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Indications, technique and results of caudal epidural injection for lumbar disc retropulsion

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Summary

The indications, contra-indications and technique of caudal epidural injections in the treatment of low back pain and sciatica are described. Of 201 patients treated by epidural injection, about 56% had favourable results.

Introduction

Intervertebral disc degeneration in the lumbar spine presents one of the most difficult of all therapeutic problems. With waning enthusiasm for excision of the prolapsed disc as the result of persisting backache in a high percentage of patients (Falconer, McGeorge and Begg, 1948), and the risk of infection, post-operative adhesions or mechanical instability, conservative management remains the treatment of choice in many centres. The usual conservative measures of bed rest with or without traction, the use of analgesic or relaxant agents, physiotherapy, plaster of Paris jackets or spinal supports are often protracted and taxing for the patients. There is clearly a need for a safe, simple, and effective method of treatment which can be undertaken on a routine out-patient basis.

Reports of injections into the epidural space are well documented. Sicard (1901) used cocaine extradurally. Evans (1930) pioneered the use of saline injections. Extradural corticosteroid injection was described by Lièvre, Bloch-Michel and Attali (1953), and its value was confirmed by Barry and Kendall (1962), Harley (1967), Cyriax (1957), Swerdlow and Sayle-Creer (1970) and Warr *et al.* (1972). A significant reduction in the analgesic consumption was stressed by Dilke, Burry and Grahame (1973) after epidural injection treatment.

The purpose of this paper is to discuss the indications for epidural injection, to describe its technique, and to analyse the results in 201 patients suffering from lumbar disc retropulsion, who were treated in this way.

Indications for epidural injection

There are two main indications: (1) diagnostic and (2) therapeutic.

(1) Diagnostic indications

Epidural injection can confirm the diagnosis in one of two ways:

(a) If a correctly performed epidural injection fails to relieve the patient's symptoms it is likely that the lesion lies outside the spinal canal. Referred pain is not affected by epidural injection.

(b) Differential spinal block can establish or exclude a diagnosis of malingering. This test is based on the fact that different strengths of a local anaesthetic agent selectively block conduction in nerve fibres of different diameters. The test is performed as follows. Ten ml of sterile isotonic saline is injected into the epidural space as a placebo injection, and its effect on the pain is noted; 10 ml of 0.5% lignocaine hydrochloride is injected to obtain a sensory block; this is followed by 10 ml of 2% lignocaine to block motor function.

Interpretation of the test. Pain of non-organic origin should be suspected when the placebo injection relieves the pain, or when there is no relief even after complete motor block. Relief from purely organic pain should be expected after sensory blockage. Mixed pain, i.e. organic pain with a functional overlay shows partial relief on sensory blockage and complete relief on motor blockage.

(2) Therapeutic indications

(a) Acute 'lumbago'. Epidural injection in this state generally affords instant relief from pain; (b) intractable sciatic pain; (c) chronic backache with sciatica; (d) symptoms of intervertebral disc prolapse complicating pregnancy; (e) nocturnal cramps and coccydynia; (f) failure after laminectomy or other methods of treatment.

Contrary to the belief expressed by Cyriax (1957) that epidural injections should not be given in post-laminectomy patients, it has been found that epidural injection can be a rewarding procedure in these circumstances. Patients should not, therefore, be deprived of a trial of treatment by epidural injection on this account.

Contra-indications

Epidural injection should not be undertaken in the presence of local sepsis; where there is a history of previous sepsis; or where the sacral hiatus is obliterated by a bony mass.

Technique of epidural injection

The essential features of the injection are: (1) the needle should enter the sacral canal through its hiatus; (2) puncture of the dural sac should be avoided; (3) the solution should reach the desired level within the vertebral canal.

Preparation of the patient

Before the injection is given the procedure is carefully explained to the patient, who is told to expect increase in intensity of his symptoms during the injection. It is stressed that sudden movements are likely to cause complications and that these movements must be avoided whilst the injection is in progress. The patient is also assured that intensification of his symptoms is to be regarded as a welcome sign. The principal aim in this exercise is to obtain the patient's confidence, and to sustain this confidence whilst the injection is being given by a quietly continued conversation.

Materials required

A simple pre-set tray can be made for routine use, as shown in Fig. 1. One to two millilitres of 1–2% lignocaine hydrochloride to infiltrate the skin and subcutaneous tissue. For the injection into the epidural space the arbitrary amount of 40 ml of 0.5% lignocaine hydrochloride is used. This amount is varied according to the volume of the epidural space, which is roughly estimated by the resistance felt by the piston of the injecting syringe. About 80 mg (2 ml) of methylprednisolone acetate (depo-medrone) is injected immediately after the lignocaine injection. Lately, 1 ml (50 mg) of hydrocortisone sodium succinate is being used, in addition to the methyl-

prednisolone acetate, in the hope that this may augment the anti-inflammatory effect.

