CASE REPORT

Epidural Spinal Cord Stimulation in the Treatment of Limb Threatening Vasospasm — Report of a Case with a Five-year Follow-up

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Introduction

Epidural spinal cord stimulation has been used for the treatment of intractable limb pain as well as for vasospastic and arteriosclerotic ischaemia.¹ ² The optimal way to treat ischaemia is to revascularise the limb by arterial reconstructive surgery or by endovascular intervention. There are, however, situations where reconstructive procedures are not technically feasible or ischaemia is intermittent due to its functional nature, i.e. vasospasm. In these cases epidural spinal cord stimulation may serve as a useful treatment modality.¹ We report on such a patient who responded favourably to epidural spinal cord stimulation.

Case Report

A 39-year-old woman admitted with a two year history of bilateral calf claudication, coldness and intermittent weakness, predominantly on the left side. She had been evaluated by neurologists and orthopaedic surgeons because of a suspected sciatic syndrome which could not be confirmed. She did not smoke and had no diabetes or hypertension. She had suffered from migraine for 20 years and used a combination drug, Anervan®, which contains 1 mg ergotamine tartrate, 2–3 times a month not more than two suppositories at a time. Additionally she had used tolphenamic acid.

On examination femoral pulses were barely palpable with absent distal pulses. Her feet were cold and pale without skin lesions. An ankle/brachial pressure index (ABI) of 0.56 and toe pressure of 40 mmHg were measured on the right leg and corresponding values of 0.53 and 39 mmHg on the left (Fig. 1). The maximum walking distance on a treadmill was only 50 m. The patient was told to stop taking Anervan® but two months later her circulatory symptoms had worsened to the level of nightly rest pains. Repeat ABI’s were 0.27 on the right and 0.14 on the left. Angiography revealed thin threadlike vessels in both lower extremities with occlusion of both superficial femoral arteries. (Fig. 2). Autoimmune disease, hypothyroidism and other causes of secondary Raynaud’s phenomenon were excluded by appropriate laboratory tests.

A diagnosis of vasospasm provoked by ergotism was made. The use of Anervan® was strictly prohibited. A low dose of clonidine was started for migraine prophylaxis, nifedipine for vasospasm prophylaxis and naproxen for migraine headache relief. Because of severe rest pain, she was scheduled for epidural sympathetic blockade, which was done over 3 consecutive days with an outstanding but temporary response confirmed by warm feet and normalisation of the distal pulses and pressures (Fig. 1). Her symptoms rapidly returned and so bilateral lumbar sympathectomy of the L2 through L4 ganglia was performed with normalisation of the circulatory status of the feet. The benefit however, had been largely lost by 3 months and totally within 1 year (Fig. 1). The patient again had rest pain with unmeasurable ankle pressures. An epidural spinal cord stimulation system
(Itrel, Medtronic™) with the electrode at the ThX level was provided for relief of the pain and vasospasm. The response was impressive both clinically and objectively (Fig. 1). Later there were gradual decrease in the effect of the stimulation, at least in part, due to movements of the electrode. These problems eventually necessitated reapplication of the electrode which did not succeed percutaneously and was performed through a hemilaminectomy and open fixation to the dura. Thereafter, in spite of small variation the circulatory status of the patient improved markedly. The patient applied the epidural spinal stimulation to such an extent that the pulse generator has been changed twice. Five years after the implantation of the electrodes she is well with normal pressure indices. She uses clonidine, nifedipine and low dose asetylsalicylic acid continuously and denies any use of ergot alkaloids.

Discussion

Vasospasm may be precipitated by a multitude of reasons. The symptoms of our patient were clearly aggravated by the use of ergot alkaloids for the treatment of migraine. She assured that she had discontinued their use and despite the use of vasodilatory drugs the symptoms continued clearly necessitating intervention. Although the evidence for lumbar sympathectomy for vasospastic disease is far from conclusive, the best effects of lumbar sympathectomy can be anticipated in patients like our present case, i.e. those without neuropathy, limited or no tissue necrosis and a favourable response to preoperative lumbar sympathetic blockade. The effects of sympathetic blockade and even successful sympathectomy are transient as illustrated by the present case. The deterioration of distal pressure to the level measured before sympathectomy could be anticipated, as the regulation of the tone of the resistance arteries was switched from neural to humoral level through increased vascular α2 adrenergic receptor sensitivity to circulating catecholamines thus counteracting the effect of sympathectomy.

Epidural spinal cord stimulation has been used with success for causalgia and reflex sympathetic dystrophy and with somewhat less conclusive evidence for selected patients with unreconstructable critical leg ischaemia. The mechanism of action is unknown, though spinal cord stimulation may induce increased levels of substance P, a vasodilator presumably of spinal origin that increases vascular permeability. The effect of electrical spinal cord stimulation could be maintained initially by increasing the amplitude but direct fixation of the electrode to dura to prevent displacement was required for a lasting effect. Normally stimulation is used intermittently but in this case the patient used the device continuously. Electrical spinal cord stimulation seems a useful method for treatment of certain vasospastic ischaemic conditions of the lower limbs as objectively demonstrated in the present case. As not all patients respond

Fig. 1. Ankle brachial index related to various interventions — the first triangle indicating epidural sympathetic blockade, the second application of epidural spinal cord stimulation and the fourth hemilaminectomy with an open fixation of the electrode. (□) left leg; (■) right leg.
favourably to spinal cord stimulation, a test stimulation with an external lead is recommended before implantation of the device.

References


Accepted 26 October 1994

Fig. 2. Arteriography of the lower limb arteries prior to the first intervention illustrating thread-like arteries with occlusion of both superficial femoral arteries.