TOWARDS PAINLESS ORTHOPAEDIC SURGERY

by

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SUMMARY

Almost one thousand patients underwent either total hip replacement or spinal surgery in which diamorphine 0.5-1.0 mg was injected intrathecally. Approximately one half of the arthroplasty patients and one third of the spinal patients required no other post-operative analgesia. In the remainder, analgesics were not required for 12 hours post-operatively. The benefits of the technique and possible complications are discussed.

INTRODUCTION

Regrettably, the management of post-operative pain has not kept pace with advances in anaesthesia and surgery and has been the subject of several critical editorials. It is generally conceded that intra-muscular opiates, given on a four-hourly basis, produce peaks and troughs of analgesia, which is very unsatisfactory. Dodson,1 in a review of the available methods of producing pain relief, considers that there may be a place for a nurse with specific responsibilities for this. Many narcotic analgesics are available and these have been assessed critically by Kay and Cohen.2

The discovery and location of receptors for opiate alkaloids and endorphins in the spinal cord by Pert, Kuhar and Snyder3 opened up a completely new field in the management of both chronic and post-operative pain, since it is possible to inject a small amount of opiate in the region of the spinal cord supplying the affected dermatomes, and to produce analgesia which is long-lasting and which, if employed correctly, produces a minimum of side-effects. The receptors are located in the substantia gelatinosa of the posterior columns of the cord, and the opiates probably act by suppressing the release of substance P at laminae I and V.4

The action is more pronounced on the C fibres than on the A fibres so that somatic pain is more amenable to treatment than visceral pain.

The use of intraspinal opiates for the relief of post-operative pain following major orthopaedic surgery was begun in our Unit in 1980 and preliminary results were published by Barron and Strong.5 Preservative-free morphine was given by the epidural route, and diamorphine was used intrathecally at that time. Results with the former were disappointing and we now believe that morphine is too hydrophilic. In contrast to this, results with intrathecal diamorphine have been very rewarding. This opiate is very lipophilic and becomes sequestered in the receptors so that there is less likelihood of respiratory depression.

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METHODS

1. **Spinal surgery:** All patients were premedicated with diazepam and were given a general anaesthetic with relaxant and controlled ventilation. No analgesic was administered during surgery. Towards the end of the operation, the surgeon injected 0.5-1.0 mg diamorphine into the subarachnoid space, as far cephalad as possible, under direct vision. Patients weighing less than 50 kg were given the smaller dose, those weighing 50-70 kg were given 0.75 mg and those over 70 kg were given 1.0 mg.

2. **Total hip replacement:** Lorazepam was employed as premedicant. Anaesthesia was induced with thiopentone, intubation carried out under pancuronium, and controlled ventilation instituted. The patient was then turned with the hip to be operated on uppermost and lumbar puncture was carried out at either L.4/5 or L.5/S.1 using a 25 s.w.g. needle. 0.5-1.0 mg diamorphine was then injected using the same criteria as above. No other analgesia was employed.

The time of injection of the diamorphine was carefully noted on a special form designed for the investigation, and this was retained in the recovery ward, where all patients were monitored for 24 hours. The usual criteria for assessing need for post-operative analgesics were used and, if these were required, the time was noted. Special observations were made for the known complications of the technique.

RESULTS

Table 1 shows the results and incidence of complications in almost one thousand patients. Tables 2 and 3 present details of the patients in the hip replacement and spinal surgery series. It can be seen that approximately half of the arthroplasty patients required no other analgesia whatsoever and that the remainder were pain-free for 12 hours. In the spinal series nearly one third of patients required no other analgesia and again the remainder were pain-free for 12 hours.

**TABLE 1**

*Incidence of complications following intrathecal diamorphine*

|                  | *Total Hip Replacement* | *Spinal Surgery* |
|------------------|-------------------------|------------------|
| Headache         | 92                      | 14               |
| Retention        | 175                     | 39               |
| 22 s.w.g. needle | 93                      | 0                |
| 25 s.w.g. needle | 71                      | 14               |
| Pruritis         | 32                      | 6                |
| Nausea/Vomiting  | 183                     | 20               |
| Respiratory depression | 0          | 0                |

Number of patients 831† 150
TABLE 2
Details of arthroplasty patients

|                     | Males          | Females        |
|---------------------|----------------|----------------|
| No. of patients     | 339            | 492            |
| Average age (years) | 66.3 ± 9.7     | 69.6 ± 10.4    |
| Average weight (kg) | 74.1 ± 12.4    | 63.1 ± 11.6    |
| No analgesia required | 47.4%        | 51.4%          |
| Average duration in remainder (hours) | 13.1          | 11.9           |

TABLE 3
Details of patients having spinal surgery

|                     | Males          | Females        |
|---------------------|----------------|----------------|
| No. of patients     | 83             | 67             |
| Average age (years) | 40.7 ± 11.8    | 39.9 ± 13.2    |
| Average weight (kg) | 75.0 ± 10.9    | 59.0 ± 14.6    |
| No analgesia required | 31%          | 23%            |
| Average duration in remainder (hours) | 12.2          | 12.4           |

DISCUSSION

The technique is not without its complications, the most important of which is respiratory depression, either immediate or delayed. That we have not seen this is, we believe, attributable to our strict adherence to the caveats laid down at the start of the investigation. There is presumably a limit to the number of receptors available and, if these are occupied by other analgesics given either pre- or intra-operatively, the diamorphine can only move passively with the circulation of the cerebro-spinal fluid and will eventually reach the receptors around the aqueduct of Sylvius and cause respiratory depression. Excessive dosage should lead theoretically to the same situation. Nausea and vomiting were worrying complications but, with the judicious use of phenothiazine anti-emetics, the incidence has fallen to acceptable levels. The incidence of headache with the fine 25 s.w.g. lumbar needle is also acceptable. Pruritis, almost certainly encephalinergic in origin is rarely troublesome and can be reversed by the use of naloxone but not by anti-histamines. The incidence of urinary retention is difficult to assess, since many of the arthroplasty patients are elderly males, in whom retention is common, whatever the technique.

Perhaps the most dramatic results of the use of intrathecal diamorphine are seen in patients undergoing laminectomy and disc surgery. Many of these patients are up walking about the ward on the second post-operative day, completely pain-free. Orthopaedic surgeons carrying out these operations are in a unique position to use the technique since the meninges are visualised and accurate placing of the opiate is therefore simple. Apart from the obvious advantages of having pain-free patients,
there is evidence — as yet unpublished — that the stress response is modified to a considerable degree and early mobilisation should lower the incidence of deep venous thrombosis.

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