# INTRATHECAL MORPHINE ADMINISTRATION FOR POST – OPERATIVE ANALGESIA
## Effects on vital signs and spinal anaesthesia components *

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**SUMMARY**
In this study, we have investigated the effects of intrathecal morphine injection on spinal anaesthesia components, some selected vital signs and respiratory functions. Fifty patients were evaluated. Half of the patients received morphine and lidocaine intrathecally, and half of them received intrathecal lidocaine alone. The results revealed that intrathecal injection of morphine does not cause unwanted side-effects in the circulatory and respiratory systems.

**Key words:** Post-operative analgesia, morphine, lidocaine, intrathecal injection, spinal anaesthesia components.

**INTRODUCTION**
In the past, variations of spinal anaesthesia components have not been investigated in studies of intrathecal morphine administration for the relief of post-operative or chronic intractable pain. In this study, we have compared the effects of intrathecal administration of morphine, with lidocaine and lidocaine alone on spinal anaesthesia components, selected vital signs, and respiratory functions.

**MATERIALS AND METHODS**
Our study included 50 patients, aged 17 - 83 years (mean 56. 1 ± 3.9 years) who had no contraindication for spinal anaesthesia. Forty eight of this group were female and two male. The patients were separated randomly into two groups, each of 25 patients. Lidocaine and morphine were administered to Group I and lidocaine alone to Group II.

All of the patients were examined and interviewed 24 hours prior to surgery. Informed consent was obtained from all of the patients. All patients were subjected to different types of urologic procedure which could be performed with spinal anaesthesia. They were premedicated with atropine 0.50 mg im, 30 -45 minutes before operation.
On arrival in the operating theatre, 5 % Dextrose infusion was commenced through an intravenous peripheral catheter. Prior to anaesthesia, systolic blood pressure, heart rate, tidal volume, respiratory minute volume and respiratory rate were measured in each patient. Respiratory functions were measured using a Wright respirometer. After examination of the lumbosacral x - rays and palpation of the patient, spinal anaesthesia was performed via the $L_{3-4}$ or $L_{4-5}$ space with a 22G needle. The patients in Group I received 120 - 140 mg of 2 % lidocaine solution and 1 mg of morphine sulfate in 2 cc of saline, administered separately. In Group II spinal anaesthesia was performed by administration of 120 - 140 mg of 2 % lidocaine solution alone. The start and finish of motor blockade were assessed by asking the patients to move their toes. Systolic blood pressure and heart rate variations were measured at 5, 10, 20, 30, 60, and 90 minutes, and 2, 4, 6, 8, 12, 16, 20 and 24 hours following spinal anaesthesia, whilst tidal volume, minute volume and respiratory rate were measured at 10, 30, and 60, minutes, and 2, 4, 8, 16 and 24 hours following the procedure. All of the patients remained in the recovery room after operation until the motor blockade ended.

**RESULTS**
25 patients in Group I who had received intrathecal lidocaine and morphine, and another 25 patients in Group II who had received intrathecal lidocaine alone were included in our study. The mean systolic blood pressure variations for Group I and Group II are shown in Table I.

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In Group I, mean systolic blood pressure was reduced compared to the preprocedure mean systolic blood pressure up to 24 hours following the induction of anaesthesia. This reduction was statistically significant at all times ($p < 0.05$). In Group II a statistically significant reduction in mean systolic blood pressure ($p < 0.05$) was observed at all times except at 2 and 4 hours. The difference in mean sytolic blood pressure between Groups I and II at each time point was analysed. The mean systolic blood pressure in Group I was significantly lower than that of Group II ($p < 0.05$) at 2, 8, 16, and 20 hours. At other times no statistically significant difference was noted.

Variations of the mean heart rates for each group are shown in Table II. In Group I, the mean heart rates were significantly depressed over the control values at 5, 10, 20, 30, 60 and 90 minutes, and 2, 4, 16 and 20 hours post spinal anaesthesia ($p < 0.05$). In Group II reduction of mean heart rate over control values was statistically significant at 10, 20, 30, 60 and 90 minutes, and 12, 16 and 20 hours following the procedure ($p < 0.05$). Comparison of mean heart rates between the groups demonstrated a significant lowering ($p < 0.05$) of heart rate in Group I only at 20 minutes.

