversion surgery (Supplemental Figure S2). Overall, our research suggests that PET/CT scans before CS is significant, which can assist preoperative assessment, guide the completion of CS, and predict the OS and surgical benefit of patients.

This study had several limitations. Firstly, the sample size was relatively small, because the overall incidence of peritoneal metastasis from gastric cancer is not very high. Secondly, there was a potential selection bias because it was a retrospective study. Additionally, the patients in this study differed in specific regimens, but

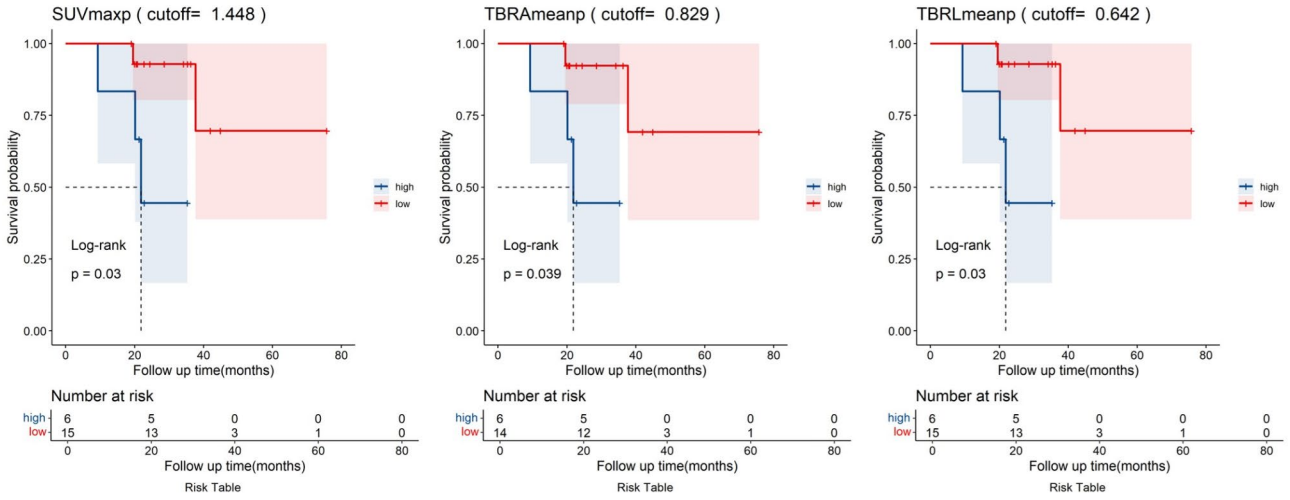

Fig. 5 Kaplan–Meier survival analysis for OS of surgical patients by imaging parameters (only variables with $p < 0.05$ are shown)
SUVmaxp maximum standardised uptake value of peritoneal lesions, *TBRAmeanp* the ratio of SUVmax of peritoneal lesions to SUVmean of aorta, *TBRLmeanp* the ratio of SUVmax of peritoneal lesions to SUVmean of liver

we did not conduct a more detailed analysis due to the limited sample size. In the future, we plan to enrol more cases for detailed analysis and try to establish predictive models.

Conclusion

Our study suggests that metabolic parameters of ^{18}F-FDG PET/CT, especially SUVmax and TBR, can be used in the preoperative assessment and the prognostic prediction of GC patients with PM. In addition, SUVmax and TBR of peritoneal lesions have the potential to preoperatively predict patients who will benefit more from conversion surgery, which can contribute to better therapeutic decisions. However, it needs to be validated in the analysis of more cases.

Abbreviations

AUC	Area under the ROC curve
CS	Conversion surgery
NIPS	Neoadjuvant intraperitoneal and systemic chemotherapy
OS	Overall survival
PCI	Peritoneal Cancer Index
ROC	Receiver operating characteristic
*SUVmax	Maximum standardised uptake value
SUVmean	Mean standardised uptake value
TBR	Tumour-to-background ratio
TBRAmax	The ratio of SUVmax to SUVmax of the aorta
TBRAmean	The ratio of SUVmax to SUVmean of aorta
TBRLmax	The ratio of SUVmax to SUVmax of liver
TBRLmean	The ratio of SUVmax to SUVmean of liver

*The last letter or number represents the different parts; 'g' means gastric lesion, and 'p' means peritoneal lesion. For example, 'SUVmaxg' means 'SUVmax of gastric lesion'.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s13550-025-01244-4.

Supplementary Material 1

Supplementary Material 2

Acknowledgements

Not applicable.

Author contributions

BL, ZY, and JH all contributed significantly to the study conception and design. YP and MS did main work of data collection and analysis. HY, SL, CY and ZZ performed material preparation. YM and and DX helped with image analysis. YP, MS and DX wrote the first draft of the manuscript, and all authors commented on previous versions. All authors read and approved the final manuscript.

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Data availability

The datasets generated and analyzed during the current study are not publicly available but are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

This study was approved by the Ruijin Hospital Ethics Committee of Shanghai Jiao Tong University School of Medicine (Ethics Committee Reference Number: 2024-59). Written informed consent was waived by the Ethics Committee due to the retrospective nature of this study.

Consent for publication

The need for written informed consent was waived with the confirmation of patient data confidentiality by the Ethics Committee for this retrospective study.

Competing interests

The authors declare that they have no competing interests.

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