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Five-Year Prognostic Value of DAPT Score in Older Patients undergoing Percutaneous Coronary Intervention: A Large-Sample Study in the Real World

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Aim: The dual-antiplatelet therapy (DAPT) score is recommended for predicting the risk of ischemia and bleeding for patients undergoing percutaneous coronary intervention (PCI). This study aimed to investigate the long-term prognostic value of the DAPT score in older PCI patients.

Methods: This study enrolled 10,724 consecutive patients who underwent PCI from January 2013 to December 2013 in Fu Wai hospital, among whom 2,981 (27.8%) were aged ≥ 65 years. The ischemic endpoint was major adverse cardiovascular and cerebrovascular events (MACCE, including myocardial infarction, all-cause death, and stroke). The bleeding endpoint was Bleeding Academic Research Consortium (BARC) 2, 3, or 5 bleeding.

Results: After a 5-year follow-up, 256 (12.0%) MACCEs and 53 (2.5%) BARC 2, 3, or 5 bleeding occurred. The patients were divided into two groups according to the DAPT score: the low-score (<2, n=1,646) and high-score (≥ 2, n=485) group. Multivariate Cox regression revealed that the risk of MACCE was similar between the two groups [hazard ratio (HR): 1.214, 95% confidence interval (CI): 0.916–1.609, P=0.178], whereas the risk of bleeding was significantly higher in the high-score group than in the low-score group (HR: 2.447, 95% CI: 1.407–4.257, P=0.002). The DAPT score did not show prognostic value in MACCE [area under the receiver operating characteristic curve (AUROC), 0.534; 95% CI: 0.496–0.572, P=0.079]; however, it demonstrated a certain prognostic value in BARC 2, 3, or 5 bleeding (AUROC, 0.646; 95% CI: 0.573–0.719, P<0.001).

Conclusion: This study suggested that in older PCI patients, the DAPT score did not show predictive value for MACCE; however, it had a certain predictive value for 5-year BARC 2, 3, or 5 bleeding.

Key words: DAPT score, older, MACCE, bleeding, PCI

Abbreviations and Acronyms: CHD = coronary heart disease; PCI = percutaneous coronary intervention; DAPT = dual-antiplatelet therapy; MI = myocardial infarction; CHF = congestive heart failure; LVEF = left ventricular ejection fraction; MACCE = major adverse cardiovascular and cerebrovascular events; BARC = Bleeding Academic Research Consortium; HR = hazard ratio; CI = confidence interval; ROC = receiver operating characteristic curve; SYNTAX = Synergy Between Percutaneous Coronary Intervention with Taxus and Cardiac Surgery; AUROC = area under the receiver operating characteristic curve; ACS = acute coronary syndrome; PES = paclitaxel-eluting stent

Introduction

With the acceleration of population aging, there had been a sharp increase in the prevalence of coronary heart disease (CHD) among older people. Despite receiving percutaneous coronary intervention (PCI) and guideline-recommended intensive dual-antiplatelet and statin therapy, older patients with CHD are more prone to experience ischemic and bleeding events than younger patients[1-3]. In the era of global aging, early identification of older patients with high risks of long-term thrombosis and bleeding

events who are undergoing PCI remains a challenge; early identification of these patients is important to improve prognosis.

The dual-antiplatelet therapy (DAPT) score is important for predicting the risk of ischemia and bleeding following PCI, which has been recommended by ESC and AHA/ACC guidelines of DAPT in coronary artery disease as a practical tool to guide clinical decision-making[4, 5]. Several studies have validated that the DAPT score is capable of discriminating between high-score groups who have higher thrombosis risk and low-score groups who have higher bleeding risk[6-10]. Nonetheless, the external validation of the DAPT score predictive value is not completely consistent in the real world[11, 12]. Furthermore, to date, there is no research evaluating the utility of the DAPT score in older patients undergoing PCI.

Aim

This study aimed to investigate the performance of the DAPT score in predicting the 5-year ischemia and bleeding risk in older patients undergoing PCI from a large-sample study in the real world.

Methods

Study Design and Population

This was a prospective, single-center, observational cohort study. A total of 10,724 consecutive patients who had undergone PCI from January 2013 to December 2013 in Fu Wai hospital (National Center for Cardiovascular Diseases, Beijing, China) were enrolled, and patients aged ≥ 65 years were included in the final analysis. Consistent with the inclusion and exclusion criteria for the DAPT score[13], we excluded patients who had any of the following conditions: absence of stent implantation, nonadherence to 12-month DAPT, occurrence of thrombotic and bleeding events within 1 year, intake of oral anticoagulants, and lost to follow-up. All the patients were given aspirin and P2Y12 receptor antagonist at baseline. After PCI, they were administered aspirin 100 mg daily indefinitely and clopidogrel 75 mg daily or ticagrelor 90 mg twice daily for at least 1 year. The study was conducted in accordance with the Declaration of Helsinki. The ethics committee of Fu Wai Hospital approved this research protocol. Written informed consent was obtained from all of the patients.

