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Original Article

Relationship of A-type personality to drug-eluting in-stent restenosis in coronary heart diseases patients received percutaneous coronary artery interventional therapy

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Abstract: The relationship between A-type personality and drug-eluting in-stent restenosis in coronary heart diseases (CHD) patients received percutaneous coronary artery interventional (PCI) therapy is uncertain. The aim of the present study was to evaluate the relationship between the A-type personality of CHD patients received PCI and in-stent restenosis (ISR). A total of 193 CHD patients received PCI in our hospital were divided into the A-type personality group (n=125) and B-type personality group (n=68). Type A behavior pattern scale was used to judge personality type in 1 week after PCI. All the patients examined by 128-slice CT angiography (128-CT) to distinguish in-stent restenosis 12 month after PCI. Major adverse cardiac events (MACE) within 12 months after PCI were observed and high-sensitivity C-reactive protein (hs-CRP) levels were detected at 6 month and 12 month after PCI. Between two groups, there were no statistical differences in the aspects of clinical features and profile of DES implantation ($P > 0.05$) except Body mass index (BMI) ($P < 0.05$). Nineteen (15.20%) in-stent restenosis were examined out in the A-type personality group, but 3 cases (4.41%) in the B-type personality group. The difference was significant ($P < 0.05$). In conclusion, the A-type personality CHD patients who received PCI may have a higher incidence rate of in-stent restenosis than the A-type personality patients. In-stent restenosis was happened because higher hs-CRP level in their blood. So we should pay attention to judge personality type. Perhaps in-stent restenosis will be reduced in these patients taken body and mind therapy for A-type personality CHD patients received PCI.

Keywords: A-type personality, percutaneous coronary interventional, in-stent restenosis, high-sensitivity C-reactive protein

Introduction

Since the first Palmaz-Schatz bare-metal (BMS) was implanted in human body in 1985, coronary stenting successfully resolved problem of the high restenosis rate in balloon dilatation era and soon became the primary means of clinical treatment of coronary artery disease [1]. Drug-eluting stent (DES) was developed more than a decade later which reduced the in-stent restenosis rate significantly, but there was still 10% DES implanted in human body taking place in-stent restenosis. The long term clinical efficacy of DES was seriously affected [2]. In the current, under the guidance of the biological - psychological - social medical model, psychologists proposed that A-type personality people possess these nature, their pace of life faster, work pressure big, ambitious, aggressive, workaholism, but the lack of patience, can easily lead to hostility, often time urgency and other characteristics.

Materials and methods

Study population and procedures

A total of 198 consecutive CHD patients who were implanted with DES from June 2012 to August 2013 in Xi'an Gaoxin hospital were studied, 3 patients were excluded for liver inadequacy and 2 patients were excluded for digestive bleeding after standard medicine for treating the CHD Exclusion and 193 of them (97.47%) were enrolled in the study including 126 male and 67 female at the mean age of (57.16 ±

7.45) years. 296 DES were implanted in these patients. For each patient, all coronary angiography and PCI procedures were performed using standard technique, and quantitative coronary angiographic measurements were made by two independent observers at least two orthogonal views. The patients rolled in the study were initially treated with aspirin 300 mg orally, followed 100 mg daily, and Clopidogrel 300 mg orally, followed 75 mg daily. If door to balloon time was short of 2 hours, the acute myocardial infarction (AMI) patients were treated with Clopidogrel 600 mg orally. They maintained standard medicine for treating the CHD including statins, aspirin, β-blockers, angiotensin converting enzyme inhibitors/angiotensin receptor blockers, calcium channel blockers, and oral nitrates according their basic illness and provided follow-up care for 12 months after PCI in discharged period [3, 4]. Clinical information of patients and stent paramenters were documented after PCI.

