

SELECTION OF AMPUTATION LEVEL

Comparison Between Morphine Puncture Test and Skin Perfusion Pressure

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In 46 amputations performed on account of peripheral occlusive arterial disease, the morphine puncture test (MPT) and the local skin perfusion pressure measurement (SPP) were carried out preoperatively.

Below-knee (BK) amputation was performed when the SPP was ≥ 40 mm Hg unless clinical criteria indicated otherwise.

Out of 12 BK amputations without any clinical skin changes, where the SPP was ≥ 40 mm Hg but the MPT was negative, healing was achieved in 11 patients. Thus, if the MPT had been used as an objective method to determine the amputation level, 11 knees would have been sacrificed. The MPT is thus not suitable for determination of amputation level in patients with peripheral occlusive arterial disease.

Key words: amputation level; local skin perfusion pressure; morphine puncture test; peripheral occlusive arterial disease.

Accepted 7.vii.83

The techniques available for assessment of circulation in the extremities are numerous (Holstein & Lassen 1973, Stöckel et al. 1982, Tanzer & Horne 1982). However, no single technique can unfailingly predict the most distal amputation level which will secure primary wound healing.

Walheim (1945) described the morphine puncture test (MPT) as a useful method to determine the amputation level. This test is still used in some departments (Bek et al. 1982), but according to our knowledge no studies concerning the prognostic value of MPT have been published recently, nor have there been any studies comparing MPT with the more modern tests. The purpose of this paper is to examine if there is any correlation between this simple morphine puncture test and the more resource-consuming measurement of the local skin perfusion pressure (SPP).

PATIENTS AND METHODS

Patients

During a period of 1 year (1.11.1981-1.11.1982) a total of 78 lower extremity amputations were performed. In 32 cases the amputation was carried out as an acute operation with the amputation level based on SPP or clinical criteria but without MPT. Thus the series included 46 patients examined with both MPT and SPP before major leg amputations. Diabetes mellitus was present in 13 patients.

The age and sex distribution are shown in Figure 1; 24 were males and 22 females. The mean age was 71 years (31-89).

Methods

Morphine injected intradermally provokes the same reaction as histamine injected intradermally; after a few minutes a sharply circumscribed wheal appears. On its appearance, the wheal is more or less simultaneously attended by a surrounding hyperaemic zone (flare) 1-5 cm in diameter and with an uneven and diffuse border.

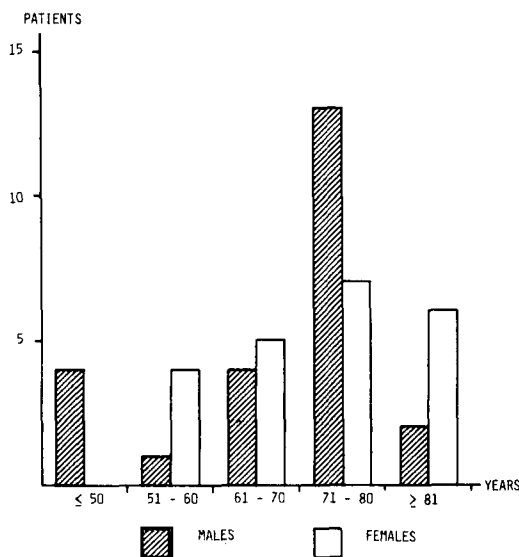


Figure 1. The age and sex distribution of 46 patients with peripheral, occlusive arterial disease.

The flare begins to subside after 10 min. The absence of a flare indicates poor local cutaneous blood perfusion (Walheim 1945).

With a hypodermic needle, 0.1 mg 2 per cent morphine hydrochloride was injected into the skin 10 cm below the knee joint on the anterolateral side of the calf just superficial to the anterior tibial muscle. The test was read after 10 min and regarded as positive if a flare appeared.

The MPT was carried out in full daylight and at least 24 h before or after the SPP to avoid any interaction.

The SPP was measured as described by Holstein & Lassen (1973). The amputation level was decided according to the SPP and conventional clinical criteria. A below-knee (BK) amputation was usually performed when the SPP was ≥ 40 mm Hg, and a through-knee (TK) and above-knee (AK) amputation in all cases with a SPP < 40 mm Hg.

RESULTS

Table 1 shows the results of the two diagnostic tests. In the 15 patients with a SPP ≥ 40 mm Hg and negative MPT, 12 BK amputations, 1 TK and 2 AK amputations were performed. The amputations at above-knee level were performed on account of preoperative bad condition of the patients or the presence of skin lesions. Primary

healing was achieved in all above-knee amputations and in nine BK amputations. Another two BK amputations healed after surgical revision of the stump, and one was reamputated at the AK level because of skin necrosis and subsequent infection.

In the group of patients with a SPP ≥ 40 mm Hg and positive MPT, 21 BK and five AK amputations were carried out. Four BK amputations failed and were converted to AK amputations. One AK amputation was infected postoperatively.

In five patients with SPP < 40 mm Hg (Table 1), five AK amputations were performed and all healed primarily.

No toxic reactions were recorded after intradermal injection of morphine. Moderate oedema of the skin did not influence the reaction. In a few cases, moderate itching was recorded.

DISCUSSION

Haxthausen (1939) first described the reaction of morphine injected intradermally in an experimental study, but did not use the method clinically. However, this was done by Walheim (1945) who found that MPT and conventional clinical criteria including oscillometric measurements were equally good methods for selection of the amputation level, but that MPT was simpler to perform than other methods.

A correlation between the MPT and SPP could not be demonstrated (Table 1). Thus in 15 pa-

Table 1. The relationship between the morphine puncture test (MPT) and the skin perfusion pressure (SPP) in 46 patients with peripheral occlusive arterial disease

Skin perfusion pressure (SPP)	Morphine puncture test (MPT)		Total
	Negative	Positive	
SPP ≥ 40 mm Hg	15	26	41
SPP < 40 mm Hg	2	3	5
Total	17	29	46

tients MPT were negative, indicating a poor local skin perfusion (Walheim 1945) in spite of a SPP ≥ 40 mm Hg and the absence of clinical skin changes. The discrepancy between the two tests was further stressed by three diabetic patients below 40 years of age, who according to the SPP had a sufficient skin perfusion pressure (SPP between 90–100 mm Hg), but nevertheless a positive MPT was obtained in only one of these patients. BK amputation was performed in all three cases and healed primarily.

A total of 12 BK amputations were performed in patients with a SPP ≥ 40 mm Hg and simultaneously negative MPT. Of these, primary healing was achieved in nine patients and secondary healing in another two patients. This means that 11 patients would have been amputated at too high a level if the amputations had been performed according to the MPT.

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