Meta-analysis of In-stent Restenosis Factors after Coronary Intervention

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Abstract: This aim is to explore the relevant factors affecting in-stent restenosis after coronary intervention procedures. Relevant research literature was searched through domestic and international databases and Meta-analysis was performed. Smoking, alcohol consumption, hypertension, hyperlipidemia, diabetes mellitus, low-density lipoprotein cholesterol, total cholesterol, triglycerides, uric acid level, number of implanted stents, and stent length were significantly associated with in-stent restenosis (P<0.05). Factors such as gender, age, body mass index, high-density lipoprotein cholesterol, and left ventricular ejection fraction were not significantly correlated with in-stent restenosis (P>0.05).

Keywords: coronary heart disease; in-stent; restenosis

1. Information and methods

1.1 Object of study
Case-control and cross-sectional studies on factors of stent restenosis after coronary intervention [1].

1.2 Literature inclusion and exclusion criteria
Inclusion criteria: (1) The type of study was a cross-sectional or case-control study; (2) The study subjects were patients who suffered from coronary atherosclerotic heart disease and underwent stenting interventions; (3) The ISR of in-stent restenosis was clearly defined as a stenosis of ≥ 50% in stent-implanted segments as shown by late follow-up coronary angiography[1]; (4) Factors related to the stent restenosis under study were clearly defined; (5) The inclusion and exclusion criteria of the study subjects were comparable. (6) Literature whose language was Chinese and English [2].
Exclusion criteria: (1) Repeatedly published literature; (2) Literature with incomplete data or data that could not be extracted for analysis; (3) Literature type belonging to case reports, reviews, theoretical studies, etc.; (4) Literature for which the full text could not be obtained.

1.3 Searching strategy
The Chinese databases searched were China Knowledge Network (CNN), Wipu Information Chinese Journal Service Platform (WISP), China Biomedical Literature Service System (CBLS), Wanfang Medical Network (WFMN), etc., and the English databases were Pub Med, Embase, and Web of Science, etc. [3], which were supplemented with manual searches, to collect the relevant literature about case-control and cross-sectional studies on the factors of stent restenosis after coronary heart disease interventional therapy [4], and the search period was from January 1, 2010 to November 30, 2023. The search strategy used a combination of subject terms and free terms, and the Chinese search terms included coronary heart disease, intervention, stent, restenosis, related factors, influencing factors, risk factors, etc. The English search terms included coronary heart disease (CHD), percutaneous coronary intervention (PCI), in-stent restenosis (ISR), in-stent restenosis (ISR), in-stent restenosis (ISR), in-stent restenosis (ISR), in-stent restenosis (ISR), in-stent restenosis (ISR), drug-eluting stents (DES), risk factor, related factor, correlation factor and so on[5].

1.4 Literature Screening and Data Extraction
The screening of literature was conducted independently by two researchers, and when there was a dispute, a third person was asked to assist and make a final judgment on its inclusion [6]. The extracted literature included: (1) general information: title of the literature, first author, year of publication, type of literature, and platform of publication, etc.; (2) the study population: the exposure of the case and control groups and the number of samples in each group; and (3) the definition of each study factor, the unit of data, the sample size of the samples in each group, as well as the mean and standard deviation of the continuous variables, etc. [9].

1.5 Statistical methods
Meta-analysis was performed using Stata 14.0 software. The dominance ratio OR and its 95% CI were used to express
effect sizes. The χ² test and I² test were used to analyze the statistical heterogeneity among the included literatures.

2. Result

2.1 Literature Screening Process

The computerized search collected a total of 2,654 pieces of relevant literature, and 1,866 pieces were de-emphasized. Thirty-eight literatures were found to meet the inclusion criteria after reading the title, abstract, and full text.

2.2 Basic characteristics and quality of the included literature

A total of 38 papers were included in this study, including 33 papers in Chinese and 5 papers in English; 19 relevant factors were included; the publication years were 2010-2023; and the Newcastle-Ottawa scale scores of the included papers ranged from 6 to 9. See Figure 1.

2.3 Restenosis rate after coronary intervention

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2.4 Meta-analysis result

The effect values of factors associated with ISR restenosis in the literature reporting >7 were combined and analyzed by Meta-analysis, which showed that: hypertension, hyperlipidemia, smoking, alcohol consumption, diabetes mellitus, high low-density lipoprotein cholesterol level, high cholesterol, high triglyceride, high uric acid, number of multiple stents, and stent length bias were all risk factors for the occurrence of ISR (P < 0.05); high bilirubin was a ISR protective factor for the occurrence of ISR; variables such as gender, age, BMI, high-density lipoprotein cholesterol, left ventricular ejection fraction, and number of stents were not statistically significant (P>0.05) for the incidence of ISR, as shown in Figure 2.
2.5 Sensitivity analysis

The results of the sensitivity analysis showed that the Meta-analysis results for each of the other influencing factors were unchanged after removing the sample of any single paper and remained within the 95% confidence intervals, and that each of the significant variables was insensitive to the change in the results after the deletion of any single paper[10].

2.6 Publication bias

The results of the sensitivity analysis showed that the Meta-analysis results for each of the other influencing factors were unchanged after removing the sample of any single paper and remained within the 95% confidence intervals, and that each of the significant variables was insensitive to the change in the results after the deletion of any single paper[9]. See Figure 3.

3. Discussion

In this study, the following conclusions were obtained by the method of Meta-analysis of 38 national and international literatures: smoking, alcohol consumption, hypertension, hyperlipidemia, diabetes mellitus, LDL cholesterol level, cholesterol level, triglyceride, uric acid, number of stents, and length of stents showed statistically significant (P < 0.05) on in-stent restenosis; gender, age, BMI, HDL. The variables of gender, age, BMI, HDL cholesterol, left ventricular ejection fraction, and number of stents were not statistically significant on the incidence of ISR (P>0.05), and the results of all the studies showed insensitivity to the exclusion of a single included literature; there was a publication bias in each of the studies on the length of the stent, and there was no publication bias for any of the other variables.

In conclusion, smoking, alcohol consumption, hypertension, hyperlipidemia, diabetes mellitus, high low-density lipoprotein cholesterol level, high cholesterol, high triglycerides, high uric acid, higher number of stents, stent length, and low total bilirubin level are risk factors for in-stent restenosis. Smoking, alcohol consumption, hypertension, hyperlipidemia, diabetes mellitus, high LDL cholesterol levels, high cholesterol, high triglycerides, high uric acid, high number of stents, longer stent lengths, and low total bilirubin levels should be of high concern in the prevention of in-stent restenosis in patients after coronary intervention.
References