Definitions and Endpoints

In this study, the DAPT score was determined according to the original DAPT study[13]. The DAPT score calculator used for all patients consisted of nine factors: age, cigarette smoking, diabetes mellitus, myocardial infarction (MI) at presentation, prior PCI or prior MI, paclitaxel-eluting stent (PES), stent diameter <3 mm, congestive heart failure (CHF) or left ventricular ejection fraction (LVEF) $<30\%$, and vein graft stent. The parameters of the DAPT score used the first laboratory results within 24 h of admission. Older patients were defined as those aged ≥ 65 years. The ischemia endpoint was defined as major adverse cardiovascular and cerebrovascular events (MACCEs, a composite of MI, all-cause death, or stroke). MI was diagnosed according to the third universal definition of myocardial infarction[14]. The bleeding endpoint was defined by Bleeding Academic Research Consortium (BARC) type 2, 3, or 5 bleeding[15]. Additional endpoints assessed included components of the above endpoints. The patients were divided into two groups according to the cutoff point of the DAPT score.

Follow-Up

Follow-up by telephone interview or clinical visits was scheduled at 30 days, 6 months, 1 year, 2 years, and 5 years, with a 91.5% follow-up rate at 5 years. If any clinical symptoms occurred or myocardial ischemia was documented, the patients were advised to return for coronary angiography. Time to event was calculated as the period between the date of PCI and the event, or the date of loss to follow-up, whichever came first. All adverse events were adjudicated by two independent cardiologists, and probably disagreement was resolved by consensus.

Statistical Analysis

Continuous variables with normal distribution were expressed as mean ± standard deviation and compared using Student's *t*-test. Categorical variables were expressed as numbers (%) and compared using the Pearson χ^2 test or Fisher's exact test. According to the risk stratification of the original DAPT score[13],

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the patients were divided into the high-score group (score ≥ 2) and low-score group (score <2). Survival curves were generated in each score group by the Kaplan–Meier method, and differences were compared using the log-rank test. Univariate and multivariate Cox regression was used for survival analysis. Gender, body mass index, and other variables, which were statistically significant in the univariate Cox regression, were included in the final multivariate analysis. Hazard ratios (HRs) and 95% confidence intervals (CIs) were calculated. To evaluate the ability of the DAPT score to predict MACCE and bleeding, receiver operating characteristic (ROC) analysis was conducted. The association between the DAPT score and endpoints in different subgroups was assessed by Cox regression models with tests for interaction. Two-sided $P<0.05$ was considered to indicate statistical significance. All statistical analyses were conducted using SPSS 25.0 (IBM Corp., Armonk, New York, USA).

Results

Patients' Characteristics

Among 10,724 consecutive patients who underwent PCI throughout 2013 in Fu Wai Hospital, 2,981 aged ≥ 65 years were enrolled. After excluding patients according to the exclusion criteria, 2,131 were finally included in this study **(Supplementary Fig. 1)**. The average age of the patients was 70.3 ± 4.5 years, and 784 (36.8%) of them were female. Most patients took clopidogrel, and only a few (0.2%) took ticagrelor. According to the DAPT cutoff score of 2 recommended by the guidelines, the patients were divided into the high-score group (score ≥ 2, $n=485$) and the low-score group (score <2, $n=1,646$). The high-score group had younger patients; had lesser proportion of women; had higher number of patients with history of peripheral vascular disease, stroke, and coronary artery bypass grafting treatments; had higher SYNTAX score; had higher proportion of smokers; had higher number of patients with diabetes; had patients who previously underwent PCI or had MI; had patients with MI at presentation; had patients with CHF or LVEF <30%; and used stent diameter <3 mm, vein graft stent, PES, and had lesser proportion of patients used second- or third-generation stent compared with the low-score group **(Table 1)**. The distribution of the DAPT score is presented in **Fig. 1**.

5-year Incidence Rates between the High- and Low-Score DAPT Groups

After a 5-year follow-up, 256 (12.0%) patients experienced MACCE [among them, 69 (3.2%) experienced MI, 109 (5.1%) all-cause death, and 93 (4.4%) stroke], whereas 53 (2.5%) experienced BARC 2, 3, or 5 bleeding. No significant differences were observed in the incidence rates of MACCE (14.2% vs. 11.4%) and its component [including MI (3.3% vs. 3.2%), all-cause death (6.6% vs. 4.7%), and stroke (4.9% vs. 4.2%)] between the high- and low-score groups. However, for BARC 2, 3, or 5 bleeding, the event rate was significantly higher in the high-score than in the low-score group (4.7% vs. 1.8%, $P<0.001$) **(Supplementary Table 1)**. BARC 3 or 5 bleeding is presented in **Supplementary Table 1**.

Kaplan–Meier Survival Curve Analysis between the High- and Low-Score Groups

Kaplan–Meier survival curve analysis revealed that the cumulative 5-year incidence rate of MACCE was similar between the two groups ($P=0.094$). However, patients with high scores had higher cumulative 5-year incidence of BARC 2, 3, or 5 bleeding than those with low scores ($P<0.001$). Further analysis revealed that the cumulative incidences of MI, all-cause death, and stroke were similar between the two groups **(Fig. 2)**.