Syringes. Four syringes are required—two of 20 ml and two of 2 ml capacity. Needles—one 3½-in. (9 cm) Howard Jones spinal needle, or a Harris spinal needle of a similar size; one 16-gauge 1½ in (4 cm) needle for initial penetration of the sacral hiatus membrane: one 21-gauge 1½-in (4 cm) needle to withdraw fluids and to infiltrate the skin and subcutaneous tissue. Chlorhexidine in spirit; swabs and drapes.

Position of the patient

The patient lies routinely in the prone position with a pillow under the chest and one placed under the ankles to release tension on the sciatic nerve. If the patient is pregnant, a lateral position is adopted with the affected side nearest to the table.

General anaesthesia

In some centres epidural injections are given under general anaesthesia. In the author's experience there is no need for this, but diazepam (10 mg i.v.) is a useful preliminary to injection if the patient is unduly apprehensive.

Selection of injection site

The injection is made through the sacral hiatus which is located by palpation using the index finger or thumb. The finger or thumb is placed over the suspected area, firmly pressed down and rolled from side to side. In this way the cornua are usually felt and the hiatal space can then be determined with certainty. Difficulty may sometimes arise when there are congenital sacral abnormalities, or an unusual amount of overlying fat. In these circumstances an approximate location of the sacral hiatus can be made by pressing the buttocks together. This narrows and elongates the natal cleft, and the sacral hiatus usually lies beneath the upper end of the narrowed cleft. Alternatively the hiatal membrane can be taken

FIG. 1. Pre-set tray showing the instruments required.

to lie at a rough guess about 1–1.5 in (4 cm) from the upper end of the natal cleft. Further difficulty may arise when the sacral hiatus membrane is replaced by a bony mass. In this event the sacral approach is not possible and should be abandoned.

The site is cleaned with an antiseptic agent and the skin is infiltrated with a 1–2% solution of lignocaine hydrochloride. It is important to avoid large amounts of local infiltration as this tends to obliterate the bony landmarks, and it is good practice first to infiltrate the skin before drawing the fluids into the syringes. This gives time for the infiltrated fluids to disperse, thus avoiding the obliteration of landmarks before the spinal needle is inserted.

Insertion of the spinal needle (Fig. 2).

Insertion of the Howard Jones or Harris spinal needle through the hiatus membrane can be facilitated by first piercing this membrane with a needle of a larger size (16 gauge). Apart from providing an entry hole this preliminary penetration of the membrane gives an idea of the angle through which the spinal needle should be directed. The usual way is to pierce the skin at right angles and then to depress the shank of the needle downwards. As soon as the hiatal membrane is felt, the needle is gently pushed through it at an angle of 60–80°. Once the needle enters the epidural space it should be advanced slowly to the S2 level (Fig. 3). In practice it has been found that injections at this level relieve the patient's symptoms. Dispersal of the injection fluid takes place in both vertical and lateral directions as can be seen by injecting coloured fluids into cadavers, or by injecting radio-opaque solutions under radiographic control.

Difficulties in insertion of the needle

Where the sacral curve is acute, advancement of the needle may be impeded. This can sometimes be

FIG. 2. Insertion of spinal needle.

(a) Angle of needle puncturing the skin;
(b) Angle of needle before entering the hiatus.

overcome by bending the needle about 2.5 cm from its tip by a few degrees or by carrying out the simple manoeuvre shown in Fig. 4a and b.

Sub-periosteal insertion is suspected if a sensation of scratching or grating is felt when the needle is advanced in a cephaloid direction, and fluids cannot be injected. In this event the needle should be withdrawn and reinserted. Occasionally the needle may be located completely outside the sacrum and lie in the nearby muscles. This mistake can be suspected during the injection when there is little or no resistance to the injection, and it can be confirmed by putting the 'watching' hand over the sacrum whilst the injection is made. If the injection is made sub-muscularly the hand will be lifted and it will receive a vibrating sensation as the injection is made (Fig. 5). In this situation the needle should be withdrawn

FIG. 3. The method of assessing the S2 level.

FIG. 4. The method of overcoming an acute sacral curve.
(A) The needle impinging on the sacrum;
(B) The position of the needle after rotation of 180°.

FIG. 5. The injection in progress with 'watching' hand to detect an accidental injection of solution submuscularly.

completely and a further attempt should be made to insert it into the epidural space.

Before the injection is given the patient is again warned against any sudden movement which could cause the needle to puncture the dura. Having estimated that the point of the needle is approximately at the S2 level and that no blood vessels or the dura mater have been punctured, i.e. by the coughing test and by withdrawing the piston of the syringe to ensure that neither C.S.F. nor blood is withdrawn, the solutions are injected.

