Original Article

Efficacy of relative dose intensity of nab-paclitaxel for the short-term outcomes, survival, and quality of life in patients with advanced pancreatic cancer: a retrospective study

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Background: To optimize treatment, choosing the appropriate relative dose intensity (RDI) of nab-paclitaxel is an important way to improve patient tolerance, therapeutic efficacy, and survival. However, few studies have focused on the efficacy of the RDI of nab-paclitaxel in patients with advanced pancreatic cancer, and whether the RDI of nab-paclitaxel could be employed as an index for treatment remains unknown. To explore the relationship between RDI of nab-paclitaxel and chemotherapy efficacy, survival, quality of life (QoL), and adverse effects in patients with advanced pancreatic cancer.

Methods: In this retrospective study, a total of 32 patients with advanced pancreatic cancer, ECOG score of 0 to 2 were included from January 2017 to March 2020. The patients were treated with nab-paclitaxel combined with gemcitabine as a first-line treatment and divided into high and low RDI groups. Chemotherapy efficacy, survival, QoL, and adverse effects between two groups were compared.

Results: The disease control rate (DCR) was 20.0% in the low RDI group, compared with 81.8% in the high RDI group (P=0.002). A good correlation between nab-paclitaxel RDI and short-term efficacy was observed in all 32 patients (r=0.728, P<0.01). Furthermore, the high RDI group had significantly better median overall survival (mOS: 12 *vs.* 8 months, P=0.034) and median progression-free survival (mPFS: 5.5 *vs.* 3 months, P=0.052) compared to that of low RDI patients. Univariate regression analysis showed that longer overall survival was associated with lower ECOG score [hazard ratio (HR): 10.88; 95% confidence interval (CI): 2.54–46.5, P=0.001], tumors located in the body or tail of pancreases (HR: 3.82; 95% CI: 1.4–10.3, P=0.0081), and higher RDI (HR: 0.21; 95% CI: 0.071–0.6, P=0.004). The high RDI group had a significantly better physical function and emotional function improvement compared to the low RDI group (P<0.05). Moreover, high RDI did not increasing the severity and frequency of the adverse events.

Conclusions: It is recommended to maintain a sufficient RDI of nab-paclitaxel to ensure that the balance between lerability, therapeutic efficacy, and survival benefits is satisfied in patients with advanced pancreatic cancer.

Keywords: Relative dose intensity (RDI); nab-paclitaxel; pancreatic cancer; quality of life

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Introduction

According to the latest epidemiological data, there are about 450,000 new cases of pancreatic cancer and 430,000 deaths worldwide each year, making it one of the most malignant gastrointestinal tumors (1). In China, the morbidity and mortality of pancreatic cancer are also on the rise, and more than 80% of patients are already in the advanced stage at diagnosis (2). Chemotherapy is the main treatment modality for these patients. Optimizing chemotherapy is a potential intervention for the treatment of pancreatic cancer and prolonging the survival of patients.

Nab-paclitaxel, a new type of paclitaxel with the advantages of no pretreatment, no allergic reaction, short infusion time, and high standard dose, has become an important drug for the treatment of advanced pancreatic cancer (3). According to a previous report (4), factors including patient age, performance statue (PS) and comorbidities (such as cardiovascular, diabetes, dyslipidemia, respiratory etc.) are involve in the outcome of nab-paclitaxel treatment, therefore, it is necessary to use the nab-paclitaxel precisely. To optimize treatment, choosing the appropriate relative dose intensity (RDI) of nab-paclitaxel is an important way to improve patient tolerance, therapeutic efficacy, and survival. Previous studies have tried to resolve this problem in different types of cancers (5-8). Tamura *et al.* found that the RDI was 97.8% for nab-paclitaxel in patients with advanced gastric cancer (9); however, no further high and low RDI grouping was employed to compare the efficacy. A study by Kanazawa *et al.* showed that gastric cancer patients with high RDI (>80%) had a longer progression-free (PFS) and overall survival (OS) compared to those with low RDI (≤80%), which initially employed the RDI as a possible treatment efficacy index (10). However, few studies have focused on the efficacy of the RDI of nab-paclitaxel in patients with advanced pancreatic cancer, and whether the RDI of nab-paclitaxel could be employed as an index for treatment remains unknown.

Moreover, it is common sense that quality of life (QoL) is a critical objective in patients with incurable cancer besides progression and survival. In patients with chemotherapy, treatment-related toxicity and efficacy are important determinants in patient's QoL (11). In addition, associations between poor survival and impairment of baseline QoL have been observed. Therefore, it is necessary to employ QoL as an index for treatment outcome in cancer patients. The present study retrospectively collected data on 32 cases of advanced pancreatic cancer treated with nab-paclitaxel in our hospital and analyzed the relationship between the RDI of nab-paclitaxel and the efficacy, survival, and adverse reactions, thereby giving a significant reference on reasonable application of chemotherapy in clinical practice. We present the following article in accordance with the STROBE reporting checklist (available at https://tcr.amegroups.com/article/view/10.21037/tcr-22-1604/rc).

Methods

Ethical declaration

This study was conducted in accordance with the Declaration of Helsinki (as revised in 2013) and was approved by the Ethics Committee of the Suzhou Xiangcheng People's Hospital (No. 2020-002). The requirement for written informed consent was waived due to the retrospective nature.