The patients fulfilled the following inclusion criteria [5]: ① the patients with successful PIC (residual narrowing < 30%, thrombolysis in MI (TIMI) flow grade III and no complications), and without staged PCI, no contraindications to aspirin, clopidogrel or heparin; ② no liver and renal inadequacy and digestive bleeding; ③ no personality disorder, schizophrenia and drug addiction; ④ no vascular cognitive impairment and vascular dementia. Exclusion criteria were as follow: ① liver and renal inadequacy and digestive bleeding after standard medicine for treating the CHD; ② conditions know to modify plasma hs-CRP, as malignancy, inflammation, autoimmune disease, thyroid disease, estrogen replacement therapy, thrombotic disorders, valvular heart disease, class III to IV heart failure, left ventricular ejection fraction < 40%, fever (body temperature > 37.5°C), infectious disease, major trauma or surgery within 1 month.

Study methods

193 patients after the PCI of the selected patients with 1 week after the application of the Chinese National Cooperative Group revised the A type behavior scale to conduct the type of survey, determine the type A personality and type B personality. 5 Type A personality for the observation group, B type personality for the control group. In the observation group, 125 cases, including 82 (65.60%) males and 43 (34.40%) females, aged 35~71 years, the average age was 56.23 + 7.47 years. In the control group, 68 cases, including 44 (64.71%) males and 24 (35.29%) females, aged 37~72 years old, with an average age of 58.10 + 7.39 years.

Stent implantation

Target lesions were treated by elective PCI with coronary stent implantation. All patients received DES including sirolimus-eluting stent and paclitaxel-eluting stent. Balloon pre-dilatationg was performed before stent implantation, direct stenting was applied as possible and post-dilatationg was used if the primary angiographic result was not satisfactory. Pre-procedural intravenous heparin was used to maintain an activated clotting time for at least 250 seconds, and all patients received aspirin (at least 75 mg/d for at least 1 year) and clopidogrel (300 mg loading followed by 75 mg/d until the angiographic follow-up).

128-CT examination

All the patents enrolled the study were examined computer tomography angiography (CTA) at 12 months after PCI. All CTA examinations were performed using a 128-CT scanner (Philips, Hamberg, Germany) with tube voltage 120 kV. The images were reconstructed by a radiologist with > 3 years of experience in cardiac CTA. In-stent restenosis was defined as 50% or greater luminal narrowing within the course of the stent. All the reports of DSCT were evaluated on PACS by two independent observers, each with > 5 years of experience in cardiac CTA. When the assessment between observers differed, they would discuss and reach a consensus.

Measurement of plasma hs-CRP

Plasma hs-CRP level was measured with an immunoturbidimetric method (Beckmann Assay 360 Bera, California, USA) as previously described. Ethylene diamine tetraacetic acid (EDTA)-anti-coagnlated peripheral blood was taken by 12-hour fasting upon patient's admission. Plasma was obtained with a centrifugation of 3000 r/min at 4°C for 15 minutes, and the resulting sample was immediately store at

Table 1. Main clinical characteristics

Characteristics	A-type personality group (*n* = 125)	B-type personality group (*n* = 68)	*P*/values
Age (years)	56.23 ± 7.47	58.10 ± 7.39	0.097
Male gender (*n* (%))	82 (65.6)	44 (64.71)	1.00
Cardiovascular risk factors			
BMI (kg/m^2)	21.98 ± 1.95	23.82 ± 2.06	< 0.001
Current smoker	37 (29.60)	21 (30.88)	0.871
Hypertension (*n* (%))	80 (64)	29 (42.65)	0.06
Hypercholesterolemia (*n* (%))	60 (48)	35 (51.47)	0.655
Diabetes mellitus (*n* (%))	52 (41.6)	26 (20.8)	0.759
Family history of CHD (*n* (%))	18 (14.4)	10 (14.71)	1.000
Disease classification (*n* (%))			
Stable angina	20 (16)	9 (13.23)	0.678
Unstable angina	64 (51.2)	38 (55.88)	0.550
MI	41 (32.8)	21 (30.88)	0.872
Medical treatment (*n* (%)) Before admission			
Statins	85 (68)	38 (55.88)	0.117
Aspirin	125 (100)	68 (100)	1.000
β-blockers	103 (82.4)	52 (76.47)	0.347
ACEI/ARB	79 (63.2)	42 (61.76)	0.877
CCB	68 (55.4)	37 (55.41)	1.00

BMI: body mass index; CHD: coronary heart disease; ACEI/ARB: angiotensin converting enzyme; inhibitors/angiotensin receptor blockers; CCB: calcium channel blockers.