Cox Regression Analysis

After multivariate adjustment, the risk of MACCE (HR: 1.214, 95% CI: 0.916–1.609) was similar between the two groups, whereas the risk of BARC 2, 3, or 5 bleeding in patients with high scores was 2.447 times higher than those in patients with low scores (HR: 2.447, 95% CI: 1.407–4.257). For further analysis, the risks of MI (HR: 0.891, 95% CI: 0.501–1.585), all-cause death (HR: 1.346, 95% CI: 0.883–2.052), and stroke (HR: 1.232, 95% CI: 0.769–1.972) were still similar between the two groups **(Table 2)**. The associations between each component in the DAPT score and MACCE as well as BARC 2, 3, or 5 bleeding are presented in **Supplementary Table 2**.

Predictive Value of the DAPT Score

When MACCE was used as the endpoint, the DAPT score did not exhibit a predictive value for ischemic events with an AUROC of 0.534 (95% CI 0.496-0.572, $P=0.079$). But when BARC 2, 3, or 5 bleeding was used as the endpoint, the DAPT score had a certain prognostic value in bleeding events with an AUROC of 0.646 (95% CI: 0.573–0.719, $P<0.001$). In further analysis, when MI, all-cause death, and stroke were used as the endpoint, the DAPT score did not exhibit significant predictive values in MI with an AUROC of 0.552 (95% CI: 0.486–0.617,

Table 1. Baseline characteristics of patients

Parameters	low DAPT score (score < 2, *n*=1,646)	high DAPT score (score ≥ 2, *n*=485)	*P* Value
Age, years	71.0 ± 4.6	69.8 ± 3.9	< 0.001***
Female	671 (40.8)	113 (23.3)	< 0.001***
BMI, kg/m^2	25.3 ± 3.1	25.1 ± 3.2	0.381
Hypertension	1,165 (70.8)	341 (70.3)	0.842
Peripheral vascular disease	51 (3.1)	30 (6.2)	0.002***
Previous stroke	250 (15.2)	96 (19.8)	0.016***
Prior CABG	77 (4.7)	51 (10.5)	< 0.001***
ACS	983 (59.7)	309 (63.7)	0.114
Ccr < 60 ml/min	355 (21.6)	105 (21.6)	0.969
SYNTAX score	11.9 ± 8.5	13.3 ± 9.0	0.002***
Factors in DAPT score			
Age ≥ 75	411 (25.0)	46 (9.5)	< 0.001***
Cigarette smoking	564 (34.3)	352 (72.6)	< 0.001***
Diabetes	374 (22.7)	291 (60.0)	< 0.001***
Prior PCI or MI	411 (25.0)	331 (68.2)	< 0.001***
MI at presentation	152 (9.2)	150 (30.9)	< 0.001***
CHF or LVEF < 30%	3 (0.2)	49 (10.1)	< 0.001***
Stent diameter < 3mm	801 (48.7)	398 (82.1)	< 0.001***
Vein graft stent	0 (0)	7 (1.4)	< 0.001***
Paclitaxel-eluting stent	21 (1.3)	25 (5.2)	< 0.001***
2nd or 3rd generation stent	1,254 (76.2)	333 (68.7)	< 0.001***

Values are presented as mean ± standard deviation, or *n* (%).
DAPT, dual-antiplatelet therapy; BMI, body mass index; MI, myocardial infarction; PCI, percutaneous coronary intervention; CABG, coronary artery bypass grafting; ACS, acute coronary syndrome; Ccr, creatinine clearance rate; SYNTAX, Synergy between Percutaneous Coronary Intervention with Taxus and Cardiac Surgery; CHF, congestive heart failure; LVEF, left ventricular ejection fraction
*********P* values indicating statistical significance

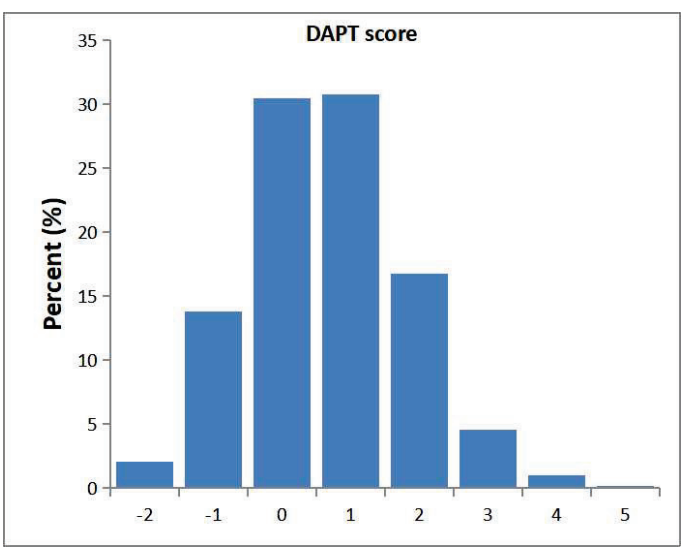

Fig. 1. Distribution of the DAPT score among older PCI patients
DAPT, dual-antiplatelet therapy; PCI, percutaneous coronary intervention