Patients

We performed a retrospective analysis of the data from 32 patients with advanced or recurrent pancreatic cancer treated with nab-paclitaxel combined with gemcitabine as a first-line treatment in the Oncology Department of Suzhou Xiangcheng People's Hospital from January 2017 to March 2020. The inclusion criteria were as follows: (I) histopathologically or cytologically confirmed pancreatic cancer; (II) evaluable lesions by imaging; (III) a Eastern Cooperative Oncology Group (ECOG) score of 0 to 2; and (IV) baseline blood routine and liver and kidney function were within the normal range.

Treatment regimen

Paclitaxel For Injection (Albumin Bound) (Stone Pharmaceutical Group Co., Ltd, China; Approved no.: H20183044) powder was dissolved using 100 mL of 0.9% sodium chloride injection liquid according to the manufacturer's instructions. The intravenous drip time was

30 minutes, and the standard dose was 260 mg/m^2. Dosing was given on the first and eighth day, and each cycle was 21 days. The gemcitabine dose was 1,000 mg/m^2 on days 1 and 8. Before chemotherapy, a 5-HT3-receptor blocker was given to prevent vomiting. The RDI of nab-paclitaxel was calculated for each patient using the following equation: actual dose intensity/standard dose intensity. The actual dose intensity was calculated using the total dose delivered divided by the total chemotherapy time.

Evaluation of outcomes and adverse reactions

Imaging examinations of the lesions were performed every two cycles [according to the RECIST1.1 guidelines (12) based on the following conditions: complete response (CR), partial response (PR), stable disease (SD), and progressive disease (PD). The objective response rate (ORR) included the ratios of CR and PR. The disease control rate (DCR) included the proportions of CR, PR, and SD. Adverse reactions were evaluated in accordance with National Cancer Institute (NCI) Common Terminology Criteria for Adverse Events (CTCAE) v.4.0.

Quality of life (QoL)

Patient-reported outcomes, including symptoms and health-related QoL, were the exploratory endpoints and were evaluated using the European Organization for Research and Treatment of Cancer (EORTC) Quality of Life Questionnaire-Core 30 module (QLQ-C30) (13), which included physical functioning, role functioning, emotional functioning, global QOL, and pain. The scores of these modules range from 0 to 100, with higher scores indicating better functioning, well-being, or higher symptom burden (note: the scales measuring symptom burden were reverse-scored to facilitate presentation). For each subscale, only those with at least 25% non-missing values in each treatment group were included, and thus, the analyses covered only the first 6 weeks of treatment.

Statistical analysis

PSS software version 23.0 (SPSS, Inc., Chicago, IL, USA) was used for data analysis, and count data were tested by either the χ^2 test or Fisher's exact method. A Kaplan-Meier curve was constructed for survival analysis, and the log-rank test was used for between-group survival differences analysis. OS was defined as the time from diagnosis of the disease to death due to any cause. Progression-free survival (PFS) was defined as the time from the beginning of treatment to the observation of disease progression or death due to any cause. A Cox proportional hazard regression model was performed to analyze the risk factors. Harrell's Concordance index (C-index) was applied to evaluate the performances of the prognostic nomograms. P<0.05 was considered to indicate statistical significance.

Results

Baseline characteristics of the patients and grouping according to the RDI value

A total of 32 patients with advanced pancreatic cancer were included in this retrospective study. The mean age of these patients was 64 years (range: 34–75 years), including 16 males and 16 females. Four cases had received postoperative adjuvant chemotherapy and 32 cases received first-line chemotherapy. Bilirubin was recovered to normal in three patients following pre-chemotherapy bile duct drainage. The patients' characteristics are shown in *Table 1*.

The actual dose of nab-paclitaxel was decreased due to several factors, including the performance score, chemotherapy delay, adverse effects, patient compliance, etc., followed by the RDI changes. The optimal RDI cut-off value (as calculated by the receiver operating characteristic curve (ROC) curve) was 68.4%. Based on this value, the patients were divided into a low RDI group (RDI <68.4%) and a high RDI group (RDI ≥68.4%) for subsequent analysis. The median number of chemotherapy cycles in the high and low RDI groups was four and two, respectively.

Short-term outcomes

The short-term outcome analysis results of the 32 included patients were as follows (*Table 2*): (I) in the low RDI group, two cases achieved SD, eight cases achieved PD, the ORR was 0%, and DCR was 20%; (II) in the high RDI group, six cases achieved PR, 12 cases achieved SD, four cases obtained PD, the ORR was 27.27%, and the DCR was 81.81%. The ORR of the low RDI group was lower than that of the high RDI group (P=0.142), and the DCR of the low RDI group was lower than that of the high RDI group (P=0.002).

