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Studies on Venous Function after Deep Venous Thrombosis

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Abstract

Background
The incidence of deep venous thrombosis (DVT) is estimated to be about 1-2/1000 per year of which approximately 4 % are located in the arm veins. Some of the most important late effects of a DVT are chronic venous dysfunction and the development of post-thrombotic syndrome (PTS). Objective diagnosis with detailed information on disease extent and location and global venous function is often important for clinical management of the patient. Color duplex ultrasonography (CDU) and computerized strain-gauge plethysmography (CSGP) are currently available non-invasive methods to study venous function after earlier DVT.

Aims
The aim of this thesis was to study venous function after earlier deep venous thrombosis assessed by CDU and CSGP; to study how findings with those methods are related to long-term sequelae, and development of postthrombotic diseases after different types of DVT.

Study I and II
These studies were performed to assess the efficiency of CSGP for evaluation of venous outflow capacity of the upper extremities, to receive reference values and to describe venous function using CSGP and CDU in patients with earlier primary upper extremity deep venous thrombosis (UEDVT). Thirty-four healthy controls and 32 patients with earlier UEDVT were included. The results showed that CSGP is easy to handle and can be used in a reproducible way to study venous function in the upper extremities. CSGP reference values were established for upper extremities. Patients with earlier UEDVT had reduced venous outflow, residual thrombus was a common finding, and one third had a moderate grade of PTS. CSGP and CDU are useful methods that can provide objective information regarding venous function after UEDVT.

Study III
This study was performed to determine whether asymptomatic deep venous thrombosis (ADVT) following minor surgery affects venous function and contributes to development of PTS. Eighty-three patients operated for Achilles tendon rupture were included; 38 patients with postoperative ADVT and 45 patients without (control group). The follow-up examinations five years after the operation consisted of CSGP, CDU and clinical scoring. More than 50 % of patients with ADVT developed post-thrombotic changes according to CDU, but these changes did not affect global venous function. Eight percent of ADVT patients and 4 % of control group patients developed PTS. Therefore, PTS is not a common sequel to ADVT after minor orthopaedic surgery.

Study IV
This follow-up study included 83 patients with postoperative DVT examined after a mean of 7 years. There was two series of patients, 45 with symptomatic deep venous thrombosis (SDVT) and 38 with ADVT. The objective was to describe long-term effect of SDVT and ADVT on venous function and subsequent incidence of PTS in patients operated for Achilles tendon rupture. Examinations comprised CSGP, CDU and clinical scoring. The results showed that post-operative DVT after minor surgery consists mainly of distal DVTs and is associated with a low risk for PTS, found in approximately 10 % of the patients. Deep venous reflux was more common in SDVT than in ADVT patients (84 % vs. 55 %). Abnormal plethysmographic results were seen in only a few patients without difference between the two groups. This indicates that DVT provoked by minor orthopaedic surgery represents a transient risk factor with minor long-term sequelae.

In summary
This thesis concerns studies of venous function and evaluation of clinical sequelae and frequency of PTS in patients with previous primary upper extremity DVT and in patients with postoperative DVT following minor orthopaedic surgery. In general, these studies show that the clinical signs as well as symptoms stated by the patients in these types of DVT are rather non-specific and often consist of pain, paresthesias, cramps, swelling and functional impairment. Therefore, in addition to the clinical examination, objective assessment of venous function and evaluation of the extent of disease are of value. Ultrasonograhy and plethysmograpy are non-invasive tests that can be used for this purpose.

Keywords: venous plethysmography, color duplex ultrasonography, scoring for venous disease, post-thrombotic syndrome, venous function, upper extremity deep venous thrombosis, lower extremity deep venous thrombosis, asymptomatic, symptomatic, postoperative deep venous thrombosis, plethysmographic reference values

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