Mean respiratory rate values are shown in Table III. The mean respiratory rate in Group I was significantly increased over the control value ($p < 0.05$) at 10 minutes and 2, 4 and 8 hours post procedure. In Group II, the respiratory rate was significantly raised ($p < 0.05$) at 10, 30 and 60 minutes and 2 hours post spinal anaesthesia. Comparison of mean respiratory rates between groups demonstrated a significant increase ($p < 0.05$) in Group I rates at 4 and 8 hours.

Mean respiratory minute volume for each group are shown in Table IV. In Group I, mean minute volume was only significantly increased ($p < 0.05$) at 4 hours. In Group II, mean minute volumes were significantly raised ($p < 0.05$) at 10 minutes and 2 and 4 hours following the procedure. Comparison of mean minute volumes between the groups demonstrated no significant difference at all times.

Tidal volumes were calculated by dividing minute volume by respiratory rate and mean values for each of the groups are shown in Table V. Tidal volume variations from control values in Group I were significantly lowered ($p < 0.05$) at 30 and 60 minutes and at 2, 4 and 8 hours. In Group II significant lowering ($p < 0.05$) occured at 10, 30 and 60 minutes and 2 hours. Comparison of mean tidal volumes between groups showed significant raising of the values ($p < 0.05$) in Group II at 4 and 8 hours.

The mean times at which motor blockade commenced and finished in each group are shown in Table VI. Whilst the time to commencement of motor blockade was statistically longer ($p < 0.05$) in Group I than that of in Group II, there was no statistically important difference between the time at which motor blockade ended.

In Group I, only two patients had severe hypotension, as a complication, either during or following spinal anaesthesia. One of them had hypotension after five minutes and the other at 30 minutes. The vasopressor drug, ephedrine, was administered intravenously to treat hypotension in both patients. In Group II, none of the patients had problems with blood pressure or heart rate.

In Group I, five of the patients suffered from nausea and one of them vomited. 17 patients complained of pruritis which extended from the tip of the nose and spread to the face, shoulders and back. This complaint was seen 3 - 4 hours after intrathecal injection, and continued for 3 - 8 hours. All pruritis improved spontaneously. None of the patients in Group II complained of nausea, vomiting or pruritis.

Spinal anaesthesia ensured satisfactory surgical analgesia in both groups, and no supplementary analgesic drugs or techniques were required. None of the patients suffered complications specific to spinal anaesthesia.

**DISCUSSION**

In this study, we have investigated the effects of morphine administered with lidocaine intrathecally and lidocaine administered intrathecally alone on spinal anaesthesia components, selected vital signs and respiratory functions.

Many authors have investigated the effects of intrathecal morphine administration on post - operative and chronic intractable pain relief, but have not investigated the spinal anaesthesia components. We were unable to find any study on motor blockade commencement time, and only Kalso (1) reports on motor blockade ending time. In his study, intrathecal morphine with bupivacaine was administered, and it was found that motor blockade was longer in the morphine/bupivacaine group with no significance between control and morphine groups. Gjessing and Tomlin (2) used intrathecal morphine alone and provided surgical analgesia with general anaesthesia. They observed an increase in blood pressure 3 - 4 minutes after intrathecal administration and decrease to normal value ten minutes later. Possibly the reason for disconcordance between their results and those reported here are due to the different methods employed in these studies.

Kalso (1) reported hypotension and bradycardia at the beginning of the spinal anaesthesia. Hypotension and bradycardia were not significantly different from the control values, and his results were parallel to those reported here.

