Buergers Test/Pole Test: simple clinical tests to screen the arterial perfusion before compression therapy

Buerger-Test/Pole-Test: Einfache Methoden zur Überprüfung der arteriellen Perfusion vor geplanter Kompressionstherapie

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ZUSAMMENFASSUNG

Vor Beginn einer Kompressionstherapie ist die Abklärung einer begleitenden peripheren arteriellen Verschlusskrankheit wichtig. Hierfür sind der Buerger-Test und der Pole-Test einfache klinische Untersuchungsmethoden zur Überprüfung der arteriellen Perfusion.

ABSTRACT

Before starting compression therapy further diagnostics of an advanced suspected peripheral arterial occlusive disease are essential. Therefore Buergers test and Pole test are validated simple clinical tests to screen the arterial perfusion.

Introduction

How do I know whether the arterial circulation is sufficient for the indicated compression therapy? Critical limb ischaemia is a contraindication to compression therapy.

We can gain a first impression on inspection, followed by palpation of the peripheral pulses in the feet. If the tibialis posterior and dorsalis pedis arteries are easily palpated, a relevant peripheral arterial occlusive disease (PAOD) can be ruled out as a contraindication to compression therapy. If the pulses are not palpable, the next step is usually to measure the pressure with Doppler ultrasound, by determining the ankle-brachial index (ABI). The minimum requirement is an ABI > 0.5 or Doppler pressure > 60 mmHg at the ankle [1]. Unfortunately, it is often difficult to ascertain the ABI with certainty due to oedema, not possible to measure it because of severe pain from pronounced ulceration or it may be falsely high (ABI > 1.3) due to medial sclerosis (usually as a consequence of diabetes mellitus). As a result, many patients, who are suspected of having advanced PAOD, are denied the compression therapy they need. It is therefore particularly worthwhile carrying out other clinical tests in these cases.

Test procedures

Buergers test (1924)

In healthy people, who are lying down, the feet remain pink and perfused even when they are elevated by 90° and there is capillary

▶ **Fig. 1** Buergers test: elevation for 30 seconds, pathological finding with noticeable pallor, loss of capillary refill, loss of venous filling.

▶ **Fig. 2** Buergers test: sitting for 10 seconds, pathological findings on the left with persistent pallor and delayed reperfusion (compared with the right side).

refill after pressure is applied briefly to blanche the tissues of the toe. However, when there is relevant ischaemia, a noticeable pallor can be seen after 30 seconds of elevation. In these cases, the vascular angle (Buergers angle) can be determined. If the leg becomes pale at < 20°, there is critical ischaemia of the foot.

▶ **Fig. 3** Buergers test: sitting for 30 seconds, pathological findings on the left with notable reactive hyperaemia (compared with the right side).

After the test, the patient sits up with the legs dependent. With normal arterial perfusion, both legs rapidly return to an unremarkable pink colour. In the case of significant PAOD, the leg reverts to the normal pink colour more slowly and passes through this stage to reactive hyperaemia, when the leg becomes markedly red due to metabolic arteriolar dilatation. Only later does the foot resume its normal skin colour [2].

This simple test is very useful in routine clinical practice and, when positive, shows a good correlation in the case of advanced ischaemia due to peripheral arterial occlusive disease [3] (▶ **Fig. 1–3**).

