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Original Article

Application of the interventional limb raising management strategy (ILRMS) at radial vascular access sites in coronary angiography and percutaneous coronary intervention: A randomized trial

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ABSTRACT

Purpose: To compare the effectiveness of the interventional limb raising management strategy (ILRMS) to elastic bandage compression at radial vascular access sites following coronary angiographies (CAGs) and percutaneous coronary interventions (PCIs).

Methods: Patients with ischemic coronary heart disease whose condition was stable over three months were enrolled in this clinical study ($n = 590$; aged 25–80). All participants had just undergone CAG and PCI. Patients were randomized into either the ILRMS group ($n = 360$) or standard post-intervention care with an elastic bandage ($n = 230$). Overall comfort and wrist pain was assessed and the degree of index finger swelling and oxygen saturation was measured on the affected arm. All variables were measured prior to post-intervention treatment and again at six hours after CAG and PCI.

Results: We found that patients receiving ILRMS had significantly lower wrist pain scores and swelling around the index finger compared to the elastic bandage group ($p < 0.05$). Oxygen saturation of the index finger was not statistically significant ($p > 0.05$). We also found that 19.57% of the elastic bandage patients were comfortable, while ILRMS patients were significantly more comfortable (93.06%; $p < 0.05$).

Conclusions: We find that ILRMS alleviates swelling and pain of the wrist more effectively than current practices and improves the degree of overall comfort of patients who undergo CAG and PCI.

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1. Introduction

A coronary angiography (CAG) is an important imaging technique used to identify coronary heart disease (CHD) and to evaluate collateral circulation. They also aid in selecting the most appropriate treatment strategy [1]. Percutaneous coronary intervention (PCI) enables occluded blood vessels to be rapidly opened and improves myocardial perfusion. Percutaneous artery puncture, both transradial coronary angiography (TRG) and transradial coronary intervention (TRI), are the best methods to diagnosis and treat CHD [2,3]. Since anticoagulants and anti-platelet agents are used during the procedures, bleeding is the major risk following cardiac catheterization. Pressure is therefore typically applied for around six hours to stop bleeding from the radial puncture site [1]. Pressure also helps to reduce swelling of the palm and wrist pain, and numbness. Elastic bandages and radial artery hemostasis devices are equally effective, but patients generally prefer the former due to superior comfort [4].

Since patients must keep the arm straight, tension and anxiety may also increase, exacerbating the feeling of the pain at puncture site. Without proper nursing care, unnecessary swelling, pain, and numbness may occur. No effective way for solving this problem is currently available. At present, patients are instructed to place their affected arm on the abdomen and to use their clothing to raise their limb. However, no attention is placed on compliance or comfort of the patient.

TRG and TRI significantly decrease the morbidity and mortality from cardiovascular diseases [5,6]. However, these procedures bring about a substantial amount of swelling, pain, and discomfort from arterial compression. This study aims examine whether the interventional limb raising management strategy (ILRMS) alleviates wrist swelling or pain following TRG and TRI. Patients were provided with routine care and instructions, their wrists were compressed for six hours after the procedure, and the index finger circumference and oxygen saturation was measured to monitor blood supply to the hand [7].

2. Materials and methods

2.1. Study design

Between July 2012 to June 2013, 590 CHD patients were recruited who had undergone TRG or TRI at our hospital. Patients are divided into either the ILRMS group ($n = 360$) or the control group ($n = 230$). The study was approved by the Biological Research Ethics Committee at the Affiliated Hospital of Jiangsu University (Trial registration Q201308 and FZ2014016). All patients gave written informed consent.

2.2. Measurements

Sex and age were recorded for each patient. Prior to compression, the circumference of the index finger was measured on the affected limb, a pain score of wrist metacarpus was recorded, peripheral oxygen saturation (SaO_2) was measured, and comfort state recorded. A pen was used to mark the SaO_2

measurement location, and the finger was not covered in order to avoid the influence temperature on measurements.

2.3. Participants

Inclusion criteria included: (1) their Allen test was positive; (2) this was their first time undergoing TRG or TRI; (3) they were in stable condition after TRG or TRI; (4) they were able to successfully communicate verbally; and (5) they were 25–80 years of age. Exclusion criteria included: (1) patients who experienced right radial artery puncture failure; (2) patients who were transferred to the coronary care unit after CAG or PCI with serious complications (malignant arrhythmia, vagus nerve reflex, and myocardial infarction); and (3) patients who generate the puncture site bleeding.

2.4. Nurse training

Four nurses with experience working with CHD patients were recruited. They went through a half-day training session lead by one investigator, one manager, and one doctor. Nurses learned about ILRMS, how to select and record the data, and how to use the interventional upper limb pad (IULP; Fig. 1).

2.5. ILRMS treatment

Participants receiving ILRMS treatment underwent three main steps: (1) Patients received instruction on the treatment, including the purpose of raising interventional limb, precautions that should be taken during treatment, and an introduction to the IULP. (2) All cardiac catheterizations utilized size 6F needles. Immediately after intervention, the IULP was applied to the affected limb. The IULP was wrapped with a disposable cover before use. If the patient was lying flat on the bed, the limb was raised at least 30° on the sloping triangular sponge pad with a shallow groove for the arm (Fig. 2). If the patient was in a reclining position, it was raised greater than 30° . A snap button was used to connect the base to the angled pad only when used in Fowler's position. (3) The forearm rested in the IULP for 6 h with the palm facing up. While ambulating, the arm always remained above the heart. Nurses ensured patient adherence to instruction and proper positioning of the IULP, and maintained quality control checklists.

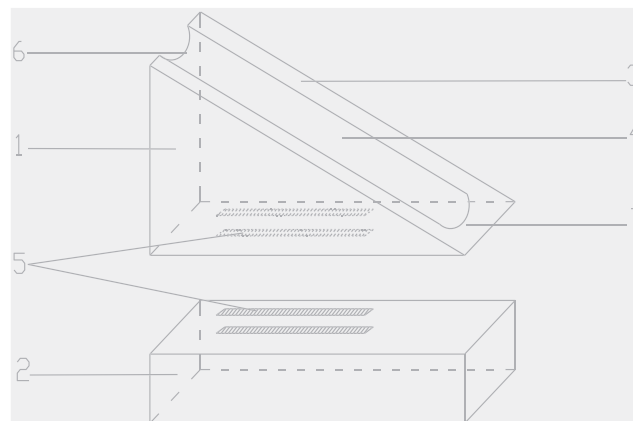


Fig. 1 – The three-dimensional structure of the IULP.

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