BLUNT INJURY OF THE RADIAL AND ULNAR ARTERIES IN VOLLEY BALL PLAYERS.
A REPORT OF THREE CASES OF THE ANTEBRACHIAL-PALMAR HAMMER SYNDROME

S. KOSTIANEN, MD* and S. ORAVA, MD†

*Ass. Chief Surgeon, Department of Cardiovascular Surgery, III Clinic, Helsinki University Central Hospital
†Ass. Chief Surgeon, Department of Surgery, Keski-Pohjanmaa Central Hospital, Kokkola, Finland

ABSTRACT

Three cases of the antebrachial-palmar hammer syndrome are described in volley ball players. They all suffered from a decreased blood perfusion of their right hand and fingers due to the repeated ball and floor impacts during the volley ball training and playing. The vascular lesions of the radial and ulnar arteries were reversible. The patients recovered spontaneously during the rest from excessive physical activity by their hands. The vascular lesions of this kind are rare but seem to be typical to volley ball players.

Key words: Vascular trauma, Thrombosis, Athletic injury.

INTRODUCTION

Vascular injuries in sports medicine are relatively uncommon (Williams and Sperryn, 1976). Repeated minor blunt trauma may cause peripheral vascular lesions with serious late consequences (Rich and Spencer, 1978). Aneurysms or occlusive arterial disease of the fingers and hands have been found to occur secondarily to repeated occupational trauma (de Takats, 1959; Conn et al, 1970; Millender et al, 1972). Identical arterial injuries with a diminished digital perfusion have been reported in baseball and handball players (Whelan and Baugh, 1967; Buckhout and Warner, 1980). In this report we describe three cases of the syndrome with a decreased arterial perfusion of the hand in volleyball players.

CASE REPORTS

Case 1

After having participated in a volleyball tournament a 17 year old man experienced symptoms of impaired circulation of the right hand. He suffered from intermittent coldness, numbness, paraesthesiae, colour changes and pain during exertion. The symptoms became worse while playing and were provoked by exposure to cold. On clinical examination two weeks later the right hand was cyanotic and colder than the left. The pulse of the ulnar artery was absent at the wrist and that of the radial artery was weak. The brachial arteriogram showed occlusion of the ulnar artery in the junction of the distal and middle third of the forearm (Fig. 1). There was a marked irregularity with stenotic sites in the radial artery at the wrist. Since the symptoms were relatively mild the patient was treated conservatively with vasodilating agents and was advised to stop...
Fig. 1: Occlusion of the ulnar artery at the distal middle-third of the forearm with a stenosis of the radial artery at the wrist (Case 1).

smoking and to avoid playing volley ball until the symptoms had disappeared. On re-examination two months later the patient was asymptomatic. The pulses of the right radial and ulnar arteries were normal. The control arteriogram demonstrated no abnormalities of the aortic arch or its branches. The right axillary and brachial arteries were normal. There was still a small filling defect in the radial artery at the wrist (Fig. 2). In the middle of the ulnar artery a slight irregularity and narrowing could be seen. The patient was allowed to play volley ball again, but was advised to use a protective pad over the anterior aspect of the forearm during

Fig. 2: The control arteriogram of Case 1. The occlusion has disappeared and the irregularities of the radial arterial wall are minor compared with those in Fig. 1.
training and playing. Six months later the hand was asymptomatic despite active volleyball playing.

Case 2
A 28 year old volleyball player of the Finnish national team began to suffer from marked coldness, numbness, cyanosis and decreased power of his right hand. The symptoms appeared after a very exhausting volleyball tournament series lasting several weeks. The symptoms were most severe at the end and after a long game. There was no history of direct trauma. The first three fingers were mostly affected. Three months after the onset of the symptoms he was examined and the fingers of the right hand were colder than on the other side. The thenar and hypothenar muscles were softer than on the left side. The pulse of the radial artery distally in the wrist was weaker than that of the left hand. The ulnar pulses were clinically symmetrical. The Doppler ultrasound examination of the radial pulse was weak and stenotic at its distal five centimetres, and absent distally at the wrist. The right ulnar pulse was also stenotic, if compared with the left normal side. The proximal pulses of the upper extremities were symmetrical and normal. The patient was treated with vasodilating agents and he rested from training and playing for six weeks. The symptoms slowly disappeared and later, in spite of the continuous active playing he managed well. In the control examination four months later both arterial pulses were palpated as normal. The ultrasound examination showed a relative slight stenosis of the radial artery.

