# Comparative analysis of safety of interventional therapy for different types of coronary heart disease based on bioelectrical signals

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**Abstract:** Objective: To analyze the safety of interventional therapy for different types of coronary heart disease based on bioelectrical signals. Methods: From January 2019 to February 20120, 168 patients with coronary heart disease treated by PCI were selected for study. All the selected patients met the diagnostic criteria of coronary heart disease and had no contraindication of PCI, and all of them knew and signed the consent form. Randomly divided into control group and research group, and compared the operation-related complications between the two groups. Results: The comparison of perioperative operation between the two groups showed that the puncture time of radial artery puncture intervention was significantly longer than that of femoral artery, but the postoperative hospitalization time was significantly lower than that of the control group ($P<0.05$). There was no significant difference between chronic coronary artery disease and operation-related complications (acute thrombosis, no reflow/slow blood flow, reocclusion, death, etc.) in the research group ($P > 0.05$). Conclusion: The safety of CVIT treatment for different types of coronary heart disease patients is similar.

## 1. Introduction

The phenomenon of electrical changes in biological organism during physiological activities is caused by the potential difference between inside and outside the corresponding cell membrane, which reflects the exciting transformation of the corresponding parts, and is an important basis for biomedical clinical diagnosis. The measurement of bioelectrical signals is often multi-channel. For example, the standard ECG signal commonly used in clinic has 12 leads, while the EEG signal has 22 leads or more [1]. Therefore, the processing methods of bioelectric signals are complex and diverse, and it is necessary to pay attention to the signal processing algorithms combining time domain, frequency domain and spatial domain. CVIT can provide a complete diagnosis and treatment path to promote accurate diagnosis and treatment, integrate clinical information system, provide cardiovascular diagnosis information for clinic, and provide powerful imaging and data analysis capabilities, as well as surgical procedures and the overall process of structured reporting.

With the aging of our society, the incidence of coronary heart disease is on the rise [2-3]. Interventional therapy is the first choice, and the indications are expanding. At present, the common approaches of percutaneous coronary intervention (PCI) include trans femoral intervention (TFI) and transradial intervention (TRI). The effectiveness of PCI in the treatment of coronary heart disease is recognized [4-5]. This paper discusses the safety of PCI in different types of coronary heart disease based on bioelectrical signals. The analysis of 160 patients with different types of coronary heart disease undergoing elective PCI in our hospital is as follows:

## 2. Materials and methods

### 2.1. Material

From January 2019 to February 20120, 168 patients with coronary heart disease treated by PCI were selected for study. All the selected patients met the diagnostic criteria of coronary heart

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disease and had no contraindication of PCI, and all of them knew and signed the consent form. Randomly divided into control group and research group. 80 patients in the control group underwent interventional therapy via femoral artery, including 58 males and 22 females, aged 48-72 years old, with an average of (67.1±5.5) years old; 80 patients in the research group underwent menstruation Radial artery interventional therapy included 43 males and 37 females, aged 50-75 years, with an average of (66.3±5.7) years old. The distribution of basic data of the two groups of patients was not statistically significant (P>0.05).

### 2.2. Method

Perioperative preparation: Before PCI, patients were given aspirin 100mg and clopidogrel 75mg orally for 4 ~ 6 days, once a day. The skin of perineum and groin was cleaned by femoral artery, and the skin of both upper limbs was cleaned by radial artery. Inform patients undergoing femoral artery surgery to prepare for bed defecation and take active exercise. At the same time, penicillin skin test, blood routine test and liver function test were performed before operation, and patients were required to fast within 4 hours before operation. Patients continued to take clopidogrel 75 mg and aspirin 100 mg orally for 12 months.

Research group: The patients were given clopidogrel 300 mg and aspirin 300 mg orally before operation, and the puncture point was just below the femoral artery beat 2 ~3 cm below the femoral transverse stripe in the right groin area. The puncture site was anesthetized locally with 1% lidocaine, and the needle was inserted at 30 °~ 40 °until the blood returned smoothly. The arterial sheath was inserted, and 5mL of 1% lidocaine, 200 μ g of nitroglycerin and 3 000 U of heparin were injected through the sheath. After operation,

Control group: 1.5 ~ 2 cm below the right femoral transverse stripes was selected as the puncture point. After local anesthesia with lidocaine, 18 g puncture needle was used. After successful puncture of femoral artery, 6 F arterial sheath was placed. The left and right coronary angiography were performed by using 6fjl4.0 and jr4.0 catheter. The strategy and method of interventional therapy are the same as those of transradial artery group. Some patients who underwent interventional therapy immediately pulled out the arterial sheath and sutured the puncture site with a vascular stapler; In other patients, the arterial sheath was removed and compressed for 15 minutes 2 ~ 4 hours after operation, and the elastic bandage and sandbag were compressed for 6 ~ 8 hours, followed by bed observation for 24 hours.