Table 1 Basic demographic characteristics of the 32 included advanced pancreatic cancer patients

Patient characteristics	No. (%)
Age, years	
<60	9 (28.1)
≥60	23 (71.9)
Gender	
Male	16 (50.0)
Female	16 (50.0)
ECOG performance score	
0	18 (56.3)
1	14 (43.7)
Surgery	
Yes	12 (37.5)
No	20 (62.5)
Tumor location	
Head	16 (50.0)
Body and tail	16 (50.0)
Pulmonary metastasis	
Yes	6 (18.8)
N0	26 (71.2)
Liver metastasis	
Yes	19 (59.4)
N0	13 (40.6)
Abdominal metastasis	
Yes	7 (21.9)
N0	25 (78.1)
Baseline CA199 concentration (U/L)	
<1,200	18 (56.3)
≥1,200	14 (43.7)
Baseline total bilirubin levels (mmol/L)	
<17.1	19 (59.4)
≥17.1	13 (40.6)
RDI	
Low RDI	10 (31.3)
High RDI	22 (68.7)

RDI, relative dose intensity; ECOG, Eastern Cooperative Oncology Group.

Relationship between the RDI of nab-paclitaxel and the short-term outcomes

The waterfall chart of target lesion changes in the 32 advanced pancreatic cancer patients is shown in *Figure 1*. All 32 patients received at least one post-baseline imaging evaluation, and the maximum percentage reduction from baseline in the target lesions ranged from –90% to 56%. The target lesions of 12 patients (37.5%) were reduced, all of which were in the high RDI group. Also, the target lesions of 20 patients (62.5%) were enlarged, of which 10 were in the low RDI group (10/10, 100%) and 10 were in the high RDI group (10/22, 45.45%).

We also evaluated the relationship between the RDI of nab-paclitaxel and the short-term outcomes of the patients, and a good correlation between nab-paclitaxel RDI and short-term efficacy (PR, SD, PD) was observed in all 32 patients (r=0.728, P<0.01). Therefore, it is suggested that the higher the RDI of nab-paclitaxel, the better its short-term efficacy (*Figure 2*).

Relationship between the RDI of nab-paclitaxel and the PFS and OS of patients

At the end of the follow-up period, three patients were still alive. The median OS was 10 months and the median PFS was 3.5 months. Kaplan-Meier survival analysis showed that the median OS of the high RDI group was 12 months, which was significantly better than that of the low RDI group (8 months) (χ^2=4.473, P=0.034). The median PFS of the high RDI group was 5.5 months, which was better than that of the low RDI group (3 months); however, this difference was not statistically significant (χ^2=3.782, P=0.052) (*Figure 3*).

High RDI of nab-paclitaxel is associated with longer survival

We also established a forest plot of unstratified hazard ratios (HRs) for death to analyze of therapeutic effect of nab-paclitaxel according to the baseline demographic data and clinical subgrouping. As shown in *Figure 4*, the ECOG 1-2 [HR: 10.88; 95% confidence interval (CI): 2.54–46.5, P=0.001], tumor location (HR: 3.82; 95% CI: 1.4–10.3, P=0.0081), and high RDI (HR: 0.21; 95% CI: 0.071–0.6, P=0.004) were confirmed as the independent risk factors for patients.

Table 2 The short-term outcomes of the 32 included advanced pancreatic cancer patients

Outcomes	Low RDI group (n=10)	High RDI group (n=22)	P value
CR	0	0	
PR	0	6	
SD	2	12	
PD	8	4	
ORR	0	27.27%	0.142
DCR	20%	81.81%	0.002

RDI, relative dose intensity; CR, complete remission; PR, partial remission; SD, stable disease; PD, progressive disease; ORR, objective response rate; DCR, disease control rate.

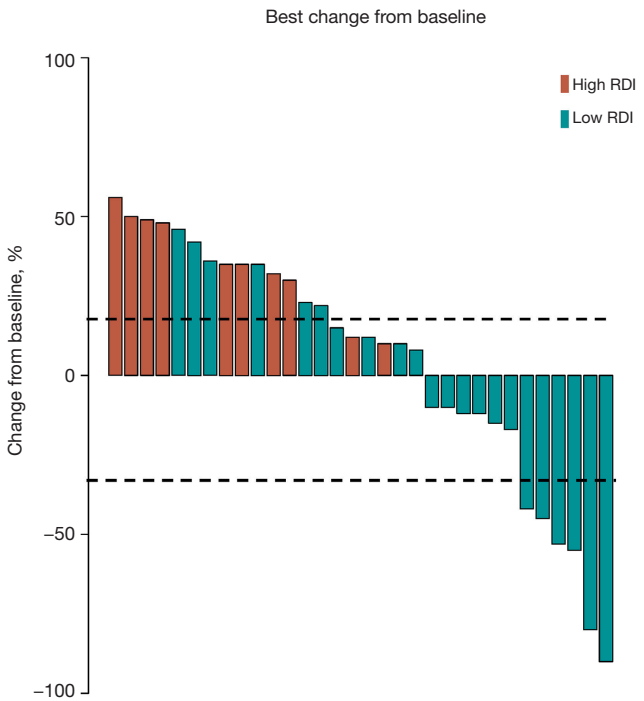

Figure 1 Waterfall chart of the target lesion changes in the 32 included advanced pancreatic cancer patients. RDI, relative dose intensity.

