Abstract

As the hand is an organ of many different structures, located in a small space, with a high functional value, congenital vascular malformations (CVM) may easily involve many tissues, presenting complex clinical pictures that are difficult to treat. Surgical treatment is possible but general principles of hand surgery should be followed. Skin incisions should be carefully planned to save hand function. Bleeding is reduced by the use of a tourniquet. Magnification with a microscope during surgery is crucial for a precise dissection and recognition of neurovascular pedicles. In case of nerve involvement, external neurolysis is the first choice, as interfascicular treatment is a risky procedure. Total or partial resection of infiltrated muscles should be carefully performed, according to their function. Intraosseous arteriovenous (AV) malformations are best treated by direct occlusion through alcohol or glue injection, avoiding surgery.

Introduction

The hand has a very complex function strictly related to its particular anatomy: its sensorial and motor functions are interdependent [1]. Congenital vascular malformations (CVM) in the hand may involve any structure, and are often atypically distributed [2]. As many different tissues of high functional value are located in a small space, clinical pictures can be extended and complex and can involve skin, bones, nerves, muscles and tendons, posing special therapeutic problems. To surgically treat CVMs in the hand, the fourth principle of Belov should be followed: a functional radical operation should be performed, meaning as radical as possible, to avoid recurrences, and as sparing as feasible in order to preserve or restore hand function [3, 4].

Surgical strategies can consist of single or multiple stage surgery, alone or associated with other procedures, such as sclerotherapy, embolization or laser treatment [5–7].

Surgical techniques should respect general principles of hand surgery, including skin incisions and skin undermining and the selection criteria of structures to be resected according to their function. Techniques and timing of hemostasis and postoperative bandage should also be performed correctly.

General Principles of CVM Surgery in the Hand

Skin Incisions

The skin in the hand works like a distinct organ with its own passive motor function. The dorsal skin of the hand is more elastic, while the palmar skin is more adherent and sensitive. The elasticity of the skin in the web spaces allows independent movements of the fingers; scar contracture precludes mobility even if all the other structures are normal. When skin incisions are planned scar lines should be mainly at the level of skin creases in order to avoid scar contracture.

There are some typical incisions in hand surgery. Each of these incisions can be performed alone or combined with others. CVMs may be sometimes difficult to approach through conventional incisions; atypical incisions may sometimes be necessary.

Incisions for hand surgery should respect some basic principles:

1. Limited skin undermining and preparing of flaps that offer large exposure of the deep structures should be planned.
2. Web spaces and joint creases should be respected by broken incisions to avoid scar contracture (Fig. 33.1a).

3. Scars from previous surgery influence the choice of new incisions. A flap should not be performed with a previous scar at its base. Incisions should be planned in order to permit extensions, when necessary. Drawing the contour of the CVM mass on the skin before marking the incision lines is helpful in order to better approach the malformation (Fig. 33.2a).

**Skin Sparing Technique**

Skin sparing is possible by subdermal undermining, which should be carefully done with a scalpel to preserve subdermal vascular networks. This allows minimal blood loss and saves skin flaps for coverage (Fig. 33.1b). It is best performed under a microscope or with loupe magnification.

**Use of a Tourniquet**

A tourniquet reduces bleeding and is useful for microsurgical techniques, especially in venous malformations. In arteriovenous (AV) malformations, a tourniquet is best applied after preparation of the fistulous area, as fistulae may be difficult to recognize during ischemia [8].

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Fig. 33.1. Multistage surgical treatment of venous malformation of the hand. a Marking of incisions on the dorsolateral aspect of the middle finger. b Subdermal surgical undermining under microscope shows the avascular plane and exposition of the involved tissue (skin sparing technique). c Late result showing scars from previous operations at the time of index finger surgery. Figures 33b, 33c reproduced from [8]

Fig. 33.2. Arteriovenous malformation in the volar aspect of the little finger. a Two fistulae areas guided the choice of a Brunner incision. b Neurovascular bundles used as a guide for the dissection of the malformed tissue. Tourniquet and microscope control reduced bleeding and resulted in a safe radical excision.