Surgical treatment of hand vascular anomalies – a case report

Hirurško lečenje vaskularnih anomalija šake

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Abstract

Background. Vascular anomalies in the hand do not occur frequently. Their presence in the metacarpal region can cause different functional disorders. The extent of such disorders directly depends on the localization and size of vascular anomalies, duration and the nature of the anomaly growth as well as on eventual secondary complications such as ulceration or bleeding. The aim of this case report was to show the specifics in the clinical picture, pathogenesis and evolution of such anomalies, applied diagnostic procedures (radiography, ultrasound, magnetic resonance, electromyography) and surgical treatment as well as postoperative functional results. Case report. In the Clinic for Plastic Surgery and Burns, Military Medical Academy Belgrade, two patients were treated surgically for vascular anomalies of the middle palmar region of the hand. The first patient, a 36-year-old male, a former active sportsman (professional handball player) was treated for acute increase in the vascular anomaly of hand in the metacarpal region and proximal phalange of III and IV fingers of his right hand. The anomaly was detected 6 months prior to his hospitalization while two weeks before the hospitalization there was a sudden growth and increase in the change. The second case, a 15-year-old male patient actively pursuing a career in professional basketball was treated for a tumor localized in the metacarpal zone of his left hand. According to the information provided by his parents, the anomaly had been present since his birth. Initially, the anomaly manifested itself as a discoloration of the skin with a marked capillary drawing, gradually increasing throughout the last five years to the present dimension. The growth of the malformation was noticed to coincide in both patients with more active pursuit of their professional sports career. Conclusion. The clinical picture of hand vascular anomalies is dominated by the symptoms of compression of neurovascular structures (paresthesia, intense hand pain, swollen fingers). If it is a chronic progressive process, signs of ischemic intrinsic muscle fibrosis with corresponding functional deficit, as well as tissue defect (usura) of bone and joint structures represent the basic pathological findings. Acute increase is accompanied by compartment syndrome symptoms and ischemic fibrosis of intrinsic hand musculature and development of irreversible dysfunction of the hand. In the presented cases rapid response implies accurate diagnostic methods followed by surgical extirpation in order to treat compartment syndrome.

Key words: vascular malformations; hand; diagnostic techniques and procedures; reconstructive surgical procedures; recovery of function.

Apstrakt

Uvod. Vaskularne anomalije u predelu šake ne javljaju se često. Njihovo prisustvo u zoni metakarpusa dovodi do različitih funkcionalnih smetnji šake. Obim tih smetnji direktno zavisi od lokalizacije i veličine vaskularne anomalije, trajanja i prirode rasta promene, kao i od eventualnih sekundarnih komplikacija kao što su ulceracija i kvarenja. Cilj ovog rada bio je da se prikažu specifičnosti kliničke slike, patogeneze i ocene tih promena sprovedene dijagnostičkim postupcima (radiografija, ultrazvuk, angiografija, magneta rezonanca, elektromiografija) i načina hirurškog lečenja, kao i postoperativni funkcionalni rezultati. Prikaz bolesnika. U Klinici za plastičnu hirurgiju i opekotine Vojn medicinski akademije u Beogradu hirurški su tretirana dva bolesnika sa vaskularnim anomalijama srednjedlanskog regiona šake. Prvi bolesnik, star 36 godina, muškog pola, bivši aktivni sportista (profesionalni rukometar) lečen je zbog akutnog rasta vaskularne anomalije šake u metakarpalnoj regiji i proksimalnim falangama III i IV prsta desne šake sa palmarne strane. Vaskularna anomalija dijagnostikovana je šest meseci pre hospitalizacije, a nagli rast promene počeo je dve nedelje pre hospitalizacije. Drugi bolesnik, star 15 godina, muškog pola, aktivni profesionalni košarkaš, lečen je zbog tumefakcije lokalizovane u metakarpalnoj regiji leve šake sa palmarne strane. Heteroanamnestički podaci uzeti od roditelja ukazali su na to da je promena bila prisutna na rođenju bolesnika i da se manifestovala kao diskoloracija kože u predelu

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Introduction

The majority of vascular anomalies develops within the first 2 years of life. Some of them are visible at birth with clear clinical signs which vary from skin changes that can include any discoloration, under-skin texture and consistency changes and may develop into hemangioma (growing congenital hemangioma), and the malformations which can appear after the birth on the not changed skin region ^1,2^.