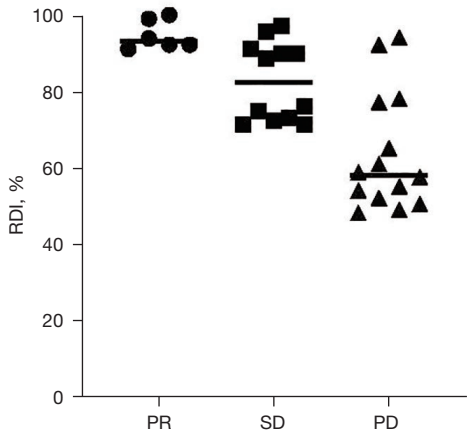

Figure 2 Relationship between the relative dose intensity of nab-paclitaxel and the short-term outcomes. RDI, relative dose intensity; PR, partial remission; SD, stable disease; PD, progressive disease.

In addition, we also constructed a nomogram for survival prediction and the results showed that ECOG PS1-2 and tumors located at the body and tail of pancreases could increase risk score, and high RDI could decrease the risk score (*Figure 5*). The C-index of the nomogram was 0.84, indicating a high prediction efficacy. Taken together, these results confirmed that the RDI of nab-paclitaxel is a protective factor for patient survival and survival prediction.

Relationship between the RDI of nab-paclitaxel and the QoL of patients

The relationship between the RDI of nab-paclitaxel and the QoL of patients was measured according to the EORTC QLQ-C30 mean scores of overall adjusted changes from baseline in the first 6 weeks of treatment. As shown in *Figure 6*, the high RDI group patients had a significantly worse physical function and emotional function improvement compared to the low RDI group patients.

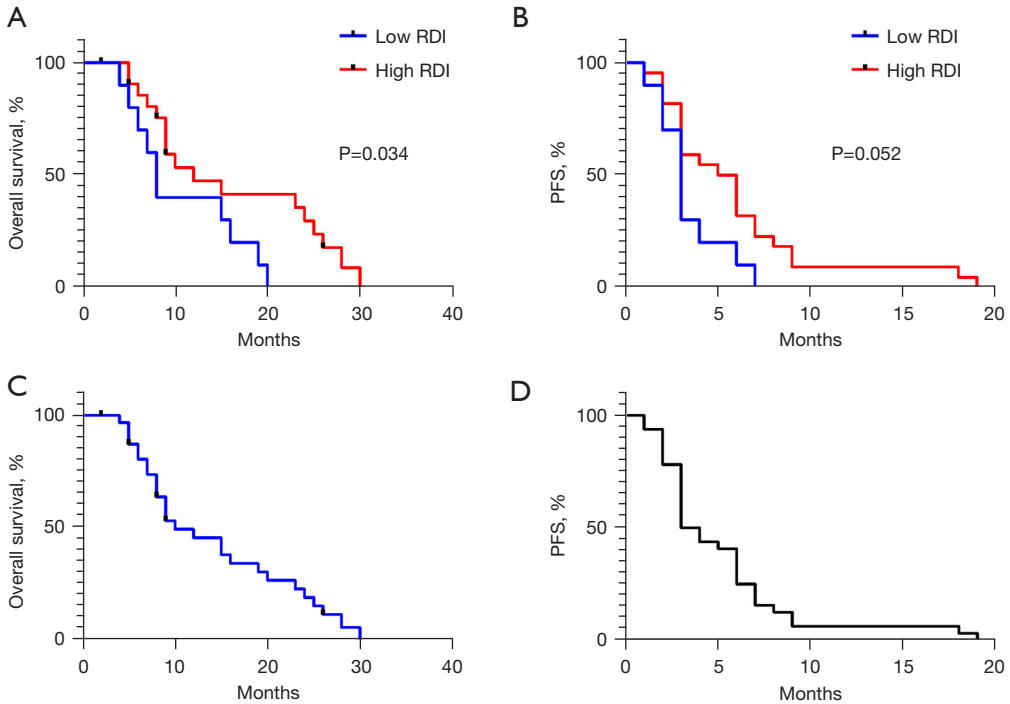

Figure 3 Relationship between the relative dose intensity of nab-paclitaxel and PFS and OS. (A) OS comparison between the high and low RDI groups; (B) PFS comparison between the high and low RDI groups; (C) OS of all 32 included patients; (D) PFS of all 32 included patients. PFS, progression-free survival; OS, overall survival; RDI, relative dose intensity.

However, no difference was observed in terms of the role function, global QoL, and pain between these two groups.

Comparison of the adverse events between the different nab-paclitaxel RDI groups

The main adverse reactions in the 32 included patients included neutropenia, anemia, thrombocytopenia, decreased appetite, nausea, peripheral neurotoxicity, abnormal liver function, fatigue, and so on. Only one case (6.25%) was found with grade 3–4 adverse reactions. The incidence of nausea, peripheral neurotoxicity, and abnormal liver function in the high RDI group was higher than that in the low RDI group, although this was limited to grade 1–2 adverse reactions. In addition, there were no treatment-related deaths (*Table 3*).

Discussion

The results of the present retrospective study verified two key findings. Firstly, the RDI of nab-paclitaxel was closely related to the efficacy of chemotherapy, OS, and PFS. Secondly, to ensure the therapeutic effect and survival benefit of patients, nab-paclitaxel with sufficient RDI is required. Our study suggested that a RDI >68.4% is the effective range with tolerable adverse reactions.