### 2.3. Observation index

The puncture time, puncture success rate, operation time, operation success rate and hospitalization time of the two interventional approaches were recorded, and the postoperative complications of patients were counted.

### 2.4. Statistical treatment

SPSS 19.0 software was used for analysis. The measurement data were expressed by $\bar{x} \times s$, and the counting data were tested by T-test. The difference was statistically significant when $P < 0.05$.

## 3. Result

### 3.1. Comparison of perioperative operation between two interventional approaches

In the research group, 6 patients failed to puncture the radial artery and changed to femoral artery puncture, and the other 74 patients were successfully punctured, with a puncture success rate of 92.5% and an operation success rate of 97.5%(78/80). In the control group, the success rate of femoral artery puncture was 100% and the success rate of operation was 95%(76/80). There was no significant difference in the success rate of operation between the two groups (P>0.05). Comparison of perioperative operation between the two groups showed that the puncture time of radial artery puncture intervention was significantly longer than that of femoral artery, but the postoperative hospitalization time was significantly lower than that of the control group (P<0.05). See Table 1 for

details.

Table 1 Comparison of perioperative operation between two interventional approaches

| Group | n | Puncture time(min) | Puncture success rate (%) | Operation time(min) | Operation success rate (%) | Length of stay(d) |
|---|---|---|---|---|---|---|
| control group | 80 | 5.2±0.7 | 80(100%) | 48.3±4.3 | 76(95%) | 8.3±1.2 |
| Research group | 80 | 8.6±0.4* | 74(92.5%) | 48.9±5.5* | 78(97.5%) | 5.6±1.1* |

Note: "*" group comparison, P<0.05.

### 3.2. Comparison of PCI complications between control group and research group

There were 17 cases of related complications in 160 patients with PCI, 5 cases in the control group and 11 cases in the research group. There were 4 cases of intraoperative complications in the control group, including 1 case of acute thrombosis, 1 case of no reflow/slow blood flow, 3 cases of coronary dissection, 1 case of postoperative complications, that is, 1 case of death; There were 4 intraoperative complications in the research group, including 1 acute thrombosis, 2 coronary dissection, 1 death and 7 postoperative complications, including 3 reocclusion, 1 heart failure, 2 coronary dissection and 1 acute thrombosis. See table 2. There was no significant difference in total complications between the two groups (P> 0.05). See Table 2 for details.

Table 2 Comparison of PCI complications between control group and research group

| Item | Control group(n=80) | Research group (n=80) |
|---|---|---|
| Intraoperative complications | | |
| Acute thrombosis | 1 | 1 |
| Coronary artery dissection | 3 | 2 |
| No reflow/slow blood flow | 1 | 0 |
| Die | 0 | 1 |
| Postoperative complications | | |
| Re-occlusion | 0 | 3 |
| Heart failure | 0 | 1 |
| Acute thrombosis | 0 | 1 |
| Coronary artery dissection | 0 | 2 |
| Die | 1 | 0 |

## 4. Discussion

Advanced signal processing, deep neural network and other technologies provide new modes and means for fast, accurate and intelligent medical treatment. The processing and recognition algorithm of ECG and EEG signals is the key technology of intelligent medical treatment based on bioelectrical signals. At present, in CVIT system based on ECG and EEG, the processing speed of signal recognition is limited and the accuracy of disease recognition is not high, which is also the main reason that hinders the intelligent disease diagnosis and rehabilitation system from moving towards clinical application.

Unhealthy eating behavior and lifestyle can lead to obesity, hypertension, coronary heart disease and diabetes, and promote the occurrence of malignant events of cardiovascular and cerebrovascular diseases. Healthy lifestyle is the primary prevention of cardiovascular and cerebrovascular diseases. With the increasing number and younger age of patients with coronary heart disease, the health education of patients with coronary heart disease has become particularly important.

Coronary heart disease is a kind of cardiovascular disease that endangers human health [6]. Its

morbidity and mortality are high, so it is very important to promote the health of patients with coronary heart disease through drugs and interventional therapy. The harm of coronary heart disease and the prevention of coronary heart disease not only bring pain to patients and affect their quality of life, but also bring heavy burden to families and society. Interventional therapy has always been regarded as the first choice for the treatment of left main artery diseases, and the effectiveness and safety of interventional therapy for left main artery diseases have always been concerned by people. Traditional drug-eluting stents and bare metal stents are regarded as the new development of percutaneous coronary intervention, but they still have shortcomings in solving the problems of restenosis and late thrombosis. At present, bioabsorbable scaffolds have become a research hotspot. At present, the arterial pathways commonly selected for percutaneous coronary intervention include femoral artery and radial artery, and a few choose ulnar artery and brachial artery. The advantage of TRI is that the blood vessels it passes through are obviously shorter than TFI in interventional therapy, which also reduces the indirect injury of vascular network and effectively avoids complications such as pseudoaneurysm, intraoperative bleeding and arteriovenous fistula. Tri has the advantages of less pain and trauma to patients, and obviously shortened healing and recovery time.