About 80% of vascular anomalies develop as a solitary tumor while there are about 20% of multiple proliferation cases. They are more common in female gender, this ratio ranging between 3–5 : 1.

The incidence is somewhat higher in the white race ^2^.

About 60% of vascular anomalies tend to appear in the cervical-facial region and this “tendency to expose” can cause a significant psychological stress both to parents and children ^1^.

In 1982 Mulliken and Glowacki described a clinically relevant classification of vascular anomalies, hemangiomas and vascular malformations, based on biological, pathohistological and clinical criteria ^1^.

Hemangioma is a benign tumor of endothelial cells, the cells that line blood vessels. Beside endothelial hyperplasia, histopathological findings show new vascular space formations composed of blood-filled “lakes” and channels as well as blood vessels. They have biaphasic growth behavior: proliferative phase, which is, after achieving proliferative stage, followed by a slow involution, and in certain cases may end in total regression of the lesions when only regular observations are needed ^4^.

Vascular malformations comprise another category of vascular anomalies considered to be congenital errors in the process of vascular morphogenesis. Histopathological findings do not show elements of endothelial hyperplasia and, depending on chemodinamic characteristics, vascular malformations are subdivided into “low-flow” vascular anomalies (capillary malformation, venous malformation, lymphatic malformation, or combined malformation) and “high-flow” vascular anomalies (arteriovenous malformations). They both have a common characteristic: do not show any functional and esthetic troubles. Only regular pediatric observations of children and parental education are needed ^4^.

Vascular anomalies (hemangiomas – arteriovenous malformations) rarely occur in the hand area. The most common site of the lesion is the palm of the hand ^1^.

If it is a progressive chronic process, signs of ischemic fibrosis of the intrinsic musculature with corresponding functional deficit as well as tissue defect of bone and joint structures represent the basic pathological findings ^4,5^.

Case report

The first patient, a 36-year-old male patient was treated in our Clinic for acute increase of vascular anomaly of the hand in the metacarpal region and proximal phalange of III and IV finger of his right hand. Six months before his hospitalization, the former active sportsman (professional handball player) detected a change of 1 cm in diameter in the palm region of his right hand, which gradually increased.

Two weeks prior to hospitalization there occurred prompt growth and increase in vascular anomaly with significant symptoms of compression of neurovascular structures of the right hand palm followed by intense pain. On the day of admission to the hospital, a tumor of 6 × 4.5 cm in diameter at the base and 1.5 cm high was detected on the palm of the right hand with lobular surface, dark blue color, without evident pulsations. The skin over the malformations was tense, hard and sporadically thinner. The hand was in the antalgic position and completely painful, finger flexion and abduction were not possible (Figure 1).

![Fig. 1 – The hand of the first patient preoperatively.](image-url)
The preoperative clinical examinations and ultrasound findings showed on the right palm under the skin showed a soft tissue fluid formation detected with irregular canalicular form, filled with dense fluid (Figure 2).

![Fig. 2 – Preoperative ultrasound finding in the first patient.](image)

The percutaneous hemangiography findings on the palmar side of the hand showed irregular holes of angioma with superficial venous drainage network (Figure 3).

![Fig. 3 – Percutaneous hemangiography finding in the first patient.](image)

The malformation was extirpated in the “blood flow stasis”. The zig-zag incision on the palmar skin brought a hemangioma just under it. Neurovascular elements and soft tissue structures of the middle palm region were identified under the tumor. In the radial part, a tumor segment was located under the muscle, while the rest of tumor tissue spreaded in the direction of the proximal parts of III and IV finger. Tumor tissue resection was done while neurovascular structures were preserved. Also, a partial usura in III metacarpal bone was detected. After partial release of the bandage, hemostasis was verified, aspirative drainage performed and the surgical wound closed with individual stitches (Figures 4 a–d).

The resected tumor was histopathologically proved as arteriovenous (AV) malformation – *haemangioma cavernosum*.

The rapid recovery of hand function was achieved with the sensitivity of all the fingers fully regained and the intrinsic musculature function completely restored (Figure 5). The patient was referred to intensive physical therapy in the competent center for physical therapy and rehabilitation (Figure 6).

