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## Original Research Article

## Pediatric arterial injuries of the forearm and hand



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## ABSTRACT

**Introduction:** Traumatic injuries of the arteries are rare in children. Operations due to that kind of damage, inherently difficult, become a challenge for a pediatric surgeon.

**Aim:** The aim of the study was to present the Center's own experience in treating children with rare penetrating injuries.

**Material and methods:** A review was completed of 10 patients treated between 2009 and 2012 due to penetrating injuries of the forearm and hand with accompanying damage to the radial and/or ulnar artery.

**Results and discussion:** There were 9 boys and 1 girl of average age 15.7 years. Injury of the radial artery was reported in 6 patients, of the ulnar in 2, of both arteries in 1 and of the superficial palmar arch in 1 patient. Partial damage was observed in 4, and complete in 7 arteries. In total, 2 patients were treated by ligation, 8 by arterial repair. In each case damage to the arteries was accompanied by injury of the muscles, and in 1 case additionally of the ulnar and median nerves. Postoperative period nerve deficits were observed in 5 patients; 4 patients were submitted to the follow-up. In 2 of these sensory disorders, slightly worse warmth of the limbs was reported.

**Conclusions:** The treatment of choice in children should be repair of the damaged vessel, nevertheless ligation of single artery does not determine limb ischemia. Concomitant neural damage determines occurrence of transient and permanent loss of limb function.

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## 1. Introduction

Traumatic injuries of the arteries are rare in children.<sup>1–3</sup> Operations due to that kind of damage, inherently difficult, become a challenge for a pediatric surgeon. In the available literature, there are few publications dedicated to this issue.

## 2. Aim

The aim of this study was to present our own experience of the treatment of arterial injuries of the forearm and hand in children.

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### 3. Material and methods

We analyzed retrospectively the medical records of 10 patients treated because of penetrating wounds of the forearm and hand with associated arterial lesions. The group was selected from 1 131 children treated between 2009 and 2012 for wounds of the forearm and hand. Age and sex of the patients, mechanism of injury, location and nature of the damage, type of performed surgery, course of postoperative period and treatment after surgery, as well as associated injuries and long-term effects, were evaluated. Children with iatrogenic or digital injuries were excluded from the study.

### 4. Results

#### 4.1. General data

The total number of children hospitalized due to arterial damage distal to the elbow amounted to 10, which represented 0.88% of all penetrating injuries of the hand and forearm. Of these treated patients there were 9 boys (90%) and 1 girl (10%), aged from 12 to 17 years (mean age 15.7 years). The main cause of injury was glass (70%), the other cases involved a razor-blade (a suicide attempt), a circular saw and a fall on the ice. There were no deaths due to injury.

Revisions of the wounds and the repair of the arteries were performed in the operating theater. In 7 patients, the operations were realized under general anesthesia and 3 of the older patients (mean age 16.3 years) were operated under local anesthesia due to the symptoms of intoxication.

Injuries were located on the anterior and antero-medial area of the forearm and hand. Wounds were judged as cut (8 patients), lobe (1 patient), or rugged (2 patients) depending on the mechanism of injury.

#### 4.2. Injuries of the arteries

Six patients had isolated damage of the radial artery (2 on the left side and 4 on the right side), 2 children suffered from isolated injury of the left ulnar artery and 1 patient underwent lesion of both arteries of the left forearm (Table 1).

In 1 boy examination revealed damage of the right superficial palmar arch. Complete damage was observed in 7, and partial lesion in 4 arteries (Table 2).

In 7 cases of artery lesion (70%) no pulse was found. In 3 cases (30%) pulse was present despite the injury (1 patient with superficial palmar arch damage, 1 with total radial artery lesion and 1 with partial radial artery injury). In 1 case, due

**Table 1 – Number of damaged arteries by side.**

	Right side	Left side
Radial artery	4	3 <sup>a</sup>
Ulnar artery	0	3 <sup>a</sup>

<sup>a</sup> As a result of injury to both arteries of the forearm in 1 patient, the total number of damaged arteries exceeds the number of patients with that kind of injury.

**Table 2 – Degree of lesion by artery.**

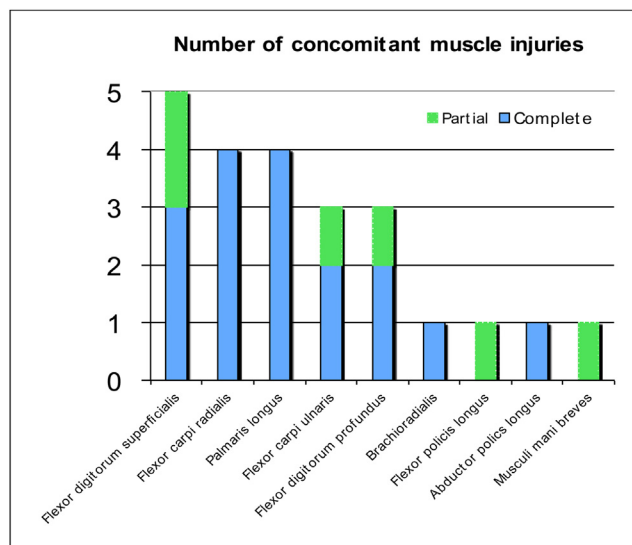
	Complete lesion	Partial lesion
Radial artery	5	2
Ulnar artery	1	2
Superficial palmar arch	1	0

to the long time between injury and initial supply of the wound, the patient was admitted to hospital with symptoms of hemorrhagic shock.

#### 4.3. Associated injuries

In each case lesions of the arteries were accompanied by partial or complete damage of muscle tendons and/or muscle bellies (Fig. 1). The most commonly injured muscles were the flexor digitorum superficialis, flexor carpalis radialis and palmaris longus.

In 2 patients sensory-motor deficits were observed in the preoperative period. One of them had two wound revisions of the forearm in outpatients, before he was admitted for surgery under general anesthesia. Throughout this period, the radial artery pulse, distal to injury, was palpable. The development of massive hematoma, sensory and motor deficits of the hand and fingers, and the disappearance of the radial artery pulse were an indication for revision of the wound in the operating theater. Examination revealed incomplete damage to the radial artery without lesion of the concomitant nerve structures. The second patient, who suffered a wound of the left forearm from breaking a glass window, as a result of aggression caused by intoxication, was initially supplied directly after the injury. Before the operation the sensory-motor deficits of the median and ulnar nerves were stated. Extensive damage to the nervous structures, muscles and vessels, known as “spaghetti wrist,” was revealed intraoperatively (4). Complete damage of both arteries of the forearm, median and ulnar nerves, and flexor muscles of



**Fig. 1 – Number of muscle injuries associated with arterial injuries. Blue indicates complete lesion of muscle bellies and/or tendons; green indicates partial damage.**

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