Pancreatic cancer is one of the most malignant gastrointestinal tumors, with approximately 80–85% of patients being metastatic or locally advanced at the time of diagnosis. The 5-year survival rate does exceed 5% and the median survival time is less than 6 months. Chemotherapy has become the main treatment for advanced pancreatic cancer and gemcitabine has been the only standard treatment drug for a long period (14). In recent years, clinical study has shown that the combined use of nab-paclitaxel could prolong the OS of patients from 6.6 to 8.7 months (15).

To further explore the potential of nab-paclitaxel in the treatment of advanced pancreatic cancer, research efforts have focused on optimizing the dose of the drug by selecting the appropriate RDI, thereby improving its short-term efficacy under the premise of ensuring treatment tolerance and prolonging the survival of patients.

Data from the MPACT clinical trial has shown that 41%

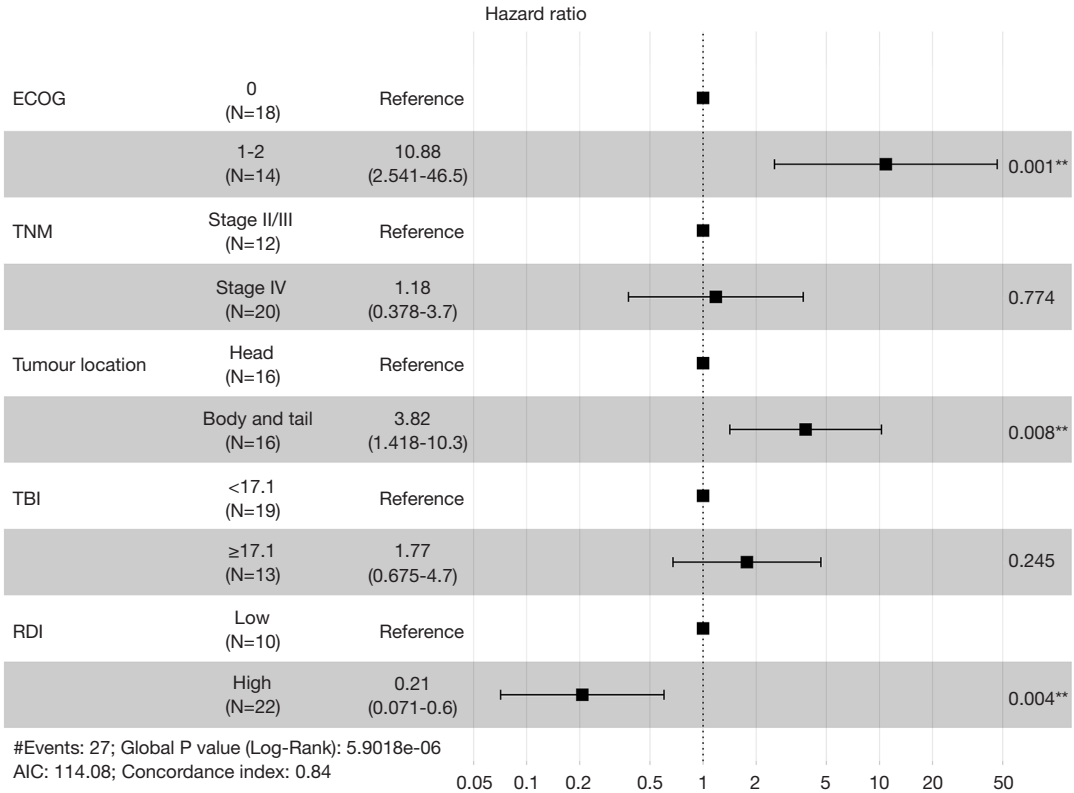

Figure 4 Forest plot of the unstratified hazard ratios for death in the analysis of therapeutic effect of nab-paclitaxel according to the baseline demographic data and clinical subgrouping. TBI, total bilirubin; RDI, relative dose intensity. **P<0.01, ECOG, Eastern Cooperative Oncology Group; TNM, tumor, node, metastasis.

of patients with advanced pancreatic cancer were presented with nab-paclitaxel dose reduction, and 71% of patients received prolonged chemotherapy cycle times, which could affect the RDI of the drug (16). Further follow-up observations have demonstrated that the decline in RDI may potentially affect the efficacy of treatment and the survival of patients.

In clinical practice, the older age of some patients with advanced pancreatic cancer increases the possibility of a decline in organ function or physical condition, other underlying diseases, possible hematological toxicity, peripheral blood neuropathy, fatigue, and the incidence of other adverse reactions (17-19). Considering patient tolerance, the continuation of chemotherapy, and the reduction of chemotherapy-related side effects, it is necessary to lower the RDI in some patients. In addition, more attention should be paid to the question of whether decreasing the RDI could result in a decline in efficacy, thereby decreasing the survival of patients. It is necessary to determine an optimal RDI that could satisfy the balance between patient tolerability and therapeutic efficacy as well as survival benefits.

