

Practice trends in use of morphine for control of intraoperative pain: An audit

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Abstract

Background: When using morphine as the sole analgesic during conduct of anesthesia, the fear of its adverse postoperative effects primarily sedation and respiratory depression may impede adequate dosing and analgesia.

Aim and Objectives: This audit aims to explore the dosing schedules of morphine used during general anesthesia in our institution and to analyze whether the fear of major side effects leads to suboptimal dosing of morphine with inadequate pain relief.

Materials and Methods: All subjects scheduled for surgery under general anesthesia wherein morphine was used exclusively for intraoperative analgesia were included in the audit. The audit proforma was completed by the attending anesthesiologist wherein the study period extended from beginning of anesthesia to immediate postoperative period.

Result: The study population comprised of 158 patients having mean age 33 ± 14 years and mean weight 52 ± 14 kg. The dose of morphine administered at induction varied widely from 0.05 to 0.3 mg/kg i.v. The VAS (Visual Analogue Scale) score in immediate postoperative period varied from 0 to 10 (mean 1.7 ± 2.0) and sedation score from 1 to 5 (mean 3.94 ± 1.05). Inadequate analgesia with a VAS score ≥ 4 was seen in 15% patients. Morphine dosage of >0.1 mg/kg was associated with highly significant increase in quality of postoperative analgesia with VAS score <4 , and an increase in sedation with sedation score ≤ 3 (P value < 0.01). However, none of the patients required active intervention for cardiorespiratory support.

Conclusion: The practice of dosing morphine in our institution is highly variable with doses ranging from 0.05 to 0.3 mg/kg. This results in inadequate analgesia in 15% patients in postoperative period. Titrating the dose of morphine to expected pain levels inflicted upon by surgical procedures may result in better pain control and less sedated patients postoperatively.

Key words: Audit, dosing schedules, morphine

Introduction

Analgesia constitutes an integral part of anesthesia. Inclusion of an opioid as a component of balanced anesthesia serves to alleviate not only perioperative pain but decreases somatic and autonomic responses to airway manipulations, improves hemodynamic stability, lowers requirements for inhaled anesthetics, and decreases anxiety.^[1]

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Several opioids are available in the armamentarium of the anesthesiologist. While newer opioids such as fentanyl and sufentanil offer several advantages and have revolutionized anesthesia. Morphine continues to have a place in clinical practice, especially for postoperative analgesia.

Owing to the limited availability of shorter acting opioids such as fentanyl, several centers are forced to use the longer acting morphine during intraoperative period also. Although morphine provides good quality pain relief, there is a wide variation in its dose requirements for pain management.^[2-4] We felt that the fear of its adverse effects in postoperative period, primarily sedation that frequently precedes the onset of analgesia^[3] and respiratory depression is responsible for an inadequate intraoperative dosing of morphine.

This audit aimed to explore the dosing schedules of morphine during general anesthesia used by anesthesiologists in our institution and its effect on analgesia and postoperative sedation.

Materials and Methods

After approval by the Institutional Ethics Committee all subjects scheduled for surgery under general anesthesia, wherein morphine was used as the sole opioid intraoperatively were included in the audit. Patients, in whom intraoperative analgesia was supplemented with any drug or technique besides morphine, were excluded. The study period extended from beginning of anesthesia to immediate postoperative period.

In the operating room, mandatory monitoring was instituted and intravenous access was established. The technique of general anesthesia was left to the discretion of attending anesthesiologist, who administered anesthesia as per his/her usual practice and was asked to complete the audit proforma.

The dose of morphine administered at the time of induction, intraoperative top-ups of morphine, and duration of operative procedure were noted. The heart rate and blood pressure were noted prior to induction of anesthesia, just after the surgical incision, and at 15 and 30 min after the incision. Postoperatively immediately after shifting to recovery VAS score was assessed on a scale of 0–10 with “0” being no pain and “10” denoting worst possible pain. Sedation was assessed on a scale of 1–5^[5] [Table 1]. The blood pressure, heart rate, presence of nausea or vomiting, and use of intraoperative antiemetic were noted.

Data collected was analyzed using SPSS software version 16. Quantitative data was represented as mean \pm standard deviation or range as appropriate. The relation between morphine dose and pain score was analyzed using chi-square test. *P* value < 0.05 was considered statistically significant.

Results

The demographic data of patients is presented in Table 2. There were more female patients than male patients. Surgical procedures included orthopedic surgeries, surgeries on spine, laparotomies, laparoscopic surgeries, percutaneous nephrolithotomy (PCNL), ear-nose-throat (ENT) and ophthalmic surgical procedures, and neurosurgical and gynecological surgeries.

