

# Chemical lumbar sympathectomy in patients with severe lower limb ischaemia

J P Alexander

Accepted 4 July 1994

---

## SUMMARY

Over a 13 year period, 544 chemical lumbar sympathetic blocks with phenol in 489 patients were performed by the author with the aid of X-ray image intensification. There was objective and subjective improvement in the signs and symptoms of limb ischaemia in 72%, judged by relief of rest pain, improvement in skin blood flow or healing of ischaemic ulcers. Of patients treated in the years 1990-1993, 44% had suffered either death or major amputation within two years of their treatment. Three serious and probably avoidable complications are described.

## INTRODUCTION

Perhaps no procedure has generated more controversy in the treatment of peripheral vascular disease than lumbar sympathectomy. Surgical section of the lumbar sympathetic chain was first performed in 1923 to alleviate muscular rigidity associated with spastic paralysis in war wounded. The obvious effect on the lower limb vasculature was immediately apparent, and the following year an operation was carried out in the Mayo clinic for Raynaud's phenomenon. At about the same time chemical lumbar sympathectomy was being carried out in Vienna and the vascular aspect of this work was soon evident. Reid and colleagues in 1970 reported the long term follow-up results of a large series of cases with ischaemic rest pain treated with phenol sympathetic block.<sup>1</sup>

In the normal subject a complete sympathetic blockade leads to visibly dilated veins or increased blood flow, seen clinically in reduced capillary refilling time. Vasoconstrictor reflexes such as the cold or "ice" response are abolished. The blood flow increase is largely restricted to the skin, with an increase in skin temperature and feeling of warmth in the extremity. Skin capillary oxygen tension and venous oxygen tension are increased. Muscle blood flow is usually unaffected so that intermittent claudication may not be helped. It is not always possible to predict the effect of sympathetic blockade in a patient with a diseased vascular system as a "steal" phenomenon may occur although this is rare. The main indication for sympathetic blockade is rest pain and ischaemic cutaneous ulcers in a limb not amenable to direct arterial reconstruction. Associated coronary artery disease, pulmonary disease and other physical conditions in the aged make some patients poor candidates for surgery. The mechanism whereby the sympathetic nervous system is involved in peripheral

---

Department of Clinical Anaesthesia, Belfast City Hospital, Belfast BT9 7AB.  
J P Alexander, FRCPI, FFARCS, Consultant Anaesthetist

pain has not been fully elucidated. The cutaneous pain threshold via a negative feedback loop is influenced by sympathetic efferents, and some afferent pathways involved in ischaemic pain are believed to pass through the sympathetic nervous system.

This paper presents a review of 544 neurolytic lumbar sympathetic blocks performed for peripheral vascular disease in the 13 year period ending December 1993. All the procedures were carried out by the author using radiological control.

## **METHODS**

The technique used is a modification of the classical method.<sup>2</sup> The patient lies in the lateral position with the side to be treated uppermost, on an X-ray translucent operating table, and is lightly sedated with intravenous ketamine 20-50 mg and Diazemuls 5-10 mg. Adequate monitoring is provided by pulse oximetry. A skin wheal is raised with local anaesthetic about 10 cm lateral to the midline of the back at the level of L3 vertebra. A 22 gauge 150 mm needle is directed to strike the body of L3 and then manipulated to slide off the antero-lateral surface of the vertebral body so that the tip lies near the anterior surface of the vertebrae. A second needle is directed cephalad to lie in a similar position in relation to L2. Correct position of the needles is confirmed using a C-arm image intensifier and careful aspiration performed to ensure that the needle tip is not in a blood vessel. A small volume of 10% phenol in Conray - 420 contrast medium is injected. If X-ray confirms that the solution is spreading correctly in a thin linear fashion that conforms to the anterior edge of the vertebrae, a maximum of 2 ml of the phenol in contrast medium is injected through each needle. A thermal print-out hard copy confirming correct spread of contrast is obtained, and 1-2 ml air injected through each needle to clear the neurolytic agent before withdrawal. Patients remain in the lateral position for 20-30 minutes to limit spread of solution laterally towards the genito-femoral nerve or posteriorly towards the somatic nerves. Patients were interviewed within 24 hours and a clinical assessment made of the success of the procedure. No special tests were performed. Results were arbitrarily graded as good, improved or unchanged depending on the adequacy of relief of rest pain and the clinical appearance of increased skin blood flow and warmth in the foot.