Table 2. Angiographic and procedural characteristics

Variables	A-type personality group (*n* = 125)	B-type personality group (*n* = 68)	*P*/values
Angiographic characteristics (n (%))			
Multivessel disease (n (%))	21 (16.8)	8 (11.76)	0.35
Target vessel LM (n (%))	2 (1.6)	1 (1.47)	1
Target vessel LAD (n (%))	82 (65.6)	51 (75)	0.196
Target vessel LCX (n (%))	23 (18.4)	10 (14.71)	0.555
Target vessel RCA (n (%))	47 (37.6)	19 (27.94)	0.205
C-type lesion (n (%))	59 (47.2)	31 (45.59)	0.649
Multiple complex lesion (n (%))	57 (45.6)	28 (41.18)	0.405
Total occlusion lesion (n (%))	25 (20.2)	17 (25.0)	0.467
Procedural variable			
RVD	3.03 ± 0.52	3.11 ± 0.47	0.559
Target lesion stenosis (%)	81.5 ± 9.5	82.3 ± 9.7	0.763
Target lesion length (mm)	30.8 (15-60)	29.6 (12-65)	0.372
Stent length (mm)	36.4 (18-68)	34.7 (15-72)	0.165
Stent diameter (mm)	3.16 ± 0.51	3.22 ± 0.49	0.495
Direct stenting (n (%))	28 (22.4)	12 (17.65)	0.464
Maximal deployment pressure (kPa)	1476 ± 285	1496 ± 293	0.687
Stent inflationg time (second)	12 (8-16)	10 (8-16)	0.524
Post-dilatationg (n (%))	103 (82.4)	52 (76.47)	0.347

LM: left main; LAD: left anterior descending; LCX: left circumflex; RCA: right coronary artery; RVD: reference vessel diameter.

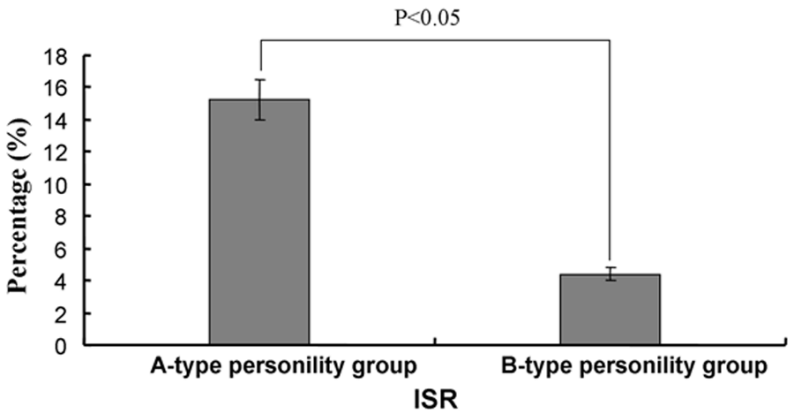

Figure 1. Comparison of rate of ISR between the A-tape personality group and B-tape personality group.

-20°C until further analysis. The lower detection limit of hs-CRP was 0.2 mg /L, the upper limit was 500 mg/L, and the median normal value was 0.8 mg/L. The inter-assay coefficients of variation were 4.4% and 4.8% respectively, and the intra-assay coefficients was 3.5% and 5.1% respectively.

Statistical analysis

All data were treated with the statistical program SPSS 13.0 for Windows (SPSS Inc, USA) Continuous variables were described as mean ± standard deviation (SD). Analyses were performed with the chi-square test for categorical data, *t* test for continuous data between the groups. A $P < 0.05$ was considered as having statistical significance.