Studies have shown that although the RDIs of elderly patients with advanced pancreatic cancer are down-regulated, a satisfactory 10-month median OS with acceptable toxicity could still be obtained (20). One previous study showed that nine patients over the age of 75 years who were treated with a RDI of nab-paclitaxel of 53.1% achieved a 66.7% DCR and a median OS of 9 months. Moreover, this study also showed that among 18 patients <75 years of age, a 63.1% RDI of nab-paclitaxel was applied, and a 77.8% DCR and 10-month median OS were achieved. The most common grade 3 adverse reaction was neutropenia in both groups of patients, with an incidence of 44% (6). A retrospective study about recurrent and metastatic pancreatic cancer showed that the median treatment cycles for patients receiving nab-paclitaxel were four cycles and 65.2% of patients were applied with

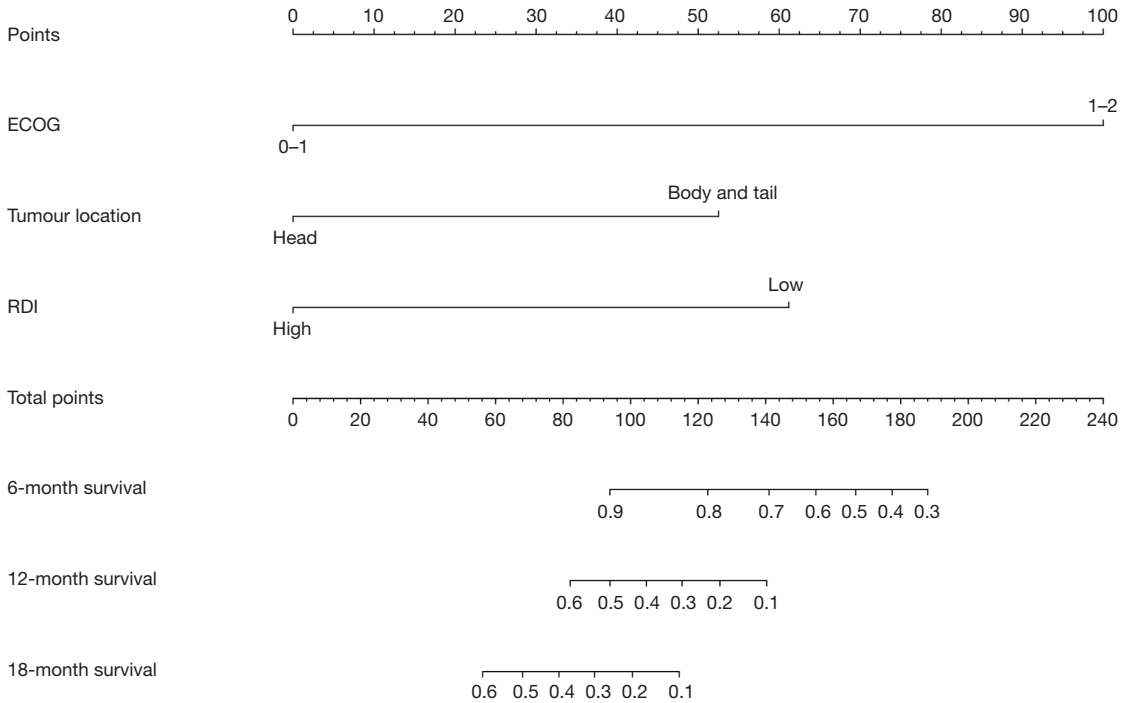

Figure 5 Establishment of a nomogram using the discovery cohort to predict the 6-, 12-, and 18-month overall survival probability. RDI, relative dose intensity. ECOG; Eastern Cooperative Oncology Group.

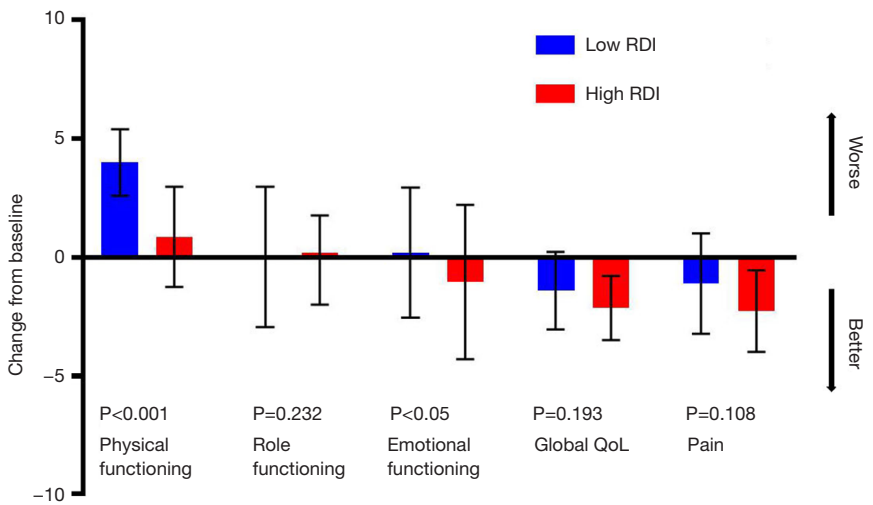

Figure 6 Relationship between the relative dose intensity of nab-paclitaxel and the quality of life (QoL) of patients. RDI, relative dose intensity.