Case 3
A 25 year old volleyball player complained of numbness and coldness of his right hand during and after a long-lasting volleyball game. He had regularly been playing since the age of 15 years. The symptoms had appeared slowly without any trauma, except the ball impacts and the floor contacts during the “tiger” jumps. In winter the hand became colder than the left when riding a bicycle. On clinical examination the pulse of the radial artery on the right side was weaker than on the left side. The pulses of the ulnar arteries were normal. In the Doppler ultrasound examination both the radial and ulnar pulse was weaker and more stenotic than at the left wrist. The proximal pulses of both extremities were symmetrical and normal. The symptoms lasted for more than one year in spite of several pauses for some weeks. The patient was given vasodilating drugs and was advised to stop the irregular smoking. He had no symptoms in normal life indoors. The symptoms still appear after long games, but he is not interested in arteriography because he already has planned to stop competitive volleyball playing.

DISCUSSION
The degree of an arterial injury secondary to blunt trauma ranges from a trivial haematoma to severe fragmentation of the arterial wall (Whelan et al, 1967). The injury of the intima layer is likely to lead to thrombosis, while the damage to the media layer may cause aneurysm formation (Little and Grant, 1972; Little and Ferguson, 1972; Millender et al, 1972). Recurrent small injuries may produce vasospasm without any organic lesions due to the mechanical myogenic or neurogenic response (Whelan et al, 1967). It is reversible, if the source of irritation is eliminated (Conn et al, 1970). On the base of the arteriogram in Case 1 the occlusion of the ulnar artery and the stenosis of the radial artery seemed to be caused by a thrombosis secondary to an intimal injury. In the other two cases the clinical examination as well as the findings of the Doppler flow detector suggested that the vascular lesions were identical.

An occlusion of the superficial palmar branch of the ulnar artery secondary to a repetitive blunt trauma by using the hand as a hammer has been reported by Conn et al (1970). He named the cases as “hypothenar hammer syndrome”. Similar complications have been described in baseball (Lowrey et al, 1976) and in handball (Buckhout et al, 1980). We have not been able to find any report of this kind of syndrome in volleyball players. In our cases the arterial lesions obviously were caused by a “hammer effect” of the ball to the palm and anterior forearm. Hard impacts follow the serve, receiving the serve, blocking, hitting and smashing the ball. A severe impact is experienced also when one performs the “tiger” jump in order to lift the ball near the floor (Figs. 3, 4, 5, 6 and 7). In two cases increased amount of training and playing preceded the appearance of the symptoms. Probably the palmar and antebrachial “hammer syndrome” as a post-exertional hand pain in volleyball players is more common than generally expected.

If the clinical symptoms suggest palmar-antebrachial arterial lesions the Doppler ultrasound flow detector will give useful information, but the arteriogram is, by far, the most certain diagnostic examination. In the differential diagnosis the vasospastic disorders, thoracic outlet syndrome and congenital vascular malformations have to be considered.

The traumatic vasospasm does not require any other treatment except to avoid further trauma. In two of the present cases the thrombosed arteries were spontaneously recanalised during two months. Vasodilating drugs and cessation of smoking perhaps have some advantageous effect, too. More severe complications as thrombotic occlusion of both the radial and ulnar arteries or aneurysm formation would require an operative treatment. Since the “hammer syndrome” lesions of the arteries in volleyball players may lead to serious complications the perfusion disorders should be diagnosed in an early stage in order to avoid further injuries. The patient
should stop playing volley ball until the symptoms have disappeared. New lesions can be prevented also by protective pads or covers on the palm and forearm area or by changes in the playing routine and technique.

Fig. 3: Volley ball serve with a palm.

Fig. 4: Smashing the volley ball with a proximal palm.

Fig. 5: Blocking the ball over the net.

Fig. 6: Volley ball player receives the serve with his distal anterior and radial sides of the forearms.

Fig. 7: A rescue jump in order to lift the ball near the floor ("tiger jump"). (A) The position of the hand before hitting the ball is shown in B and the impact against the floor after that in C.
REFERENCES


BOOK REVIEW

Title: PHYSICAL FITNESS AND ATHLETIC PERFORMANCE: A GUIDE FOR STUDENTS, ATHLETES AND COACHES

Author: A. W. S. Watson

Publisher: Longmans, London and New York, 1983

Price: £8.95

This book provides a simplistic account of the biological factors which play a part in human performance. The author is a lecturer in Physical Education and I would guess from the style that these are lecture notes slightly expanded. The book is aimed at students and coaches but assumes some scientific background which I think would make it difficult to read if this field of knowledge is sketchy.

The section of fitness tests assumes these will provide information that is of value in assessment of physical performance. The variables are infinite and the possible interpretations myriad and I have yet to see proof that these relate in any way to actual performance on the day.

I thought many of the pieces of physiology which I would find interesting were omitted. The co-ordinatory function of joint capsulo-ligamentous sensory feedback, the muscle elongation phenomena and other features are not touched upon.

The photo of Coe in full flight on the cover brought to mind the delicate tuning of the organism which can be so easily disrupted by a tiny fragment of viral protein.

Sports Science is an ever widening field. It is probable that the aspects covered by this book are of value to students of Physical Education and coaches. At least it will not cost them much to find out for themselves.

B. Helal