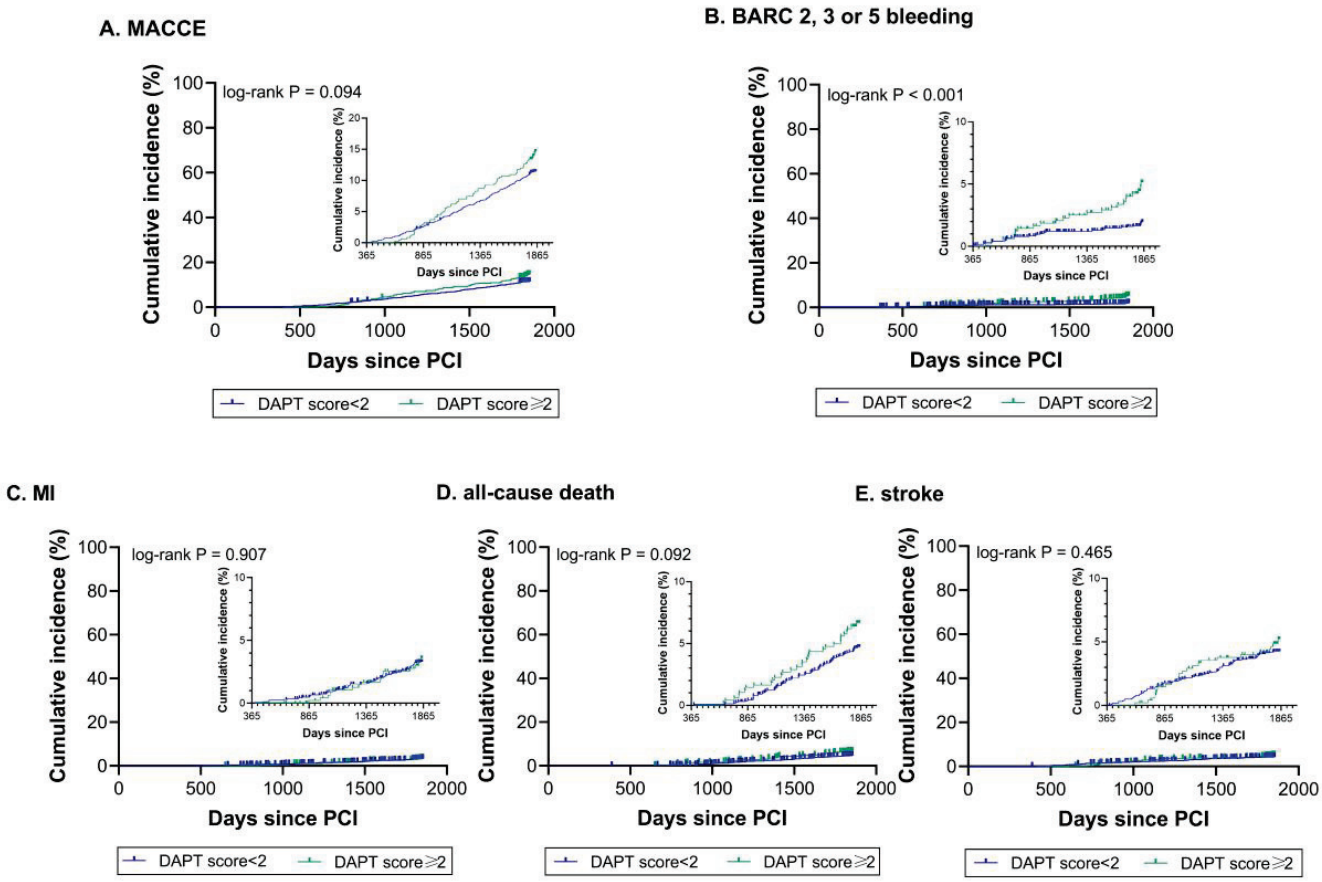

Fig. 2. Kaplan–Meier curve analysis of clinical outcomes according to the different DAPT score groups

DAPT, dual-antiplatelet therapy; MACCE, major adverse cardiovascular and cerebrovascular events; BARC, Bleeding Academic Research Consortium; MI, myocardial infarction; PCI, percutaneous coronary intervention

Table 2. Cox regression of high vs. low DAPT score

	low DAPT score (score < 2)	high DAPT score (score ≥ 2)	*P* Value
MACCE			
Univariate Cox regression [HR, (95%CI)]	Reference	1.266 (0.960-1.668)	0.094
Multivariate Cox regression [HR, (95%CI)]	Reference	1.214 (0.916–1.609)	0.178§
BARC 2, 3 or 5 bleeding			
Univariate Cox regression [HR, (95%CI)]	Reference	2.631 (1.528-4.529)	<0.001***
Multivariate Cox regression [HR, (95%CI)]	Reference	2.447 (1.407-4.257)	0.002***§
MI			
Univariate Cox regression [HR, (95%CI)]	Reference	1.034 (0.591-1.809)	0.906
Multivariate Cox regression [HR, (95%CI)]	Reference	0.891 (0.501-1.585)	0.695§
All-cause death			
Univariate Cox regression [HR, (95%CI)]	Reference	1.423 (0.942-2.148)	0.094
Multivariate Cox regression [HR, (95%CI)]	Reference	1.346 (0.883-2.052)	0.167§
Stroke			
Univariate Cox regression [HR, (95%CI)]	Reference	1.189 (0.747-1.891)	0.466
Multivariate Cox regression [HR, (95%CI)]	Reference	1.232 (0.769-1.972)	0.386§