However, in recent years, a large number of clinical practices have confirmed that femoral artery puncture operation is simple, but because of the deep puncture position, the risk of hematoma or infection, pseudoaneurysm, etc. during and after operation is higher, especially for elderly patients with coronary heart disease, which are more prone to various complications due to their weakened physiological functions [7-8]. Transradial artery puncture has won the favor of clinicians and patients in recent years because of its shallow puncture position, less peripheral nerve and blood vessels, less injury to nerve and blood vessels during operation, less postoperative complications and quick recovery. The results of this study showed that the success rate of puncture through radial artery and operation in the research group was 92.5% and 97.5%, respectively. In the control group, the success rate of puncture through femoral artery was 100%, and the success rate of operation was 95%. There was no significant difference in the success rate of operation between the two groups ($P>0.05$).

There were 4 cases of re-occlusion in our hospital, all of which were patients with acute ST-segment elevation myocardial infarction. Among them, 3 cases of acute in-stent occlusion were related to poor stent adhesion, and the symptoms were relieved after re-balloon dilation and tirofiban pumping. One patient had repeated myocardial infarction, which was considered to be related to antiplatelet drug resistance. Two patients died, including one patient with chronic coronary artery disease complicated with diabetes, and the other patient with senile acute coronary syndrome complicated with diabetes mellitus. Ventricular fibrillation caused by thrombosis occurred during operation and died after rescue, all of which were related to acute thrombosis. All patients complicated with heart failure had cardiac insufficiency before operation, and they were improved according to heart failure treatment.

## 5. Conclusions

To sum up, CVIT in TRI treatment can effectively reduce puncture-related complications, because the radial artery is superficial and easy to compress and stop bleeding. Immediately after operation, the patient can get out of bed and walk, and recover quickly, which increases the comfort of the patient. Postoperation posture is not limited, which reduces the incidence of complications such as thrombosis and pulmonary embolism due to bed rest. It does not affect the continued application of anticoagulants after operation, reduces the risk of acute thrombosis, and is easily accepted by patients and their families.

## References

[1] Mehdi, Slim, Mohamed, Aymen, Meddeb, & Elies, et al. (2019). A comparative study of bypass versus percutaneous intervention for left main disease. La Tunisie medicale, vol. 97, no. 4, pp. 533-

540.

[2] Jiang, Z, Qu, H, Y Zhang, Zhang, F, & Chen, K. (2021). Efficacy and safety of xinyue capsule for coronary artery disease after percutaneous coronary intervention: a systematic review and meta-analysis of randomized clinical trials. Evidence-based Complementary and Alternative Medicine, vol. 2021, no. 4, pp. 1-13.

[3] Wang, Chao, Hou, Jiqiu, Yan, & Shasha, et al. (2020). Chinese herbal medicine therapy for coronary heart disease complicated with anxiety: a systematic review of randomized controlled trials. Journal of Traditional Chinese Medicine, vol. 40, no. 01, pp. 4-19.

[4] Hui Lin, Hui Dan,&Shi Huijuan. (2019). Effect of continuous self-management education on the patients with interventional therapy for coronary heart disease. nursing practice and research, vol. 016, no. 002, pp. 50-52.

[5] Feng Yuping, Tang Yubin. (2018). Study on risk factors of interventional therapy for ischemic stroke patients with coronary heart disease. Journal of Anhui Health Vocational and Technical College,vol. 017, no. 001, pp. 49-50.

[6] Athauda-Arachchi, P. (2019). Advanced interventional cardiac procedures and perioperative care required to prevent the epidemic of end-stage heart disease in sri lanka. Sri Lanka Journal of Medicine, vol. 28, no. 1, pp. 54.

[7] Yi-Fan Li, Zhi-Wei Zhang, Shu-Shui Wang, Zhao-Feng Xie, Xu, Z, & Yu-Fen Li. (2017). Transcatheter closure of congenital coronary artery fistulas with a giant coronary artery aneurysm in children: experiences from a single center. Chinese Medical Journal, vol. 130, no. 16, pp. 1919-1925.

[8] Hylands-White, N, Rui, V. D, & Raphael, J. H. (2017). An overview of treatment approaches for chronic pain management. Rheumatology International, vol. 37, no. 1, pp. 29-42.