## **RESULTS**

Five hundred and forty-four blocks were performed on 489 patients; 55 patients had bilateral blocks, on separate occasions. The male to female ratio was 1/1.05 and the average age 72 years (range 14-95). Twenty-eight patients were less than 50 years-of-age and five of these were females having bilateral treatments for severe vasospastic disease (Raynaud's phenomenon or chilblains). All patients were referred for treatment by one of four vascular surgeons. Patients were interviewed 24 hours after the block had been performed and a clinical evaluation made. Where the foot was obviously warmer, with hyperaemia and complete relief of rest pain, the block was graded as good (40%). Many of these patients spontaneously volunteered that they had had the first good nights sleep for weeks. Patients who had objective or subjective evidence of lesser degrees of warming of the foot or incomplete relief of rest pain were graded as improved (32%). Thus a favourable response was obtained in 72% of all patients. No detectable change was seen in the remaining 28% and they were

graded as unchanged or poor. Thirty-seven patients were diabetic and a favourable response to the block was obtained in 54%.

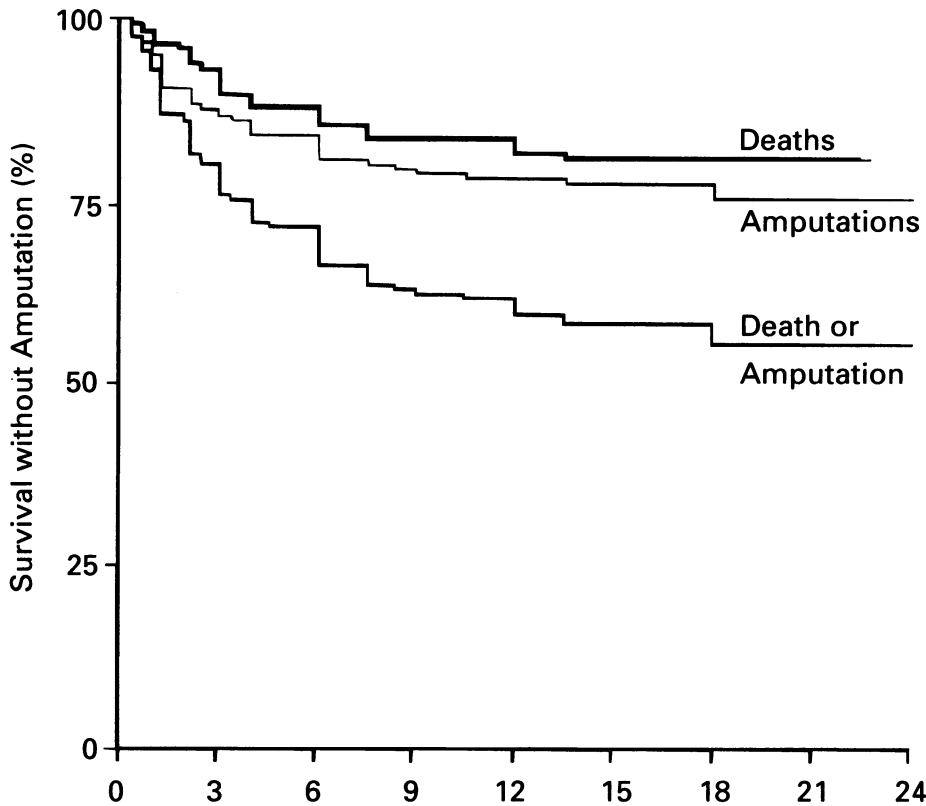
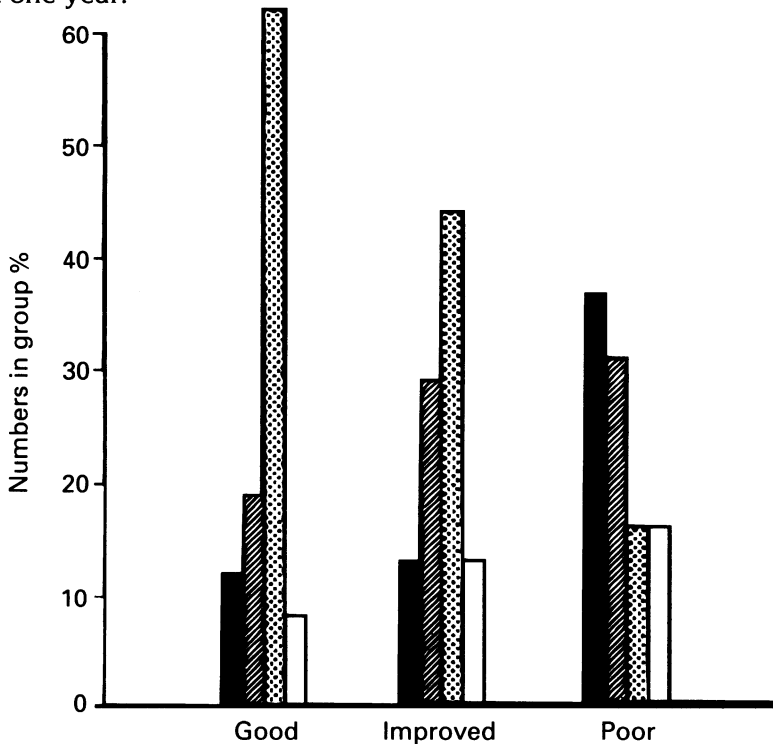


Fig. 1 Proportion of the subgroup of 148 patients remaining alive (upper line, 20% died), remaining amputation free (middle line, 24% had above or below knee amputation) or suffering neither death or amputation (lower line). Four patients who died within 6 months of amputation are not included in the deaths.

