Title: INTRAVENOUS VERSUS SUBCUTANEOUS HYDROMORPHONE FOR PATIENT-CONTROLLED ANALGESIA

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Introduction. Patient-controlled analgesia (PCA) is a useful technique for postoperative pain management because it can improve titration of analgesic medication and minimize the time interval between the perception of pain and its relief.[1] A limitation of this technique relates to the need to maintain continuous intravenous (IV) access. Since opioid analgesics are effective when administered by the subcutaneous (SQ) route,[2] a study was designed to compare the efficacy of hydromorphone in relieving postoperative pain when self-administered by either the IV or SQ route.

Methods. Thirty consenting ASA I-III patients undergoing elective surgical procedures were randomly assigned to receive hydromorphone via IV (n=15) or SQ (n=15) administration. The study was approved by the local Institutional Review Board. Patients were instructed in the use of the PCA device prior to their operation. When the patient began to complain of pain in the PACU, a loading dose of hydromorphone was titrated in 0.2 mg IV increments until the patient was comfortable. Subsequently, patients were allowed to self-administer hydromorphone using an Abbott Lifecare^{R} PCA infusion device via either the indwelling IV or a 20 ga catheter placed in the SQ tissue of the forearm. Incremental dose was monitored and adjusted by the investigators to achieve optimal analgesia with minimal sedation. Patient usage was recorded at 4 hr intervals during the first 48 hrs after the operation. Patients were also asked to assess their postoperative comfort level on a five-point scale: 1=severe pain, 2=moderate pain, 3=slight pain, 4=moderately comfortable, 5=very comfortable. At the completion of PCA therapy, patients were questioned regarding side effects and their overall satisfaction with the technique. Data were analyzed by Chi-square analysis and Student's t-test, $p<0.05$ was considered statistically significant.

Results. The two groups were comparable with respect to age (44-53 yr), weight (72-74 kg), gender, types of procedures, and the amount of narcotic medication administered during the operation. The hydromorphone analgesic requirement (mg/h) and frequency of self-administered doses are shown in the figure. Loading doses and maintenance analgesic requirements (mean ± SEM) with respect to the type of operative procedure are summarized in table 1 . There were no significant differences between the two groups in analgesia scores (3-4 at 4-8 hr and 4-5 during the remainder of the 48 hr study period). Patients were highly satisfied with PCA by either route of administration. Twelve of 15 patients in the SQ group and 10 of 15 patients in the IV group rated their overall pain control as "excellent". No patient rated it as less than "satisfactory". PCA was well-tolerated by the SQ route, without evidence of inflammation at the SQ catheter site. The type and incidence of side effects were similar in the two groups (table 2).

Discussion. Our results demonstrate the efficacy of hydromorphone in the management of postoperative pain when delivered by a PCA device. The SQ route was found to be as effective as the IV route. The higher hydromorphone requirement in the SQ patients may reflect less complete absorption of the drug from this site. The SQ technique would be advantageous for surgical patients in whom continuous IV access is difficult to maintain. Further studies involving narcotic analgesics with varying degrees of lipid solubility and durations of action are needed to establish the optimal drug regimen for SQ-PCA.

References.

1.White PF: Semin Anesth 4:255-266,1985
2.Goudie TA, et al: Anaesthesia 40:1086-1092,1985

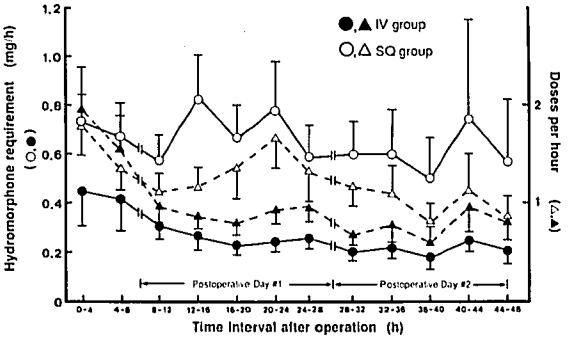

Table 1. Postoperative hydromorphone requirement.

	Group	Peripheral extremity	Lower abdominal	Upper abdominal
Number (N)	IV	4	7	4
	SQ	3	6	6
Loading dose(mg)	IV	0.35(0.18)	0.40(0.14)	0.90(0.44)
	SQ	0.53(0.24)	0.57(0.06)	0.57(0.18)
Use(mg/h) 0-24 hr	IV	0.23(0.09)	0.34(0.10)	0.34(0.06)
	SQ	0.47(0.08)	0.53(0.12)	0.69(0.17)
Use(mg/h) 24-48 hr	IV	0.10(0.02)	0.21(0.04)	0.29(0.06)
	SQ	0.27(0.05)	0.49(0.16)	0.83(0.26)

Table 2.Incidence of postoperative side effects (%)

	IV	SQ	Overall
Sedation	20	27	23
Dizziness	13	27	20
Diplopia	0	20	10
Nausea	27	7	17
Vomiting	7	7	7
Pruritus	20	40	30
Hesitancy	7	13	10