DAPT, dual-antiplatelet therapy; MACCE, major adverse cardiovascular and cerebrovascular events; BARC, Bleeding Academic Research Consortium; MI, myocardial infarction; HR, Hazard ratio; CI, confidence interval

***P values indicating statistical significance

§Multivariate Cox regression was adjusted for gender, body mass index and other significant variables in the univariate model

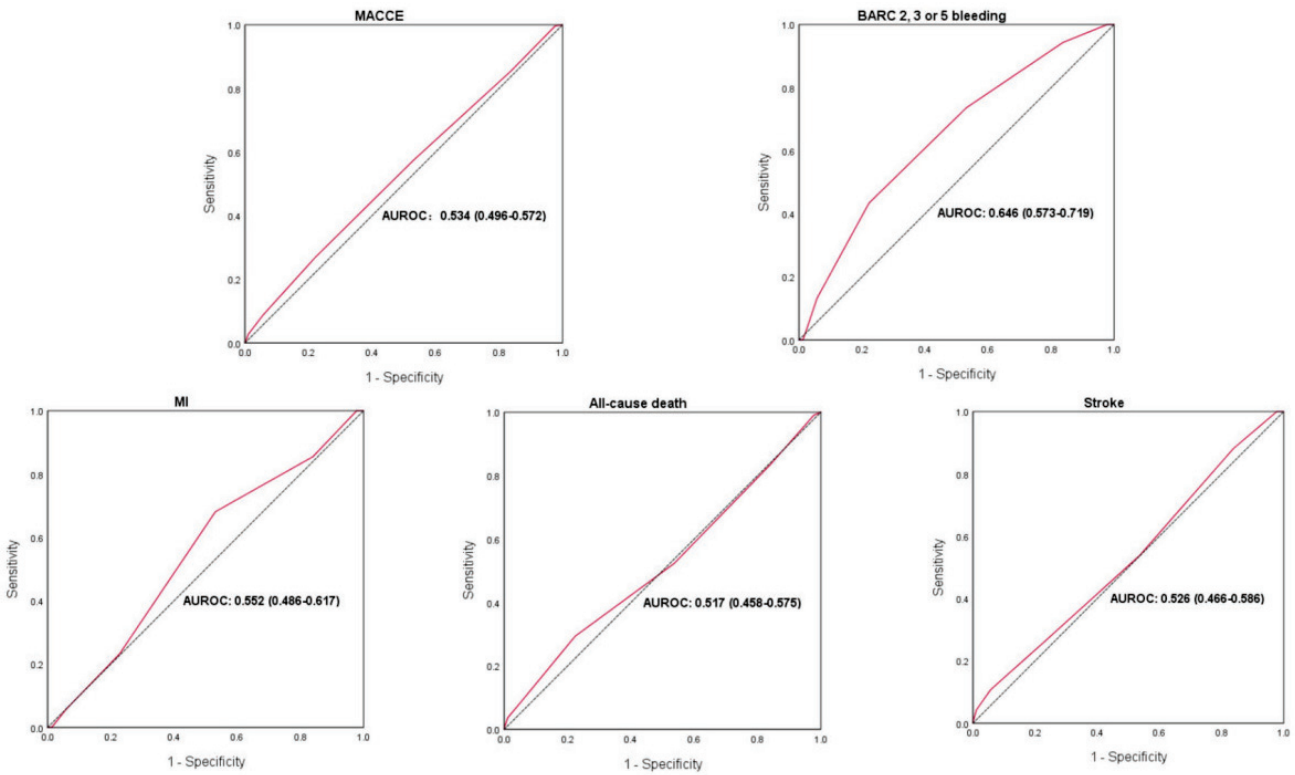

Fig. 3. The AUROC of the DAPT score for predicting MACCE; BARC 2, 3, or 5 bleeding; MI; all-cause death; and stroke

AUROC, area under the receiver operating characteristic curve; DAPT, dual-antiplatelet therapy; MACCE, major adverse cardiovascular and cerebrovascular events; BARC, Bleeding Academic Research Consortium; MI, myocardial infarction

P=0.144), all-cause death with an AUROC of 0.517 (95% CI: 0.458–0.575, *P*=0.560), and stroke with an AUROC of 0.526 (95% CI: 0.466–0.586, *P*=0.398) **(Fig. 3)**.

Subgroup Analysis

In the total population, no significant difference was observed in MACCE between the high- and low-score groups. This result was consistent in different subgroups, regardless of age, sex, and acute coronary syndrome (ACS) **(Fig. 4a)**. Furthermore, the association between the DAPT score and BARC 2, 3, or 5 bleeding showed no significant interaction with age, sex, and ACS (*P* value for interaction >0.05) **(Fig. 4b)**.

Discussion

DAPT score is an important clinical decision tool recommended by the guidelines for predicting the risk of ischemia and bleeding following PCI to identify patients who could benefit from DAPT treatment beyond 1 year[13]. In this real world large-sample study, we firstly evaluated the predictive performance of the DAPT score for 5-year MACCE and BARC 2, 3, or 5 bleeding risk in older PCI patients. The main findings were as follows: (1) the DAPT score did not exhibit predictive value for 5-year MACCE in older PCI patients; (2) however, the DAPT score had a certain predictive value for 5-year BARC 2, 3, or 5 bleeding in older PCI patients.