The second case, a 15-year old male patient was treated in our Clinic for tumor localized in the metacarpal zone of his left hand. According to the information provided by the patient’s parents the anomaly was present at birth. It was initially manifested as discoloration of the skin with marked capillary drawing, which gradually increased over the last five years in size to reach the actual dimension.

The change in growth coincided with the patient’s more active pursuit of his professional sports career (basketball). He reported subjective discomfort as hand pain during weight training intensifying recently as well as discomfort during ball training exercises.

On the day of admission to the hospital, an oval form tumefact of 4 × 2 cm in diameter and 1 cm protruding out of the skin plane was detected on the middle region of the left hand palm, of light blue color, without clear limits, soft consistency and with palpable pulsations (Figure 7).

X-ray contrast angiography of the left hand showed intrapalmar hemangioma, which extended between metacarpal bones and partly along the first phalanx of the second finger.

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Hemangioma itself was fed by *arcus palmaris profundus*, who gives two branches of the feeder. Hemangioma rapidly lost its stain in venous drainage through *arcus palmaris*, probably *profundus*, which was relatively *gracilis*. The venous phase of the initial part of *v. ulnaris* is showed (Figure 8).

Tumor resection was performed in the conditions of regional intravenous (RIV) anesthesia and blood flow stasis. The zig-zag incision was placed in the mid palm region. The tumor permeated the neurovascular and tendon elements, so after the tumor resection, all the elements were preserved.

The partial usure on the head of II metacarpal bone was detected. After the partial release of the bandage, the hemostasis was performed, using aspirative drainage, and the wound was closed with individual stitches in a single layer (Figures 10 a–d).

Material for histopathological analysis represented vascular spaces, coated with flattened endothelial cells with the presence of vascular stents, surrounded by. The received material did not show the elements of malignancy. The finding corresponded to vascular malformation.

A fast recovering of hand function was noticed, and after stitches removal, the patient was referred to intensive physical therapy (Figure 11).
The main symptoms were compressions of neurovascular structures in the form of paresthesia, numbness and a painful swelling of the fingers, with limited active mobility. The pressure on muscle, tendon and bone structure leads to fibrosis and atrophy of intrinsic hand musculature, limited active flexion and extension of fingers, as well as the appearance of usurce on the joint structures.

Physical activities such as sport that requires full engagement of the hand, as was the case with the two patients treated at our Clinic, can accelerate the evolution of change and lead to a rapid growth phase. The possibility of complications due to injury of vascular anomaly in these cases is even larger. According to the reportes there are similar evidences about correlation of the expression and evolution of vascular anomalies and intensive physical activites 6.

In case of acute rise the symptoms of compression of neurovascular bundle are expressed with signs of pain, paresthesia and loss of sensibility, as well as compression of intrinsic hand musculature, which significantly limits active and passive movements of the fingers – compartment syndrome.

Treatment of vascular anomalies includes various methods, which, considering the principle of *primum non nocere* provide a complete functional recovery, give acceptable esthetic results and prevent recurrence. Therapeutic modalities include observation, systematic and intraleisional application of corticosteroids, use of interferon, laser and sclerotherapy and embolization, chemotherapy, cryotherapy, compression, surgical resection, and combined methods 7–11.

In cases of hand vascular anomalies, according to the anatomical and functional specificity of the hand, as well as possible complications that can cause disability, surgery is the choice of treatment. Other treatment methods, according to various data and theories in the literature (compression bandage, sclerotherapy, intraleisional application of corticosteroids), may be applied only in a limited number of cases, as well as in a preparation for surgery which is a definitive method of treatment.

**Conclusion**

Depending on the size and rate of growth vascular anomalies in the mid-palmar region can lead to functional disorder of the hand of varying degree.

Complications that may result in disability can be avoided if a timely surgical intervention is applied after appropriate diagnostic procedures. A qualified physical therapy in the postoperative period enables a complete functional recovery of the affected hand, only if intervention was performed on time and if there was no irreversible damage of neurovascular, tendon and bone structures of the hand.

**REFERENCES**


Received on April 19, 2012. Revised on September 26, 2012. Accepted on October 10, 2012.