In an effort to establish the long-term fate of these patients, a chart review was undertaken of the 148 patients treated during the period January 1990 to December 1993. The mean follow-up period was 8 months (range 3 days -42 months). Twenty patients could not be traced. Thirty patients (20%) are known to have died within two years of their treatment and an additional 34 (24%) suffered a major (above or below knee) amputation. Thus 44% of this subgroup of patients suffered a major complication (death or amputation) within two years (Figure 1). Four had died within six months of amputation and these deaths are not included in Figure 1. Six patients became bilateral amputees. Fifty-two (35%) of this subgroup had good long-term improvement in the condition of the treated limb with healing of ischaemic ulcers and relief of rest pain. In five there was return of peripheral pulses which had been absent and in one only the claudication distance improved. Twelve of these 148 patients

were diabetic, of whom two were dead within a year and five had undergone a below-knee amputation within six months giving an unfavourable outcome in 58%. Three of the diabetic patients had satisfactory circulation in the treated limb at one year.



*Fig. 2* The response to sympathetic block was graded as good (27), improved (52) or poor (49). Solid bars represent deaths, hatched bars amputations, stippled bars survival with satisfactory circulation, plain bars survival with continuing circulatory problems; all expressed as a percentage for each group.

Grading the success of the block as good, improved or poor according to the clinical evaluation was somewhat arbitrary, and Figure 2 is designed to justify this classification. The figure shows that in the good responders, deaths and amputations were less likely, and the chance of survival with satisfactory circulation in the treated limb high (62%). In the poor responders, death or amputation occurred in 68%. Those patients graded as improved occupied an intermediate position. The incidence of minor amputations (toes) without loss of the limb was 12%

### *Complications*

Minor complications were more commonly observed in the earlier treatments. In the first 200 patients, nine minor adverse effects were seen, and these included hypotension (2), convulsions (3) or severe nausea and vomiting (2). Larger doses of phenol were used in these patients, and the unwanted effects were presumably caused either by accidental intravascular injection or by the systemic toxic effects of phenol.

*Genito-femoral nerve irritation*

Genito-femoral nerve neuritis or neuralgia is said to occur in 5-7% of patients following chemical sympathectomy and is conventionally regarded as being due to the neurolytic solution spreading to involve the genito-femoral nerve as it lies on the anterior surface of the psoas muscle where it may be close to the sympathetic chain. A similar complication can occur after surgical sympathectomy, and the numbness, burning and hyperaesthesia in the groin may last for several weeks. There is a well recognised anatomical anomaly where the genito-femoral nerve is fused with the sympathetic trunk for part of its course, so some of these complications may be unavoidable.

Case 1 A 25-year-old female suffering from severe chilblains had a successful neurolytic block performed. She developed a severe and apparently permanent genito-femoral nerve lesion. Ten years later the area of hypersensitivity and tenderness is still present although less acute. Permanent genito-femoral nerve irritation has not previously been described after chemical sympathectomy.

*Psoas haematoma*

Case 2 A 60-year-old male diabetic patient who had had a recent myocardial infarct had an apparently technically satisfactory block performed. It was not obvious in the medical notes that he was being treated with warfarin. He subsequently complained of severe back and leg pain and a CT scan showed a large haematoma in the psoas muscle. He suffered a fatal cardiac arrest five days later.

*Spinal paralysis*

Case 3 A 76-year-old male diabetic patient developed a complete flaccid paralysis below the waist 12 hours after a phenol sympathetic block. There had been technical problems in getting a satisfactory spread of solution at the L3 level and it was suspected that a small amount of phenol solution was injected intra arterially. He died suddenly four months later, without any sign of neurological recovery. Autopsy revealed a recent occlusive thrombus in a severely diseased coronary artery system, infarction of the lower lumbar spinal cord, and a patent anterior spinal artery. It was suspected, but not confirmed, that this individual was one of the few (1.4%) in whom the great radicular artery of Adamkiewicz is supplied from the lumbar artery at the L3 level, and that injection of phenol into or near this dominant artery caused a direct toxic or ischaemic effect on the lower spinal cord.

