Results in 60 Cases of Deep Brain Stimulation for Chronic Intractable Pain

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Abstract

Sixty cases have had deep brain stimulators implanted in the past 3 1/2 years. Forty-six cases have had PVG stimulation for peripheral pain, two PVG implants for central pain, and 12 have had specific sensory nucleus stimulation for central pain. Of the PVG cases, 80% have total pain relief or only slight residual pain, and 20% have failed. Those that have failed were probably poor candidates who should not have been selected. Of the specific sensory nucleus stimulation cases, only 33% are satisfied with their results and 50% have totally failed. Two cases had early complications (intraventricular haemorrhage) and four had late complications (sepsis and electrode drift).

The cases recorded here are the first 60 consecutive patients at this centre to have deep brain electrodes implanted to control chronic intractable pain. The programme was commenced after reports of this method by Adams et al. (1, 2), Hosobuchi et al. (8–11) Richardson et al. (17, 18), and many others (3–7, 13–16) appeared in the literature.

Material and Methods

Initially, patients were selected on clinical grounds, namely a history of chronic pain with clear organic cause. After 26 operations had been performed, morphine saturation testing using Hosobuchi's method (personal communication) was introduced, and all patients considered for deep brain stimulation were submitted to this test. When central pain was considered likely, the morphine saturation was followed after several days by a pentothal test.

Morphine Saturation Test

Through a fast running intravenous line, 1.5 mg morphine are given every 60 seconds until 30 mgs have been injected. The patient's pain level on a scale of 10 is charted each minute. If there is residual pain after this, a further 20 minutes is allowed to ensure complete saturation of morphine binding sites. Naloxone (0.8 mg) is then administered intravenously and the charting of pain levels continues for a further 20 minutes. Non-organic pain is indicated by total pain relief a few seconds
after administration of 1.5 or 3.0 mg morphine, or a bizarre response. Gradually diminishing pain with naloxone reversal indicates peripheral pain of organic origin, and an anticipated good result with deep brain stimulation. No response to morphine suggests central pain. These patients are then subjected to a pentothal test. No analgesics are permitted for 12 hours prior to either test. Where hysteria is strongly suspected, normal saline is given in the same manner initially as part of the test, the patient being unaware of which substances are being injected at any particular moment (the author's modification).

**Pentothal Test**

25 mgs Pentothal is administered intravenously each minute until the patient is on the point of unconsciousness, at which time pain, if central, should entirely disappear. This test is carried out by an anaesthetist with full facilities for assisted respiration if required. (Tasker, R.R. reported by Hosobuchi, personal communication.)

The electrodes used were manufactured by Medtronic Inc., introduced in the alert state with a Leksell stereotaxic apparatus. Analgesics were withheld for 18 hours prior to operation. Patients were tested on the operating table to exclude placements where stimulation would produce undesirable side effects. All patients were tested via the external leads for at least one week, chronic implantation being undertaken only if an adequate response was obtained. An hourly pain chart was maintained during the test period with details of the stimulation given.

All cases had prophylactic antibiotics. Disulfiram 400 mg and amitriptyline 100 mg daily was administered for the first two weeks to those patients with periventricular grey implants, commencing on the day of electrode implantation. Thereafter the disulfiram was reduced to 200 mg daily (12), and the amitriptyline dosage adjusted according to the frequency of stimulation.

Forty-eight cases had electrodes introduced into the periventricular grey (PVG) 2 mm lateral to the edge of the third ventricle at the level of the posterior commissure. In two of these patients the pain was considered to be central in origin because of its nature and the response to the pentothal test. The types of pain treated and the number of cases are shown in Table 1.

Twelve patients had electrodes introduced into the specific sensory nucleus (VPL or VPM), all for apparent deafferentation pain. These cases are shown in Table 2.

The longest follow-up in this series is 42 months, and the shortest 6 months.

All patients had the best response when stimulated at 80 Herz, at an amplitude below discomfort. Stimulation time is half an hour.

**Results**

Of the 48 cases with PVG implants, 38 are pain-free or with only a small residuum of pain not requiring analgesics. Ten patients are failures in that either stimulation never relieved their pain, or pain was only controlled for a variable period. Nearly all patients who were initially relieved of their pain but subsequently failed, failed after approximately one year, only one at four months, and one at eighteen months. Seven of these failures were from the 26 cases selected without morphine saturation. Four of these were subsequently submitted to this test, and all gave hysterical reactions. Therefore three of the failures were positive to morphine saturation.