Int J Clin Exp Med 2014;7(12):5921-5924
www.ijcem.com /ISSN:1940-5901/IJCEM0003294

Case Report

Efficacy of traditional chinese medicine in a patient with forearm compartment syndrome after coronary angiography

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Received October 21, 2014; Accepted November 13, 2014; Epub December 15, 2014; Published December 30, 2014

Abstract: Coronary angiography via the radial artery has been widely used in clinical practice. The radial access has the major advantages of fewer traumas, quicker recovery, better hemostasis and lower incidence of complications of puncturefor unnecessarily postoperative oppression. Although literature of forearm compartment syndrome (FCS) after angiography is scarce, however, the FCS could have disastrous clinical consequences and hence drew more attention. The use of bandages together with traditional Chinese medicine is an effective therapy in treating limb sprain in china society. However, it has not been reported in FCS after angiography. Here, we present a case of FCS after routine coronary angiography in a patient with acute heart failure, which was treated by external therapy of traditional Chinese medicine (TCM) using compression bandaging and the Xiao Zhong Zhi Tong plaster. FCS was caused by failure to puncture the artery and vessel injury caused by a catheter. The clinical diagnosis was based on the "5P syndrome", which standed for pain, paralysis, paresthesia, pallor and pulselessness. We showed that external therapy of TCM could help save time for subsequent surgical treatment and facilitate full recovery.

Keywords: External therapy of TCM, forearm compartment syndrome, diagnosis

Introduction

Coronary angiography via the radial artery is currently popular among inter-ventional cardiologist in clinical practice. Radial access has the advantages of fewer traumas, less pain, lower rates of arterial access complications, better hemostasisfor unnecessarily postoperative oppression [1]. However, it is also associated with a number of complications including anterior compartment syndrome. The worst outcome of these complications is forearm compartment syndrome (FCS). Although its incidence is reported to be 0.4%, its consequences may be serious and should be adequately addressed by clinicians [2]. Between 1992 and 2008, 2 cases of anterior compartment syndrome after coronary angiography were reported in China [2]. In 2011, we admitted an elderly patient with acute heart failure who underwent coronary angiography and subsequently developed a forearm compartment syndrome (FCS). Following the Chinese medicine principle of treating secondary symptoms first in urgent cases, we introduced the external therapy of traditional Chinese medicine (TCM) and successfully stopped the progression of the disease, as described in detail below.

Case presentation

An 85-year-old man was admitted to our hospital with dizziness and lassitude on July 14, 2011, and was diagnosed with cardiogenic shock and inferior acute myocardial infarction. Electrocardiography on admission showed ST-segment elevation in leads II, III, and avF. Baseline troponin I levels were 0.018 μg/L and creatine kinase MB levels were 17 μg/L. Because the time of infarction could not be determined, we immediately introduced intra-aortic balloon counterpulsation and conservative treatment with clopidogrel (75 mg/day), aspirin enteric-coated tablets (0.1 g/day), and

Figure 1. The fingers revealed progressive cyanotic change (A, B) and shown the prompt amelioration of the lesion (C, D).

atorvastatin (20 mg/day) until the patient's condition stabilized. On 16 July, coronary angiography was performed under local anesthesia via the radial or femoral arteries. Catheter guide wires were inserted into the arteries several times but the attempts failed and the procedure was stopped. One day after the surgery, around noon, the patient complained of pain in the right forearm and dorsal side of the hand. Moreover, his fingers were numb and his pulse was weak. The symptoms suggested FCS. As soon as we identified the syndrome, a sphygmomanometer cuff was placed on the patient's forearm to maintain the radial artery compression, and the Xiao Zhong Zhi Tong plaster was applied to the affected part for 1 h. The plaster consisted of 12 Chinese herbs of *Phellodendron*, *Radix Notoginseng*, *Rheum rhabarbarum*, *Gardenia jasminoides*, *Sanguisorba officinalis*, and *Paeonia suffruticosa Andr.* When the pain alleviated and the local tissue became soft, we wrapped the cuff around the affected part (systolic pressure was 20 mmHg) and applied pressure on the local tissue for 10 min and then released pressure for 10 min. The procedure was repeated 5 times. On July 17, at 7:30 p.m., 7 hours after FCS occurred, emergency extensive fasciotomy in the right dorsal radial thenar was performed at the bedside. The procedure allowed us to save the affected limb and maintain its function in the later period of treatment (**Figure 1**).

Discussion

Pathogenesis

Venipuncture, arterial access equipment, prolonged use of compression tourniquets, and other minimally invasive procedures have been reported to cause a compartment syndrome [1]. In coronary angiography, FCS with atypical symptoms may be caused by the leakage of a contrast agent [3]. Besides, FCS may develop not only due to the local oozing of blood, but also due to the damage to tiny blood vessels

caused by a catheter and guide wires, which results in a vascular spasm followed by ischemia [4]. FCS has also been shown to be caused by secondary infection of the forearm; in these cases, FCS may be diagnosed sloely by means of an exploratory operation [5]. In our case, FCS was caused by complications at the access site as well as injury to blood vessels for catheter guide wires.

Diagnosis

The diagnosis of acute FCS is based on clinical symptoms and classic signs, and the 5P syndrome (pain, paralysis, paresthesia, pallor, and pulselessness) are traditionally considered to be the symptoms. Acute pain and tumefaction are the first to appear, followed by disturbances in distal sensitivity and distal pallor with preserved radial and ulnar pulses [6]. Moreover, the diagnosis can be further confirmed by measuring the pressure of the extensor and flexor compartments of the forearm. According to the available studies, the upper limit of extensor compartment pressure is 25.2 mmHg and that of the flexor compartment is 21.4 mmHg [7]. Pressures above 35 mmHg are generally considered to be an indication of FCS. In our case, symptoms appeared in hours and the FCS was diagnosed by the 5P syndrome and physical examination.

External therapy of TCM

If there is a suspicion on developing compartment syndrome, the optimal treatment is surgical intervention, however the best effect can be achieved immediately after the diagnosis [8]. If fasciotomy is not performed within the optimal period of 6 h, the severity of FCS develops and the consequences probably become more serious [7].

In our case, we failed to perform the surgery within the optimal period because the patient's condition was complicated by acute heart failure. However, in this situation, we took advantage of external therapy of TCM and used the Xiao Zhong Zhi Tong plaster. It is applied in various soft tissue injuries caused by trauma. It can promote blood circulation, remove blood stasis, and relieve pain. In TCM, FCS is viewed as disruption of blood flow in the meridian. The blood not only leaks out of the vein, but also stops in the muscles and skin, at the same time, accumulates resulting in blood stasis, which causes pulselessness, pain, swelling, and paralysis of the limbs. Moreover, the lack of nutrition leads to paleness and decrease in temperature at the affected sites. In our patient, we chose to apply the Chinese medicine principle to treat secondary symptoms of the acute disease. Since the blood was leaking out of the vein, the first step in our management plan was to stop the bleeding. This method proved effective in promoting blood circulation and removing blood stasis. Our case showed that the external therapy of TCM using compression bandaging with the Xiao Zhong Zhi Tong plaster was effective prior to a surgery. Moreover, 7 h between the occurrence of FCS and fasciotomy in our case was the longest time reported in the literature and successful surgery proved the effectiveness of TCM The most important fact was that we observed the swelling of the patient's forearm and immediately applied external therapy of TCM, which reduced exudation and swelling. This allowed us to save time for decompressive fasciotomy and improved the overall prognosis of the patient. The forearm function was restored and the treatment effect was maintained after the surgery.

Disclosure of conflict of interest

None.

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