Predictive Value for MACCE

Our study found that the DAPT score was not predictive of long-term MACCE in older PCI patients. Several studies evaluating the validity of the DAPT score have been conducted as it was recommended by guidelines[4]. Surprisingly, the results were inconsistent in the external validations. In the original DAPT study[13], the DAPT score exhibited moderate predictive value for 12 to 30 months of ischemic events following PCI (C-statistic=0.70). Another study by Brener *et al.*[6] reported that the DAPT score exhibited predictive value for the composite of MI or stent thrombosis with a C-statistic of 0.71. However, an analysis from the ISAR-SAFE trial[16] revealed that the risk of ischemia was similar between the high-score (>2) and low-score (≤ 2)

(a)

Subgroup	DAPT score<2	DAPT score≥2	Hazard Ratio (95%CI) for MACCE	P Value for Interaction
	no. of patients with events/total no. (%)			
Overall	187/1646 (11.4)	69/485 (14.2)	1.214 (0.916–1.609)	
Age				0.456
≥75 years	56/411 (13.6)	10/46 (21.7)	1.456 (0.719-2.947)	
<75 years	131/1235 (10.6)	59/439 (13.4)	1.259 (0.920-1.722)	
Sex				0.635
Male	109/975 (11.2)	54/372 (14.5)	1.260 (0.907-1.751)	
Female	78/671 (11.6)	15/113 (13.3)	1.077 (0.618-1.880)	
ACS				0.987
Yes	116/983 (11.8)	45/309 (14.6)	1.197 (0.840-1.704)	
No	71/663 (10.7)	24/176 (13.6)	1.229 (0.769-1.965)	

(b)

Subgroup	DAPT score<2	DAPT score≥2	Hazard Ratio (95%CI) for BARC 2, 3 or 5 bleeding	P Value for Interaction
	no. of patients with events/total no. (%)			
Overall	30/1646 (1.8)	23/485 (4.7)	2.447 (1.407-4.257)	
Age				0.318
≥75 years	8/411 (1.9)	4/46 (8.7)	4.397 (1.297-14.902)	
<75 years	22/1235 (1.8)	19/439 (4.3)	2.297 (1.228-4.299)	
Sex				0.695
Male	20/975 (2.1)	18/372 (4.8)	2.338 (1.235-4.428)	
Female	10/671 (1.5)	5/113 (4.4)	2.803 (0.955-8.229)	
ACS				0.253
Yes	15/983 (1.5)	16/309 (5.2)	2.904 (1.414-5.962)	
No	15/663 (2.3)	7/176 (4.0)	1.842 (0.741-4.580)	

Fig. 4. Subgroup analysis of the association between DAPT score and endpoints

Hazard ratios (HRs) and 95% confidence intervals (CIs) are shown for the MACCE (a) and BARC 2, 3, or 5 bleeding (b). P represents the interaction test between the variable and the DAPT score. DAPT, dual-antiplatelet therapy; MACCE, major adverse cardiovascular and cerebrovascular events; ACS, acute coronary syndrome; BARC, Bleeding Academic Research Consortium

groups (P=0.11). These inconsistent results may be related to different clinical endpoints, study populations, and follow-up durations.

It is worth noting that compared with the above research, our study focused on older PCI patients and did not show the predictive value of DAPT score for ischemic events at a long-term follow-up. The possible reasons were as follows: (1) Older patients usually have characteristics of frequent comorbidities, altered pharmacokinetics and pharmacodynamics, and hemostatic factor plasma level disorders[17] and have high ischemia and bleeding risks[18, 19]. Our findings suggested that the DAPT score is inappropriate for the prediction of ischemic events in this population. (2) The discrepancy may stem from different clinical endpoints. This study had a follow-up duration of 5

years and used the hard endpoint MACCE (composite of myocardial infarction, all-cause death, or stroke), which is often used in clinical practice. (3) The different stent types may explain part of the negative result. The proportion of patients using PES was significantly lower (2.2% vs 22.9%) in this study than in the original DAPT study[13]. In fact, the original DAPT study also performed a subgroup of patients with second-generation everolimus-eluting stent and found that the treatment effect for ischemic and bleeding events between the high- and low-score groups was not significant. Meanwhile, the PRODIGY study demonstrated that the effect of the difference by DAPT score for the ischemic outcome also disappeared after excluding patients treated with PES[10]. These findings indicated that the influence of different stent types needs to be examined when considering the predictive value of the DAPT score. In summary, we found that the DAPT score could not show predictive value for MACCE. In the future, a more suitable risk score for predicting ischemia for the older Chinese population needs to be established.