The effects of intrathecal morphine on respiratory functions have been investigated in many studies, but methods differ. Gjessing and Tomlin (2) observed significant respiratory depression in some of

their patients. They observed $CO_2$ narcosis in two patients and found an increase of $PaCO_2$ 4 - 8 hours after injection. This increase began to decrease 12 hours after injection. Respiratory function changes at 4 and 8 hours in our study confirm their findings. Cunningham et al (3) observed signs of respiratory depression at 6 and 12 hours following morphine injection. Liolios and Andersen (4) observed depression at 7 hours. It is possible that the different times of depression reported in these studies depend upon the different morphine dosage and experimental design. Additionally, Paulus, Paul and Munson (5) administered 2 mg of morphine intrathecally to a patient undergoing an inguinal hernia repair, and observed severe respiratory depression and coma 4 hours later. 30 mg of naloxone was administered during the next 20 hours.

Pruritis was the most frequent complaint seen following administration of intrathecal morphine (1, 6, 7). Only Gjessing did not report pruritis in his group of 32 patients, and neither did he observe nausea and vomiting. One of his group suffered from urinary retention. Cunningham (3) reported nausea and vomiting as the most frequent side effect.

In our study, we observed no significant respiratory depression, but found that morphine caused an increase of respiratory rate and a decrease of tidal volume at 4 and 8 hours.

We observed significant differences between the two groups' blood pressure values at 2 hours. We postulate that the ending of spinal analgesia and commencement of pain at this time in control group caused an increase in blood pressure. It should be noted that this difference was removed at 4 hours by administration of supplementary analgesics to the control group. Whilst satisfactory analgesia continued between 8 - 20 hours in the morphine group, supplementary analgesics had lost their effects during this period in the other group. The commencement of pain again caused an increase in blood pressure in the control group. These factors; satisfactory analgesia in the morphine group and increase of blood pressure in the control group, caused a statistically important difference in blood pressure at 8, 16 and 20 hours. The blood pressure decrease was at least 23 mmHg in the morphine group and at least 27 mmHg in the control group. It can be seen that intrathecal morphine administration does not effect blood pressure significantly. In summary, administration of morphine by this method does not cause central vasomotor depression.

The commencement of motor blockade was much longer in the morphine group, but there was no significant difference between the motor blockade termination in the two groups.

In conclusion, in the light of our and other investigators' results we conclude that intrathecal morphine administration for analgesia does not cause unwanted side - effects.

**REFERENCES**


1. *Kalso E. Effects of intrathecal injected morphine with bupivacaine on pain after orthopaedic surgery. Br J of Anaesth. 1983; 55: 415.*
2. *Gjessing J, Tomlin PJ. post - operative pain control with intrathecal morphine. Anaesthesia. 1981; 36: 268 - 76.*
3. *Cunningham AJ, McKenna JA, Skene DS. Single injection spinal anaesthesia with amethocaine and morphine for transurethral prostatectomy. Br J of Anaesth. 1983; 55: 423.*
4. *Christensen V. Respiratory depression after extradural morphine. Br J of Anaesth. 1980; 52: 841.*
5. *Paulus DA, Paul WL, Munson ES, Neurologic depression after intrathecal morphine. Anesthesiology. 1981; 54: 517 - 18.*
6. *Duggan AW. Supression of transmission of nociceptive impuls by morphine, selective effects of administered in ten region of the substantia gelatinosa. Br J of Pharmac. 1977; 61: 65 - 76.*
7. *Nelson W, Katz J. Intrathecal morphine for post - operative pain. Anesthesiology. 1980; 53: 218.*