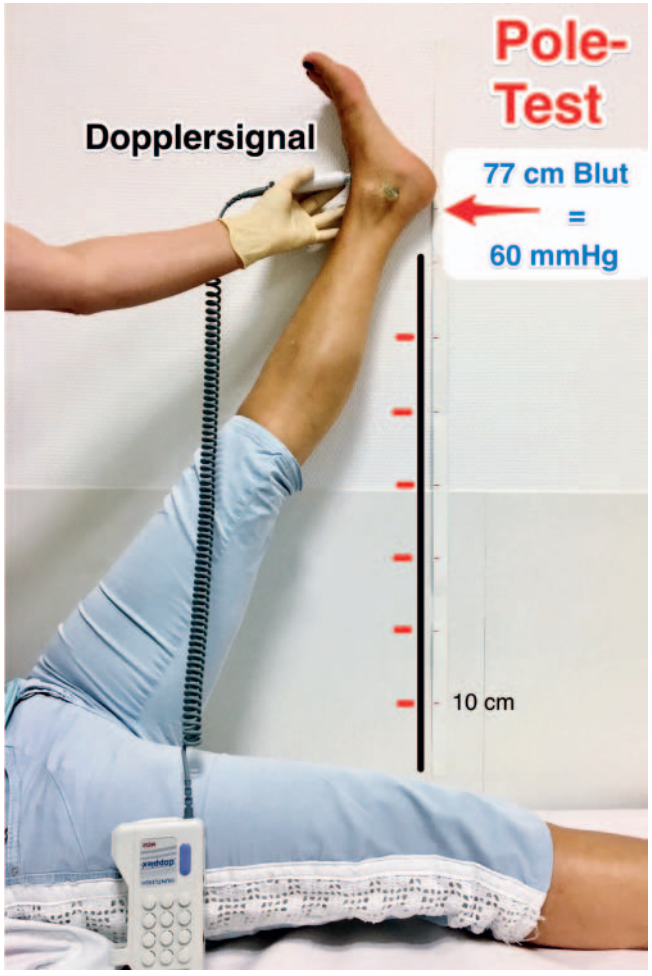
The pole test (1994)

This clinical test is also based on the hydrostatics for pressure determination. With the patient lying down, a Doppler signal is recorded in the foot. When the leg is elevated, the Doppler signal becomes attenuated depending on the vertical height above the heart. Pascal's law allows us to convert the perfusion pressure of the blood (density 1.06×10^3 kg/m^3) into the familiar mmHg (density 1.36×10^4 kg/m^3). In this way, the desired arterial perfusion pressure is 60 mmHg at a height of 77 cm. If a pulsatile Doppler signal can be recorded at this height, then the perfusion pressure is > 60 mmHg.

This pressure measurement on elevation showed a significantly better correlation (index) to ischaemia than the ABI measurement, when used for intraoperative checks. The result was, however, restricted to values up to 60 mmHg [4].

Further comparative studies confirm that it is a good clinical method and describe the technical details.

The toe pole test can be used to determine the arterial perfusion (up to 70 mmHg) in people with diabetes and it is more reli-



▶ **Fig. 4** The pole test: Doppler signal recorded with the leg elevated (height of 77 cm).

able than in the ankle region [5]. The pole test is a technically simple, cost-effective and quickly performed method for the quantitative determination of arterial perfusion pressure irrespective of the compressibility of the lower leg arteries [6]. Figures of 95 % sensitivity and 73 % specificity for the diagnosis of critical chronic limb ischaemia can be found in the literature [7] (▶ **Fig. 4**).

CONCLUSIONS

Buergers test and a subsequent pole test are well-validated simple test procedures to check whether there is sufficient arterial perfusion of the foot in the required range of > 60 mmHg. Controlled compression therapy is possible, if a Doppler signal can be recorded from the ankle when the leg is elevated to a height of 77 cm.

Conflict of Interest

The authors declare that they have no conflict of interest.

References

[1] Andriessen A, Apelqvist J, Mosti G et al. Compression therapy for venous leg ulcers: risk factors for adverse events and complications, contraindications – a review of present guidelines. J Eur Acad Dermatol Venerol 2017; 31: 1562–1568

[2] Buerger L. Circulatory disturbances of the extremities. Philadelphia: WB Saunders; 1924: 162–168

[3] Insall RL, Davies RJ, Prout WG. Significance of Buerger's test in the assessment of lower limb ischaemia. J R Soc Med 1989; 82: 729–731

[4] Smith FC, Shearman CP, Simms MH et al. Falsely elevated ankle pressures in severe leg ischaemia: the pole test – an alternative approach. Eur J Vasc Surg 1994; 8: 408–412

[5] Pahlsson HI, Wahlberg E, Olofsson P et al. The toe pole test for elevation of arterial insufficiency in diabetic patients. Eur J Vasc Endovasc Surg 1999; 18: 133–137

[6] Jachertz G, Stappler T, Do DD et al. The pole-pressure test: an easy alternative in patients with ischemic legs and incompressible arteries. Vasa 2000; 29: 59–61

[7] Paraskevas N, Ayari R, Malikov S et al. "Pole test" measurements in critical leg ischaemia. Eur J Vasc Endovasc Surg 2006; 31: 253–257