Results

Clinical and angiographic characteristics

There were no significant differences in the most relevant clinical characteristics between the two groups (**Table 1**), but loading A-type personality group has lower body mass index (21.98 ± 1.95) in 12 months after PCI. The angiographic and procedural characteristics were similar between two groups (**Table 2**).

In-stent restenosis and Plasma hs-CRP

As show in **Figure 1**, nineteen (15.20%) in-stent restenosis were examined out in the A-type personality group, but 3 cases (4.41%) in the B-type personality group. The difference was significant ($P < 0.05$). As shown in **Table 3**, hs-CRP levels at 6 month (2.89 ± 1.26 vs. 1.03 ± 0.43) and 12 month (1.61 ± 0.97 vs. 0.54 ± 0.18) after PCI were all higher in the A-type personality group than the B-type personality group, and the difference were significant ($P < 0.05$).

Discussion

The present study found that CHD patients with A-type personality planted drug-eluting stent had higher incidence of in-stent restenosis than B-type personality. And the patients in A-type personality group had higher level of hs-CRP at 6 months and 12 months after PCI than B-type personality group. A large number of studies have found that social psychological factor play an important role in the occurrence, development and prognosis of CHD [6, 7]. In the 1970s American cardiologist Friedman and Rosenman on a large number of CHD patients with personality, behavior research, found that many CHD patients possessed these character, such as ambitious and feisty, workaholic but a lack of patience, can easily lead to hostility, often have a sense of time urgency and, put forward the concept of type a personality, found in the further study, and defined this type personality as A-type personality. This type is a personality of individual CHD risk in individuals with type B personality 2 times [8, 9]. With the change of social life style and rhythm of Chinese society, the importance of personality characteristics for the occurrence and prognosis of coronary heart disease have gradually been recognized and valued [10].

Pathological studies have revealed the stent restenosis process. When the stent implantation and balloon dilatation cause mechanical damage depth of vascular membrane, collagen is exposed, activation of the coagulation system, platelet adhesion, thrombosis; cytokine release and growth factor activation of the medial vascular smooth muscle cells, smooth muscle cells of a series of genes abnormal expression, making them migration, proliferation, secretion of extracellular matrix, resulting

Table 3. hs-CRP level at 6month and 12 month after PCI

Variable	A-type personality group (n = 125)	B-type personality group (n = 68)	P values
hs-CRP at 6 month	2.89 ± 1.26	1.03 ± 0.43	0.02
hs-CRP at 12 month	1.61 ± 0.97	0.54 ± 0.18	0.01

in negative remodeling of the vascular intimal thickening and vascular [11, 12]. The A-type personality CHD patients may have more significantly reaction and release more cytokines in the process [13, 14]. In the various cytokines, particularly hs-CRP, plays an important role in the proliferation of vascular intima [15]. In recent years, many researchers have indicated that high sensitivity C-reactive protein (hs-CRP) is a sensitive inflammatory marker, and increased hs-CRP level is related to cardiovascular events as ISR in SA patients [16]. It remains controversial that hs-CRP has an association with PCI for ISR especially in DES era [17, 18]. Several studies have indicated that hs-CRP levels were significantly elevated in in-stent restenosis CHD patients [19].

Although conventional coronary angiography is generally accepted as the gold standard, multidetector computed tomography (MDCT) can provide high accuracy for the assessment of in-stent restenosis and can play an important role in ruling out in-stent restenosis [20]. So, it can be drawn a conclusion that the A-type personality CHD patients may have a higher incidence of in-stent restenosis after planted drug-eluting stent, and the results support the conclusion.

This study is a single-center study with a relatively small sample size. The difference of the baseline data and 5 patient's exclusion may influence the results of this study. In summary, our finding suggested that A-type personality CHD patients have a higher incidence of in-stent restenosis after planted drug-eluting stent.

In the modern biological-psychological-social medical model, Clinicians should pay more attention to evaluation the personality type of patients [21]. According to the type of personality, CHD patients implanted drug-eluting stent were received comprehensive education and treatment. Perhaps, we can reduce drug-eluting in-stent restenosis through changing the CHD patient's characters and behavior.

Disclosure of conflict of interest

None.

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