**DISCUSSION**

Many studies have indicated that patients with rest pain, ulceration or limited gangrene are likely to derive benefit from lumbar sympathectomy. Chemical sympathectomy is a simple procedure to perform and in our hands the success rate compares favourably with that claimed using computed tomography control (72% versus 76%).<sup>4</sup> It can be repeated if necessary although this only occurred once in this series. We have not found special investigations particularly helpful although younger patients would usually have a local anaesthetic block performed with bupivacaine (Marcain) so that the effect of a permanent block can be assessed. Because the number of patients with vascular disease is large, complicated and time consuming physiological studies are not always feasible.

It has generally been accepted that the ankle-brachial systolic pressure ratio or index measured with a Doppler probe is important; if less than 0.35 the response to sympathectomy is likely to be poor although rest pain may be relieved. A recent study suggests that orthostatic responses to changes in limb position as measured by a duplex ultrasound flowmeter may be used to predict the clinical outcome to sympathectomy.<sup>5</sup>

In a recent review Cotton and Cross concluded that sympathectomy was a good procedure in end-stage disease when no other option was open;<sup>6</sup> there was little to support the addition of sympathectomy to a synchronous vascular reconstruction as a way of improving graft patency; sympathectomy probably does not postpone amputation or influence the level at which this will be required. In general, the most beneficial effect of sympathectomy was relief of rest pain, with a somewhat lesser effect of improved healing of ulcers. Increased walking tolerance was of benefit in a small group of patients with intermittent claudication. Occasional dramatic deterioration has been described but is sufficiently rare not to prevent sympathectomy from being widely used in the treatment of ischaemic pain. Their general conclusion was that the use of chemical sympathectomy in the control of ischaemic rest pain and pregangrene in the lower limb is at least as effective as open operation and the high morbidity and mortality of the latter is considerably reduced.<sup>6</sup>

The use of sympathectomy in diabetic patients has been questioned by some workers. Although diabetic ischaemic disease increased the risk of failure of sympathectomy, 54% of diabetics in the present series responded favourably initially and in those patients who were followed up for a longer period, 25% had a good long term result. Our numbers are small but a 58% incidence of major complication (death or amputation) within a year as against 44% for the group as a whole would suggest that diabetics do less well, although some worthwhile results can be obtained. Two recent publications take the view that diabetic status has no prognostic value, and should be ignored.<sup>7,8</sup> Of equal concern are the increasing numbers of renal transplant and chronic dialysis patients who are being referred with critical ischaemia.

I feel that chemical lumbar sympathectomy is useful in the treatment of patients with severe lower limb ischaemia manifest as rest pain, ulceration or toe gangrene, where arterial reconstruction is not feasible for technical or medical reasons. It is of doubtful value in patients with massive tissue necrosis, deep infection or forefoot gangrene, and the inability to salvage an effective walking surface of the foot will ensure that the procedure is not successful. It can be done as a day procedure, although our preference would be that the patient stays in hospital the night following the block. The very serious complications seen in three patients could probably have been avoided. In many patients critical limb ischaemia is an end-stage phenomenon, and almost 50% will suffer major amputation or death within two years. Some patients are unable or unwilling to stop smoking, and progression of their disease is inevitable.

#### ACKNOWLEDGEMENT

I am grateful to Mr R C Curry, Mr M J G O'Reilly, Mr B Lee and Mr R J Hannon who referred the patients.

## REFERENCES

1. Reid W, Watt J K, Gray T C. Phenol injection of the sympathetic chain. *Br J Surg* 1970; **57**: 45-50.
2. Cousins M J, Reeve T S, Glynn C J, Walsh J A, Cherry D A. Neurolytic lumbar sympathetic blockade; duration of denervation and relief of rest pain. *Anaesth Intens Care* 1979; **7**: 121-35.
3. Cross F W, Cotton L T. Chemical lumbar sympathectomy for ischaemic rest pain. *Am J Surg* 1985; **150**: 341-5.
4. Dondelinger R, Kurdziel J C. Percutaneous phenol neurolysis of the lumbar sympathetic chain with computed tomography control. *Ann Radiol* 1984; **27**: 376-9.
5. Morgan P H, Psaila J V, Stone J, Carolan G, Woodcock J P. Postural changes in femoral artery blood flow in normal subjects, patients with peripheral vascular occlusive disease and patients undergoing lumbar sympathectomy, measured by duplex ultrasound flowmetry. *Eur J Vasc Surg* 1992; **6**: 408-15.
6. Cotton L T, Cross F W. Lumbar sympathectomy for arterial disease. *Br J Surg* 1985; **72**: 678-83.
7. Aburahma A F, Robinson P A. Clinical parameters for predicting response to lumbar sympathectomy in patients with severe lower limb ischaemia. *J Cardiovasc Surg* 1990; **31**: 101-6.
8. Baker D M, Lamerton A J. Operative lumbar sympathectomy for severe lower limb ischaemia: still a valuable treatment option. *Ann R Coll Surg Engl* 1994; **76**: 50-3.