Table 3 Adverse events of different relative dose intensity of nab-paclitaxel

Adverse events	Low RDI (n=10)		High RDI (n=22)	
	Any grade No. (%)	Grade 3–4 No. (%)	Any grade No. (%)	Grade 3–4 No. (%)
Neutropenia	4 [40]	1 [10]	15 [68]	3 [14]
Anemia	5 [50]	2 [20]	12 [55]	5 [23]
Thrombocytopenia	2 [20]	0	5 [23]	1 [5]
Anorexia	4 [40]	0	9 [41]	0
Nausea	1 [10]	0	4 [18]	0
Vomiting	0	0	2 [9]	0
Diarrhea	0	0	0	0
Peripheral sensory neuropathy	3 [30]	1 [10]	11 [50]	3 [14]
Fatigue	3 [30]	0	7 [32]	1 [5]

RDI, relative dose intensity.

a decreasing RDI of nab-paclitaxel during treatment, resulting in a mean RDI of 66.7%, a median OS of 7.2 months (95% CI: 6.0–8.5), a median PFS of 5.0 months (95% CI: 4.3–5.9), and an ORR of 24.6% (21). In the present study, the RDIs of 22 patients ranged from 100% to 68.4%, leading to a DCR of 81.81% and a median OS of 12 months. Thus, it can be seen that proper decreasing of the RDI of nab-paclitaxel could ensure treatment efficacy, survival benefits, and chemotherapy tolerance for patients.

However, a question remains as to whether there is an optimal RDI that could satisfy the balance between patient tolerability, therapeutic efficacy, and survival benefits. Previous reports have shown that a significant RDI reduction could markedly affect therapeutic efficacy and patient survival. A previous Cox regression analysis of patients receiving adjuvant therapy after resection of pancreatic cancer suggested that the RDI of chemotherapy drugs was an independent predictor of disease-free survival (DFS) and OS, and the prognosis of patients with adjuvant chemotherapy at RDI ≤80% was poor (22). In advanced gastric cancer patients treated with nab-paclitaxel, the PFS and OS of patients in the RDI ≥80% group are significantly prolonged compared to those in the RDI <80% group, and the adverse reactions are safe and controllable (10).

In the present study, the cut-off value of RDI calculated using the ROC curve was 68.4%, which was used as the criteria for subgrouping. The relationship between the RDI of nab-paclitaxel and the short-term efficacy was further analyzed. The results showed that the patients with enlarged target lesions were distributed in the low RDI group other than the high RDI group. Moreover, a good correlation was observed between the RDI and short-term efficacy (PR, SD, and PD) (r=0.728, P<0.01). The above results suggested that the short-term efficacy of a high RDI was significantly better than that of a lower RDI. Survival analysis demonstrated that the OS and PFS of the high RDI group were better than those of the low RDI group. Cox regression analysis further confirmed that RDI was an independent prognostic factor affecting survival. The observation of adverse reactions suggested that although the incidence of hematological toxicity, nausea, and peripheral neurotoxicity in the high RDI group was higher than that in the low RDI group, they were limited to grades 1–2. Therefore, it can be preliminarily deduced that a RDI of 68.4% could satisfy the balance between patient tolerability, therapeutic efficacy, and survival benefits.

In addition, Picozzi *et al.* (23) assessed the real-world QoL of patients with metastatic pancreatic cancer at different stages of treatment and their results showed that patients in the nab-paclitaxel plus gemcitabine PR or SD group had lower mean pain scores compared to those without treatment. However, a meta-analysis demonstrated that gemcitabine plus nab-paclitaxel could improve the OS, PFS, and response rate, but increased the side effects, which resulted in no improvement in the QoL (24). In the present study, we observed that patients from the high RDI group had a markedly worse physical function and emotional function improvement compared to those from the low RDI group. Meanwhile, no differences were found in role function, global QoL, and pain between these two groups.

There were several limitations in the present study that should be noted. Firstly, the included sample size was small. Secondly, the study included patients receiving first- and second-line treatment. Thirdly, inconsistent RDI-decrease criteria were applied. To further evaluate the impact of RDI on the therapeutic efficacy and survival of advanced pancreatic cancer patients, further studies with larger sample sizes and corresponding prospective randomized controlled studies should be performed in the future.

Conclusions

In summary, when nab-paclitaxel is applied to patients with advanced pancreatic cancer, it is recommended to maintain a sufficient RDI to ensure that the balance between patient tolerability, therapeutic efficacy, and survival benefits is satisfied.

Acknowledgments

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Footnote

Reporting Checklist: The authors have completed the STROBE reporting checklist. Available at https://tcr.amegroups.com/article/view/10.21037/tcr-22-1604/rc

Data Sharing Statement: Available at https://tcr.amegroups.com/article/view/10.21037/tcr-22-1604/dss

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at https://tcr.amegroups.com/article/view/10.21037/tcr-22-1604/coif). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. This study was conducted in accordance with the Declaration of Helsinki (as revised in 2013) and was approved by the Ethics Committee of the Suzhou Xiangcheng People's Hospital (No. 2020-002). The requirement for written informed consent was waived due to the retrospective nature.