These procedures were further categorized into three groups comprising of “high pain surgeries” (*n* = 21), “medium pain surgeries” (*n* = 44), and “low pain surgeries” (*n* = 93) depending on level of pain expected in the perioperative period (based on consensus of three senior anesthesiologists).

The dose of intravenous morphine administered at induction varied widely (0.05–0.3 mg/kg). Majority of patients (48%) received morphine in dose range of 0.11–0.15 mg/kg. Almost an equal percentage (45%) received lower range of 0.05–0.1 mg/kg, while only 7% were administered morphine greater than 0.15 mg/kg. In 27% patients, morphine was repeated in the intraoperative period, with the total dose of these top-ups averaging 0.01 mg/kg. Amongst the patients who received top-ups of morphine, the duration of surgery varied from 45 to 330 min.

In the immediate postoperative period, VAS score varied from 0 to 10 (mean 1.7 ± 2.0). Inadequate analgesia suggested by VAS score ≥ 4 was present in 15% of the responding patients. The duration of surgery, mean dose of morphine used at induction, and the mean total dose of morphine used intraoperatively in patients, whether they had inadequate or adequate analgesia in immediate postoperative period, were comparable [Table 3]. Of the 135 patients, who had adequate analgesia in immediate postoperative period, 57.7% patients

Table 1: Observer’s assessment of sedation

Responsiveness	Speech	Facial expression	Eyes	Score
Responds readily to name spoken in normal tone	Normal	Normal	Clear, No ptosis	5
Lethargic response to name spoken in normal tone	Mild slowing	Mild relaxation	Glazed or mild ptosis (Less than half the eye)	4
Responds only after name is called loudly and/or repeatedly	Slurring or prominent slowing	Marked relaxation	Glazed And Marked ptosis (half the eye or more)	3
Responds only after mild prodding or shaking	Few recognizable words			2
Does not respond to mild prodding or shaking				1

Table 2: Demographic data of patients (n = 158)

Male	Female	Age in years (Mean \pm SD)	Weight kg (Mean \pm SD)	Duration of surgery in minutes (Mean \pm SD)	High pain surgeries	Medium pain surgeries	Low pain surgeries
49	109	33 \pm 14	52.4 \pm 14.3	124 \pm 61	21	44	93

were administered >0.1 mg/kg morphine at induction and 42.2% patients were administered lower doses. Of these 135 patients, 12.6% patients underwent surgeries considered highly painful, 25% underwent surgeries considered to cause moderate pain, and a large number of them amounting to 62.2% patients underwent low pain surgeries.

Of the 23 patients who had inadequate analgesia in the immediate postoperative period, 43.4% patients were administered >0.1 mg/kg morphine at induction and 56.5% patients were administered lower doses. Of these 23 patients, 17.3% patients underwent surgeries considered highly painful, 43.47% underwent surgeries considered to cause moderate pain and only 39.1% patients underwent low pain surgeries.

Mean sedation score was 3.94 ± 1.05 (range 1–5), with 27% patients being heavily sedated with sedation score of ≤ 3 . Of these 27% patients, 16% patients could not respond to any verbal queries on pain, the other 11% could only confirm absence or presence of pain without being able to quantify it. Of the total 88 patients who were administered morphine in excess of >0.1 mg/kg, 66% were adequately awake (sedation score > 3) in the immediate postoperative period, while 34% were deeply sedated (sedation score ≤ 3) [Table 4].

We carried out a telephonic survey of 20 consultant anesthesiologists in our institution and recorded that all considered a dose of >0.1 mg/kg as a “high dose” for moderate duration surgery, while 0.1 mg/kg was considered a usual dose.

Amongst patients who received this perceived high dose of morphine (>0.1 mg/kg), 88% had satisfactory pain relief in

PACU, i.e., VAS score < 4. There was a significant relation between the patients receiving >0.1 mg/kg morphine and those developing adequate immediate postoperative analgesia (*P* value < 0.01). However, 31% of patients with adequate analgesia had sedation score of ≤ 3 .

No significant change was seen in the intraoperatively hemodynamic parameters measured after incision and at 15 and 30 min after incision, when compared to respective baseline values. The lack of any significant change in hemodynamic parameters was similar in patients receiving the low or high dose of morphine. Only one patient complained of nausea in PACU. None of the patients required any cardiac or ventilatory support.