Predictive value for bleeding

We initially reported that the DAPT score had a predictive value for long-term BARC 2, 3, or 5 bleeding in older PCI patients. The original DAPT study demonstrated a predictive value for 12–30 months of moderate and severe bleeding following PCI (C-statistic 0.68)[13]. However, external validation studies have shown poor predictive value of DAPT score for bleeding. Chichareon *et al.*[20] reported that the DAPT score could not predict BARC 3 or 5 bleeding (0.44% of patients experienced bleeding), and Ueda *et al.*[21] showed that the DAPT score had poor predictive value for fatal or major bleeding (0.66% of patients experienced bleeding). The different bleeding endpoints and follow-up days could be the possible reasons. Meanwhile, the low bleeding rates may influence the risk prediction performance of the DAPT score[22]. In our study, BARC 2, 3, or 5 bleeding was defined as the bleeding endpoint, and we followed up for 5 years, which had a relatively high cumulative bleeding rate (2.5%) than previous studies[20, 21] and thus could show predictive value for bleeding.

Interestingly, the original DAPT study[13] demonstrated that lower score was associated with a higher risk of bleeding; however, our study found that a higher DAPT score was associated with a higher bleeding risk. There were some potential explanations for the contradicting results. First, the original DAPT study showed that older age was a significant risk factor for bleeding (1 point for 65–75 years old, 2 points for age ≥ 75 years)[13]; in this study, all patients enrolled were aged ≥ 65 years, corresponding to those who were at high bleeding risk in the DAPT score. Therefore, the distribution of DAPT score in older population has changed and this may have an impact on the result. Of note, our study also analyzed the association between age and bleeding in the Cox regression model. We found that age ≥ 75 years was not an effective cutoff point for bleeding event prediction in older PCI patients. Second, prior PCI or MI was a significant risk factor for BARC 2, 3, or 5 bleeding in the older patients in the present study, whereas it was considered as a risk factor for ischemia risk in the original DAPT study. A previous randomized clinical trial of 9,013 PCI patients with a median follow-up of 5 years found that PCI or MI at follow-up was a risk factor for BARC 3 or 5 bleeding[23]. In addition, the CREDO-Kyoto trial[24] showed that prior MI was a significant risk factor for bleeding and ultimately included this factor in the bleeding prediction score. These two studies and our results both showed that prior PCI or MI, an ischemia risk variable in the original DAPT study, was an important risk factor for bleeding events, resulting in high DAPT score in older patients with higher bleeding risk. For older PCI patients, our study provided an important view that the higher the DAPT score, the higher the bleeding risk. Notably, there may be ethnic disparities in thrombosis and bleeding tendency between Asians and Caucasians according to "East Asia paradox,"[25] which could have an influence on the utility of the DAPT score. Therefore, the prognostic value of the DAPT score in older patients from different races needs to be further evaluated in the future.

In conclusion, the predictive value of the DAPT score in older PCI patients differs from that in the original DAPT study. Older patients are usually at a high risk of both ischemia and bleeding, which may influence the performance of the DAPT score. This study not only pointed out the limitations of the DAPT score in predicting ischemic events in older PCI patients but also supplemented a new perspective for the DAPT score in predicting BARC 2, 3, or 5 bleeding. Therefore, clinicians should consider individual differences and use comprehensive risk assessment tools to better guide health management in older PCI patients.

Limitations

This study had some limitations that need to be acknowledged. First, this was a single-center study, which may potentially limit the generalizability of our

findings. Second, in this study, most patients took clopidogrel. Further studies are warranted to evaluate the efficacy of this score for new antiplatelet drugs and their association. Third, the incidence rate of BARC 3 or 5 bleeding in this study was too low to produce powerful statistical results. Therefore, more large-scale studies should be conducted to further investigate the utility of the DAPT score in older PCI patients according to the BARC 3 or 5 bleeding endpoint. Fourth, because this was an observational cohort study, there may have been some confounding factors. Lastly, this study mainly focused on the older population, and research is required in the future to compare the utility of the DAPT score between younger and older PCI patients.

Conclusion

The present study evaluated the prognostic value of the DAPT score in older patients after PCI at a 5-year follow-up in the real world. The results indicated that the DAPT score could not discriminate the MACCE events in the older PCI patients; however, it had a certain predictive value for BARC 2, 3, or 5 bleeding in long-term follow-up, providing new insights into the application of the DAPT score in older PCI patients in the future.

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Conflicts of Interest Statement

The authors have no conflicts of interest to declare.

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Data Availability Statement

Due to ethical restrictions related to the consent given by subjects at the time of study commencement, our datasets are available from the corresponding author upon reasonable request after permission of the Institutional Review Board of State Key Laboratory of Cardiovascular Disease, Fu Wai Hospital, National Center for Cardiovascular Diseases.

