- variable delivery rate
- catheter becomes disconnected
- CSF(cerebrospinal fluid) leak
- Catheter displaced from epidural or intrathecal space
- Catheter occluded
- Catheter kinked
- Ligature around the catheter
- Fibrotic encapsulation of catheter (renders drug delivery ineffective and may produce neural compromise by mass effect)
- Pump pocket infection
- Surgical wound dehiscence
- Bleeding/haematoma
- Pocket seroma
- Battery depletion
- Component failure
- Procedural complications

Other adverse events outlined by Medtronics (manufacturer of Synchromed) include:

- Spinal headache
- Epidural abscess
- Meningitis
- Arachnoiditis !!
- Drug toxicity : hyperalgesia syndrome*

*A painful dose-limiting toxicity often of unexpected acute onset : severe pain, hypersensitivity, autonomic abnormalities, myoclonus. It is dose-related and tends to occur at high doses of intraspinal opiates. (may be related to M-3-G metabolite accumulation)

This may be termed "paradoxical pain" and may be reduced by decreasing the opiate dose (plus systemic administration of benzodiazepine if necessary).

Side-effects of the pump include:

- Constipation
- Nausea and vomiting
- Itching
- Oedema
- Sweating
- Loss of libido
- Impotence
- Urinary retention
- Cessation of menstruation
- Nightmares
- Anxiety states

The majority of these side effects subside within a couple of months, the most persistent tending to be constipation, sweating and swelling, which may necessitate discontinuing this form of treatment.

A well-known study by Winkelmuller([i]) showed that most patients started at about 1.6mg to 3mg of morphine daily and over a 6 month period their doses increased by between 60 and 100%.

It was predicted that some patients were likely to require further dose escalation over the coming months and years.

About three quarters of patients were considered to have successful treatment, the other quarter being classed as treatment failure due to drugs being ineffective or because the pump had to be removed. This was considered encouraging as 95% of these patients had failed to achieve relief from oral opioids.

There was a high rate of patient satisfaction with this form of treatment.

Maintenance:

Abram presented a comprehensive review of neuraxial opioid administration at the 1992 Bonica lecture.

He concluded that studies of cancer pain treatment showed that there tends to be a slow increase in mean daily opiate, usually at a rate that doubles every few months.

This dose escalation is slower in patients receiving intrathecal infusion and for those with continuous infusion compared with those receiving bolus injections.
Changes in intrathecal dose tend to be made in 10-20% intervals, depending on pain intensity, side effects and previous exposure to opiates.

Supplemental oral analgesia may be necessary to combat incident pain, but breakthrough pain may be alleviated by a bolus scheduled using the pump programmer if it can be predicted.

A NOTE OF CAUTION...it is important to bear in mind that any invasive treatment may carry a potential risk of causing or exacerbating arachnoiditis (indeed, Medtronic list it as a complication.)

Hodgson et al ([ii]) have discussed the neurotoxicity of spinal drugs as a central safety issue. They cite animal studies which have failed to show any evidence of histologic or physiologic toxicity.

There have been limited postmortem neurohistopathology studies in cancer patients who received long-term continuous intrathecal morphine infusion. These have not implicated the drug (with metabisulfite preservative) in any histopathological abnormalities.

However, there is a dearth of animal studies in the use of spinal meperidine, hydromorphone and fentanyl.

Indeed, the authors note

"fentanyl is notably absent from animal safety testing data."

Moreover,

"controlled human safety data are also minimal with spinal fentanyl." They conclude that "overall, most spinal drugs in clinical use have been poorly studied for spinal cord and nerve root toxicity."

Clinical use suggests that spinal opioids are safe but they recommend further research "to follow a systematic approach to determine potential neurotoxicity."

Angel et al ([iii]) contend that the use of the morphine pump is a "viable alternative in the management of failed back syndrome" but suggest that "its use in long-term therapy, however, is not without its limitations and should be a last choice option."

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[i] Winkelmuller M, Winkelmuller W, *J Neurosurg* 1996; 85:458-67 Long-term effects of continuous intrathecal opioid treatment in chronic pain of nonmalignant etiology

[ii] Hodgson PS , Neal JM , Pollock JE, Lui SS *Anesth Analg* 1999;88:797 The neurotoxicity of drugs given intrathecally (spinal)

[iii] Angel IF, Gould HJ, Carey ME *Surg Neurol* 1998 Jan;49 (1):92-98 Intrathecal morphine pump as a treatment option in chronic pain of nonmalignant origin

My thanks to those who contributed their stories about the experience of using opioid medication.