Discussion

Opiates form the cornerstone of pain management. With the advent of newer faster and shorter acting opioids such as fentanyl and its congeners, morphine, because of its slower onset and longer duration of action is no longer preferred for intraoperative analgesia and is used mainly for postoperative analgesia.^[6-10] However, in developing nations, where the availability of newer opioids is limited and supply erratic,^[10] anesthesiologists with varying experiences are obliged to use morphine intraoperatively with wide dosing schedules, as we have seen in our audit.

Grace and coworkers used $13.1 + 4.3$ mg morphine with dextromethorphan and $17.6 + 6.0$ mg without dextromethorphan for intraoperative analgesia, when titrating its dose to keep blood pressure and heart rate within 20% of baseline values.^[4] Other evidence base also shows that morphine is used in varying doses, but mainly for postoperative analgesia.^[2-4,6-11]

This audit was merely aimed at knowing the current practices of morphine when used for intraoperative analgesia. To assess intraoperative analgesia, we recorded the hemodynamic responses to surgical incision and patient’s assessment of pain as soon as he was shifted to recovery room.

Table 4: Comparison of different doses of morphine with respect to sedation levels in postoperative period (n = 158)

Dose of morphine	No. of patients (%) in postoperative period with sedation score	
	≤ 3	>3
Up to 0.1 mg/kg (n = 70)	17.1	82.8
>0.1 mg/kg (n = 88)	34.09	65.9

Table 3: Comparison of patients with inadequate and adequate pain relief in postoperative period with respect to surgical procedures, dose of morphine administered, and sedation levels (n = 158)

Adequacy of postoperative analgesia with VAS score	H (%)	M (%)	L (%)	Low M (%)	High M (%)	Mi mg/kg (Mean \pm SD)	Mt mg/kg (Mean \pm SD)	T min (Mean \pm SD)	No. of patients with Sedation score (%)	
									≤ 3	>3
Inadequate ≥ 4 (n = 23)	17.3	43.47	39.13	56.5	43.4	0.1 ± 0.02	0.12 ± 0.05	123.7 ± 58.6	0	100
Adequate <4 (n = 135)	12.59	25.1	62.2	42.2	57.7	0.11 ± 0.02	0.12 ± 0.04	124.1 ± 62.0	31.1	68.8

H: no. of patients operated upon for high pain surgeries; M: no. of patients operated upon for medium pain surgeries; L: no. of patients operated upon for low pain surgeries; Mi: dose of morphine administered at induction; Mt: total dose of morphine administered intraoperatively; Low M: no of patients administered morphine up to 0.1 mg/kg at induction; High M: no of patients administered morphine ≥ 0.1 mg/kg at induction; T: duration of surgery.

As with earlier evidence, though for postoperative analgesia, a wide variation in the dosing schedules is evident (0.05–0.3 mg/kg intravenous). The apprehension of the anesthesiologists in using higher dose of morphine due to postoperative sedation is evident from the finding that 15% patients had moderate to severe pain (VAS score ≥ 4) immediately after waking up from anesthesia, and 27% were highly sedated with sedation score ≤ 3 . Sixty two percent of patients, who had adequate analgesia in postoperative period, were operated upon for low pain surgeries, while only 39% of patients, who had inadequate pain relief, were operated upon for low pain surgeries and they were administered a marginally lower dose of morphine at induction.

Clinically, these observations reflect that anesthesiologists do not always titrate the dose of morphine administered at the time of induction to the level of pain inflicted upon by the surgical procedure but administer it on a fixed dose regime that varies among different anesthesiologists. Some anesthesiologists use relatively higher doses, while others use lower doses of morphine; this practice results in inadequate pain relief in some patients and deeper sedation in some other patients.

Some anesthesiologists recognized the need for additional doses, while others went on with the dose of morphine used at induction. The decision could have been based either on duration of surgery or the hemodynamic response, although no statistically significant relation was seen between dose of morphine and hemodynamic changes.

In contrast to earlier studies on opioids, where incidence of postoperative nausea vomiting has been reported to be as high as 30%,^[7] in our audit only one subject complained of nausea in PACU. This could be due to our institutional practice of prophylactic administration of antiemetics.

Conclusion

This audit showed a wide range of morphine doses used for intraoperative analgesia. Its sole usage in existing dose schedules failed to provide adequate analgesia in 15% patients, and it also resulted in 27% patients being highly

sedated. Using a dose of morphine as per the anticipated pain from the surgery may result in better titration of pain relief and avoidance of excessive sedation.

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