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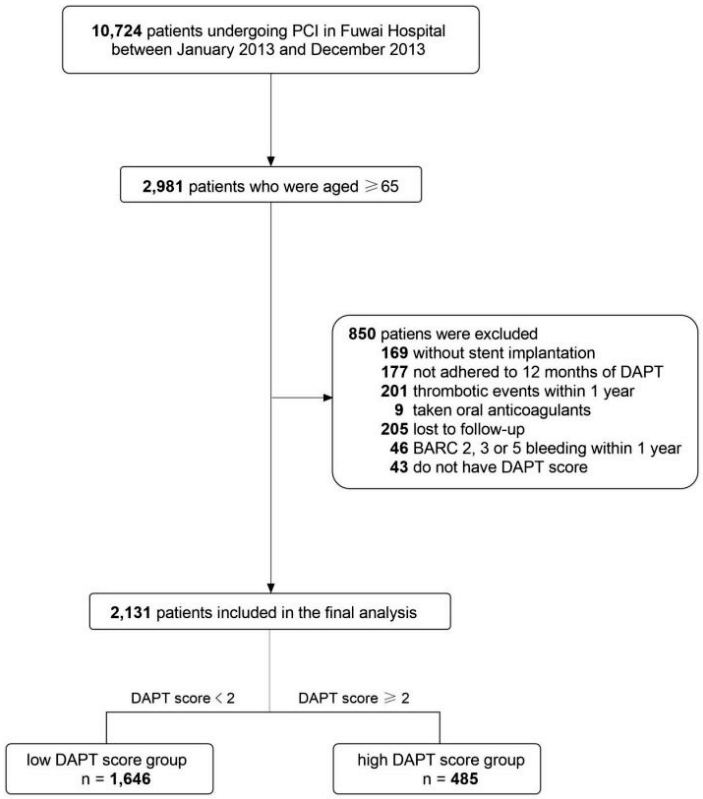

Supplementary Fig. 1. Patient flow chart

PCI, percutaneous coronary intervention; DAPT, dual-antiplatelet therapy; BARC, Bleeding Academic Research Consortium

Supplementary Table 1. 5-year incidence rates of high vs. low DAPT score

	low DAPT score (score <2, *n*=1,646)	high DAPT score (score ≥ 2, *n*=485)	*P* Value
MACCE	187 (11.4%)	69 (14.2%)	0.088
BARC 2, 3 or 5 bleeding	30 (1.8%)	23 (4.7%)	<0.001***
MI	53 (3.2%)	16 (3.3%)	0.931
All-cause death	77 (4.7%)	32 (6.6%)	0.092
Stroke	69 (4.2%)	24 (4.9%)	0.474
BARC 3 or 5 bleeding	9 (0.5%)	7 (1.3%)	0.044***

DAPT, dual-antiplatelet; MACCE, major adverse cardiovascular and cerebrovascular events; BARC, Bleeding Academic Research Consortium; MI, myocardial infarction

*********P* values indicating statistical significance

Supplementary Table 2. Univariate and multivariate Cox regression of each risk factors with clinical outcomes

Factors	MACCE				BARC 2, 3 or 5 bleeding			
	Crude HR	*P* value	Adjusted HR[§]	*P* value	Crude HR	*P* value	Adjusted HR[§]	*P* value
Female	0.980 (0.759–1.264)	0.875	1.258 (0.930–1.702)	0.136	0.675 (0.372–1.228)	0.198	0.957 (0.476–1.926)	0.902
BMI	1.003 (0.965–1.043)	0.877	0.995 (0.957–1.035)	0.807	1.001 (0.919–1.091)	0.976	0.997 (0.913–1.088)	0.944
Hypertension	1.450 (1.082–1.943)	0.013***	1.466 (1.089–1.972)	0.012***	1.816 (0.913–3.614)	0.089		
Peripheral vascular disease	1.639 (0.973–2.761)	0.063			1.012 (0.246–4.157)	0.987		
Previous stroke	1.173 (0.855–1.609)	0.324			1.857 (1.008–3.420)	0.047	1.833 (0.993–3.382)	0.053
Prior CABG	1.887 (1.258–2.831)	0.002***	1.818 (1.209–2.734)	0.004***	2.083 (0.891–4.873)	0.091		
Risk factors in DAPT score								
Age ≥ 75	1.312 (0.991–1.736)	0.058			1.110 (0.583–2.112)	0.751		
Cigarette smoking	1.440 (1.127–1.840)	0.004***	1.607 (1.203–2.146)	0.001***	1.749 (1.016–3.012)	0.044***	1.630 (0.867–3.066)	0.129
Diabetes	0.190 (0.920–1.539)	0.185			1.705 (0.990–2.935)	0.054		
Prior PCI or MI	1.262 (0.982–1.620)	0.069			2.125 (1.239–3.644)	0.006***	2.029 (1.178–3.496)	0.011***
MI at presentation	0.789 (0.539–1.155)	0.223			1.586 (0.817–3.080)	0.173		
CHF or LVEF <30%	1.973 (1.069–3.610)	0.027***	2.083 (1.136–3.817)	0.018***	2.614 (0.815–8.383)	0.106		
Stent diameter <3mm	0.976 (0.762–1.249)	0.845			1.279 (0.734–2.228)	0.386		
Vein graft stent	2.627 (0.654–10.563)	0.174			0.050 (0.000–1083.117)	0.784		
Paclitaxel-eluting stent	1.507 (0.745–3.047)	0.254			0.048 (0.000–157.125)	0.462		

DAPT, dual-antiplatelet; BMI, body mass index; CABG, coronary artery bypass grafting; MI, myocardial infarction; PCI, percutaneous coronary intervention; CHF, congestive heart failure; LVEF, left ventricular ejection fraction; HR, hazard ratio; CI, confidence interval; MACCE, major adverse cardiovascular and cerebrovascular events; BARC, Bleeding Academic Research Consortium; MI, myocardial infarction

***P* values indicating statistical significance

[§]Gender, BMI and other variables which were statistically significant in univariate Cox regression were included in the multivariate analysis