References

1. Sung H, Ferlay J, Siegel RL, et al. Global Cancer Statistics 2020: GLOBOCAN Estimates of Incidence and Mortality Worldwide for 36 Cancers in 185 Countries. CA Cancer J Clin 2021;71:209-49.
2. Chen W, Zheng R, Baade PD, et al. Cancer statistics in China, 2015. CA Cancer J Clin 2016;66:115-32.
3. Philip PA, Lacy J, Portales F, et al. Nab-paclitaxel plus gemcitabine in patients with locally advanced pancreatic cancer (LAPACT): a multicentre, open-label phase 2 study. Lancet Gastroenterol Hepatol 2020;5:285-94.
4. Catalano M, Aprile G, Conca R, et al. The impact of age, performance status and comorbidities on nab-paclitaxel plus gemcitabine effectiveness in patients with metastatic pancreatic cancer. Sci Rep 2022;12:8244.
5. Iede K, Yamada T, Koh M, et al. Optimal Relative Dose Intensity in the First 4 Weeks During Nab-Paclitaxel Plus Gemcitabine for Older Patients With Advanced Pancreatic Cancer in Japan. Pancreas 2022;51:e4-6.
6. Ishimoto U, Kinoshita A, Hirose Y, et al. The efficacy and safety of nab paclitaxel plus gemcitabine in elderly patients over 75 years with unresectable pancreatic cancer compared with younger patients. Cancer Chemother Pharmacol 2019;84:647-54.
7. Nielson CM, Bylsma LC, Fryzek JP, et al. Relative Dose Intensity of Chemotherapy and Survival in Patients with Advanced Stage Solid Tumor Cancer: A Systematic Review and Meta-Analysis. Oncologist 2021;26:e1609-18.
8. Abbassi R, Algül H. Palliative chemotherapy in pancreatic cancer-treatment sequences. Transl Gastroenterol Hepatol 2019;4:56.
9. Tamura S, Taniguchi H, Nishikawa K, et al. A phase II trial of dose-reduced nab-paclitaxel for patients with previously treated, advanced or recurrent gastric cancer (OGSG 1302). Int J Clin Oncol 2020;25:2035-43.

10. Kanazawa Y, Fujita I, Kakinuma D, et al. Initial Experience with Nab-Paclitaxel for Patients with Advanced Gastric Cancer: Safety and Efficacy. Anticancer Res 2017;37:2715-20.
11. Al-Batran SE, Ajani JA. Impact of chemotherapy on quality of life in patients with metastatic esophagogastric cancer. Cancer 2010;116:2511-8.
12. Eisenhauer EA, Therasse P, Bogaerts J, et al. New response evaluation criteria in solid tumours: revised RECIST guideline (version 1.1). Eur J Cancer 2009;45:228-47.
13. Aaronson NK, Ahmedzai S, Bergman B, et al. The European Organization for Research and Treatment of Cancer QLQ-C30: a quality-of-life instrument for use in international clinical trials in oncology. J Natl Cancer Inst 1993;85:365-76.
14. Bhutani MS, Cazacu IM, Roy-Chowdhuri S, et al. Upfront molecular profiling of pancreatic cancer patients - An idea whose time has come. Pancreatology 2020;20:391-3.
15. Pusceddu S, Ghidini M, Torchio M, et al. Comparative Effectiveness of Gemcitabine plus Nab-Paclitaxel and FOLFIRINOX in the First-Line Setting of Metastatic Pancreatic Cancer: A Systematic Review and Meta-Analysis. Cancers (Basel) 2019;11:484.
16. Goldstein D, El-Maraghi RH, Hammel P, et al. nab-Paclitaxel plus gemcitabine for metastatic pancreatic cancer: long-term survival from a phase III trial. J Natl Cancer Inst 2015;107:dju413.
17. Higuera O, Ghanem I, Nasimi R, et al. Management of pancreatic cancer in the elderly. World J Gastroenterol 2016;22:764-75.
18. Barreto SG, Gardi N, Dutt S. Birth of a solid organ cancer-the cell fusion hypothesis presented with pancreatic cancer as a model: a narrative review. Chin Clin Oncol 2021;10:45.
19. Rehman H, Chi J, Hakim N, et al. Attenuated regimen of biweekly gemcitabine/nab-paclitaxel in patients aged 65 years or older with advanced pancreatic cancer. Therap Adv Gastroenterol 2020;13:1756284820974912.
20. Ahn DH, Krishna K, Blazer M, et al. A modified regimen of biweekly gemcitabine and nab-paclitaxel in patients with metastatic pancreatic cancer is both tolerable and effective: a retrospective analysis. Ther Adv Med Oncol 2017;9:75-82.
21. Fernández A, Salgado M, García A, et al. Prognostic factors for survival with nab-paclitaxel plus gemcitabine in metastatic pancreatic cancer in real-life practice: the ANICE-PaC study. BMC Cancer 2018;18:1185.
22. Morita Y, Sakaguchi T, Kitajima R, et al. Body weight loss after surgery affects the continuity of adjuvant chemotherapy for pancreatic cancer. BMC Cancer 2019;19:416.
23. Picozzi V, Narayanan S, Henry Hu X, et al. Health-Related Quality of Life in Patients with Metastatic Pancreatic Cancer. J Gastrointest Cancer 2017;48:103-9.
24. Chin V, Nagrial A, Sjoquist K, et al. Chemotherapy and radiotherapy for advanced pancreatic cancer. Cochrane Database Syst Rev 2018;3:CD011044.

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