Acute Ischemia of the Forearm in a Five Year Old Child Following Chinese Traditional Medical Therapy

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Abstract

Traditional medical therapies are popular alternative treatments for limbs sprain and strain in the Chinese society. We report a rare case of a five-year-old boy with left wrist sprain, who was treated by a Chinese traditional medical practitioner using herbal ointment and a bandage wrapped over the forearm. One week later the boy was found to have an acute compartment syndrome of the left forearm and ischemic changes of the hand. Fasciotomy, vascular embolectomy and arteriorrhaphy were done, but in vain. Three days later, an above elbow amputation was necessary owing to progressive gangrene.
Introduction

Although the forearm is a common site for compartment syndrome, this condition is relatively rare in children [2,3,13]. Fractures, intra-arterial injury and crushing injury are the most common mechanisms for compartment syndrome in children. It can be successfully treated by decompressive fasciotomy [1,7,10]. However, a missed or delayed diagnosis may lead to limb ischemia and amputation. The use of bandages together with Chinese traditional medicine is an alternative therapy that is widely used to treat limb sprain and strain in the Chinese society. We report a case of a 5-year-old boy with left wrist sprain who was treated by Chinese herbal medicine using a bandage, causing acute ischemia.

Case Report

A five year old boy was sent to the emergency room by his parents complaining of paresthesia and tightness of the left forearm, accompanied by pallor of left hand. His parents stated that, they had taken the boy to a Chinese traditional medicine practitioner for treatment about one week previously because of left wrist sprain suffered while playing ball. No fracture was found and some herbal ointment was applied to the wrist and wrapped under an elastic bandage. Two days later, a skin rash with swelling appeared, and the patient was wrapped to the upper arm. The patient had normal left hand function and was suffering no discomfort. The day before admission, the arm displayed swelling and bullous rash. He was taken to the Chinese medicine practitioner again and was applied another herbal ointment with elastic bandage around the whole arm. That night the boy suddenly suffered hypoesthesia and weakness of the left hand. Subsequently, he was referred to our hospital. 

Physical examination revealed patchy erythema and bullous skin lesions located all the way up to the left arm and extending to the left anterior chest without fever. Blood pressure was 66/42 mmHg. However, the radial and ulna arteries below the elbow were pulseless and had evidence of occlusion by Doppler. Laboratory values included myoglobin level 8121 mg/dL and creatine kinase level 6994 U/L, aspartate aminotransferase level 162 U/L and serum creatine level 1.1 mg/dL. Moreover, leukocyte count was 3300 with 5% band neutrophils.
Chest film revealed mild pleural effusion in the left lung. Acute arterial insufficiency of left forearm with rhabdomyolysis and sepsis was diagnosed. Fasciotomy over the wrist and elbow with carpal tunnel release was performed in the ER without anesthesia, but the hand showed persistent cyanosis and stayed pulseless (Fig.1).

He was brought immediately to the operating room for decompression. Extensive volar fasciotomy, vascular embolectomy and arteiorrhaphy were performed, and moderate muscle necrosis in the volar compartment of the wrist was also noted. Following surgery all the arteries below the elbow still had no pulsation. He was transferred to the intensive care unit for further management.

Figure 1 (A). The fingers revealed progressive cyanotic change (B) Fasciotomy over the wrist and elbow was done in the ER.

Three days later, the above elbow (AE) amputation was performed owing to severe
digital gangrene and continued muscle necrosis (Fig 2).

Figure 2 Three days later, severe digital gangrene and continued muscle necrosis were noted.

Broad-spectrum antibiotic therapy with cefamerzin and gentamycin was initiated. Subsequently, wound and blood culture confirmed group A $\beta$-hemolytic streptococci infection and antibiotic coverage was changed to ceftraxone and clindamycin by antibiotic sensitivities. The patient had normal renal function and no signs of sepsis after intensive care and ventilatory support. Myoglobulin level of 16.2 mg/dL, serum creatine level of 0.3 mg/dL and normal leukocyte count were checked. The boy improved following repeated debridement and had delayed closure with skin grafts to cover the stump wound. He was discharged two weeks after the amputation.

At one-year follow-up examination, he had received rehabilitative training program based on orthoses without recurrent infection in this stump.
Discussion

Traditional medical therapies, such as chiropractic, acupuncture and herbal ointment applied with bandage, are popular alternative treatments for limbs sprain and strain in the Chinese society. Now these methods have spread to the western world. Generally, such treatments are not harmful. However, most practitioners are not professionally trained doctors; and they develop their own treatment methods or products to treat people. In fact, the content of herbal ointments are largely unknown and sometimes causes complications such as contact dermatitis, limb edema and local cellulites, which can be relieved after dressing removal.

Compartment syndrome of the forearm can be caused by a variety of factors. The etiologies include trauma, prolonged external pressure as seen in alcohol or drug abusing patients, constricting dressings, wringer injury to the upper extremity, burns, snakebites, arterial injury, nephritic syndrome, rupture at the origin of the flexor superficialis muscle and exercise induced transient syndrome [3,4,8,9,12]. Otherwise, systemic infections, local cellulitis, and necrotizing fascitis, such as Vibrio vulnificus, meningococcal and $\beta$-hemolytic streptococci infection, also have been implicated as causes of compartment syndrome. [4,5,6,10,12]

However, compartment syndrome of the forearm and hand in children is exceedingly rare and has been reported secondary to suction injury, fracture of radial head, humeral supracondylar fracture [1,11,13], and intravenous or arterial-line infiltration injury [10]. Unfortunately, intracompartment pressure measurement may be more unreliable and difficult to assess in children than in adults because of the uncertain clinical examination [13].

Swaringen reported influenz A induced rhabdomyolysis resulting extensive compartment syndrome and acute renal failure in a ten-year-old child [14]. Rhabdomyolysis results from the injury to the cell membrane of the skeletal muscle releasing the intracellular substance, including myoglobin and creatine phosphokinase, into the plasma, thus increasing tissue
and terminal arteriolar pressure. Creatine kinase values exceeding 1000 IU/L could predict impending limb toxicity following isolated limb perfusion [15]. However, with increasing or prolonged elevation of tissue pressure in excess of critical levels, compartment syndrome and tissue ischemia occur.

In the subject patient, the clinical course of the acute compartment syndrome, with rapid progression and ultimate AE amputation, makes it hard to identify the causes or measure the compartment pressure at ER. However, this study considered the possible mechanism that the unknown herbal ointment induced local cellulitis and that bandage increased the compartment pressure on the forearm. Then it was related to superficial infection with group A \( \beta \)-hemolytic streptococci with increased severity of subcutaneous edema and hemorrhage. The tissue and terminal arteriolar pressure elevated, which led to muscle destruction and raised serum myoglobulin. Since the diameter of the artery is much smaller in children than in adults, septic emboli, thrombosis and serum myoglobulin can easily obstruct these vessels under the circumstance of prolonged bandaging. Finally, the ischemia with irreversible pulselessness occurred.

As with any etiology of compartment syndrome, early detection and recognition by the doctors are extremely important to ensure the limb survival. Likewise, the Chinese traditional medicine practitioners should be aware and pay much more attention to the compartment syndrome, and to avoid further irreversible tragedy such as the present case.

References