The rate of injection should be a slow, stop-and-go procedure. Too rapid injection may produce syncope attack. Aggravation of the patient's symptoms during the injection, apart from confirming that the injection is being made at the desired level, is usually

associated with a better response than when no aggravation occurs.

Post-injection management

At the conclusion of the injection a note is made of the following: relief of pain and its extent measured subjectively as well as by straight leg raising test, and motor and sensory examination. The patient is advised that apart from a feeling of warmth in the legs and perhaps a sensation of walking on cotton wool, there should be no other neurological signs or untoward effect. The patient is further warned that as after any hydrocortisone injection the pain may be worsened for a few days before it begins to settle. The patient is advised to lie flat for at least 45 min after the injection which helps to avoid headache

developing on sitting up. The patient should be advised to pass urine before leaving the hospital as urinary retention is known to occur after epidural injection.

Number of injections

If the first injection fails to relieve symptoms, further injections can be given at 2-week intervals. The number of injections is a matter of personal choice, but a total of three injections would appear to be a reasonable limit.

Analysis of patients treated with epidural injection

A total of 201 patients suffering from disc degeneration and retropulsion diagnosed by the history, clinical examination, radiography or myelography in doubtful cases and ancillary laboratory investigations to exclude other diseases were treated by epidural injection and the results are analysed. The ages ranged from 15 to 74 years, but most were in the 25–50 age bracket. The male to female ratio was 2 : 1. The study consisted of a correlation of factual information obtained from the case notes and replies received to a postal questionnaire. The follow-up period varied from 6 months to 3 years.

Mode of presentation of patients

The patients were grouped into Group I, those with acute backache or acute exacerbation of chronic backache. This group included patients who developed sudden severe pain with or without sciatica, and who showed gross restriction of straight leg raising with or without detectable neurological abnormality; Group II, those who suffered from chronic or recurring backache with or without sciatica.

Response to injections

Relief from pain was the main criterion in assessing the results and responses to the injection treatment. Improvement in straight leg raising and the duration of relief from pain were also taken into

account in the assessment. The results (Table 4) were interpreted as follows:

(1) *Very good*. Patients who obtained complete or almost complete relief from pain with improvement in straight leg raising, the improvement being maintained for longer than 18 months.

TABLE 1. Mode of presentation of patients on their first attendance

Group	Mode of presentation	No. of patients	Percentage
I	Acute or acute exacerbation of backache with or without sciatica	60	29.9
II	Chronic and recurrent backache with or without sciatica	141	70.1

TABLE 2. Relationship of epidural injections to other treatments

	Number of patients	Percentage
After a course of physiotherapy	155	77.1
Concurrent with physiotherapy	31	15.4
Before physiotherapy	11	5.5
After laminectomy	4	2.0

TABLE 3.

Number of injections	Number of patients	Percentage
One injection only	165	82.1
Two injections	31	15.4
Three injections	5	2.5

TABLE 4. Analysis of results of 201 patients treated by epidural injection

Effect	Number of patients	Percentage
Very good	59	29.4
Good	54	26.9
Fair	48	23.9
No improvement	40	19.9

FIG. 6. Total loss of work and time off work.

(2) *Good*. Patients with complete or almost complete relief lasting for 4–18 months.

(3) *Fair*. Some relief from pain, lasting 2 weeks to 4 months.

One hundred and sixty-five patients (82%) responded to a single injection (Table 3).

The average time lost was 14.8 weeks. In just over 50% of the patients only 8 weeks were lost.

Discussion

Epidural injection via the caudal approach is preferred to injection by the lumbar route because it is simple and relatively free from complications. The fact that it can be done on a day-case basis without the assistance of an anaesthetist is an advantage. However, problems may arise as the result of congenital abnormalities of the lower end of the sacrum in this technique, and epidural injection may not be possible. In this event, if epidural injection is considered essential, the only resort is to use the lumbar approach. The usefulness of epidural injections in the conservative management of disc degeneration is now well established, but its mechanism of action remains a matter of conjecture and hypothesis. The theories so far proposed are counter-irritation followed by resolution (Viner, 1925), a stretching phenomenon (Evans, 1930), breakdown of peridural adhesions (Greenwood, McGuire and Kimbell, 1952), breakdown of the vicious circle of pain (Kelman, 1944), a view supported by Cyriax (1957) and by the author.

Assuming that nerve compression of varying degree and nerve inflammation are necessary components for pain production in disc retropulsion, it would be logical to assume that lignocaine breaks down the vicious circle of pain which, in turn, not only relieves symptoms and abolishes spasm, but also diminishes nerve inflammation by isolating the axon reflexes. On the assumption that corticosteroids have an anti-inflammatory effect, and may thus reduce oedema and relieve the intensity of the pain, it is further assumed that the anti-collagenic activity of methylprednisolone acetate, by depressing adhesion

formation, minimizes nerve traction and subsequent pain production. These are clearly theoretical suggestions.

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