**TABLE I. Mean systolic blood pressure variations in Group I and Group II (mmHg).**

| | GROUP I | GROUP II |
|---|---|---|
| Control | 136.40 ± 4.54 | 138.00 ± 3.95 |
| 5 min. | 122.40 ± 6.76 | 120.00 ± 4.16 |
| 10 min. | 119.40 ± 5.24 | 111.20 ± 4.29 |
| 20 min. | 120.00 ± 4.86 | 112.00 ± 3.36 |
| 30 min. | 118.80 ± 5.59 | 114.00 ± 3.74 |
| 60 min. | 118.00 ± 4.04 | 117.40 ± 3.38 |
| 90 min. | 123.40 ± 3.81 | 127.40 ± 3.97 |
| 2 hr. | 123.20 ± 4.49 | 138.00 ± 4.83 |
| 4 hr. | 125.80 ± 3.76 | 134.80 ± 4.16 |
| 6 hr. | 120.40 ± 3.02 | 129.20 ± 3.60 |
| 8 hr. | 116.00 ± 2.70 | 129.60 ± 3.89 |
| 12 hr. | 116.20 ± 3.71 | 127.00 ± 4.20 |
| 16 hr. | 114.20 ± 2.76 | 128.80 ± 3.01 |
| 20 hr. | 113.20 ± 2.15 | 128.80 ± 2.72 |
| 24 hr. | 124.00 ± 3.05 | 130.00 ± 3.91 |

**TABLE II. Mean heart rate variations in Group I and Group II (beats /min).**

| | GROUP I | GROUP II |
|---|---|---|
| Control | 87.44 ± 2.39 | 86.72 ± 1.91 |
| 5 min. | 82.24 ± 2.99 | 83.36 ± 1.76 |
| 10 min. | 80.64 ± 2.72 | 79.52 ± 2.08 |
| 20 min. | 80.36 ± 2.28 | 76.80 ± 1.78 |
| 30 min. | 80.24 ± 2.74 | 76.72 ± 1.85 |
| 60 min. | 79.20 ± 1.85 | 77.84 ± 2.03 |
| 90 min. | 78.64 ± 2.15 | 78.72 ± 1.87 |
| 2 hr. | 79.68 ± 2.01 | 82.40 ± 2.06 |
| 4 hr. | 79.76 ± 2.01 | 84.00 ± 1.94 |
| 6 hr. | 82.40 ± 2.27 | 83.12 ± 2.32 |
| 8 hr. | 84.32 ± 2.30 | 83.36 ± 2.21 |
| 12 hr. | 83.28 ± 1.85 | 82.00 ± 1.87 |
| 16 hr. | 79.76 ± 1.81 | 80.88 ± 1.28 |
| 20 hr. | 81.28 ± 2.16 | 81.52 ± 1.15 |
| 24 hr. | 83.44 ± 2.03 | 82.64 ± 2.06 |

**TABLE III. Mean respiratory rate variations in Group I and Group II.**

| | GROUP I | GROUP II |
|---|---|---|
| Control | 15.20 ± 0.35 | 15.88 ± 0.29 |
| 10 min. | 15.68 ± 0.35 | 16.72 ± 0.32 |
| 30 min. | 15.48 ± 0.29 | 16.64 ± 0.42 |
| 60 min. | 15.56 ± 0.29 | 17.04 ± 0.36 |
| 2 hr. | 16.04 ± 0.38 | 16.64 ± 0.32 |
| 4 hr. | 18.12 ± 0.45 | 16.52 ± 0.32 |
| 8 hr. | 16.48 ± 0.44 | 16.08 ± 0.30 |
| 16 hr. | 15.40 ± 0.32 | 15.96 ± 0.23 |
| 24 hr. | 15.24 ± 0.29 | 15.88 ± 0.21 |

**TABLE IV. Mean minute volume variations in Group I and Group II (ml).**

| | GROUP I | GROUP II |
|---|---|---|
| Control | 7462.00 ± 181.20 | 7598.00 ± 143.01 |
| 10 min. | 7528.00 ± 160.80 | 7756.00 ± 136.05 |
| 30 min. | 7456.00 ± 176.57 | 7686.00 ± 155.20 |
| 60 min. | 7456.00 ± 180.28 | 7746.00 ± 166.78 |
| 2 hr. | 7474.00 ± 179.42 | 7828.00 ± 155.88 |
| 4 hr. | 7774.00 ± 215.81 | 7822.00 ± 144.77 |
| 8 hr. | 7504.00 ± 221.37 | 7710.00 ± 135.33 |
| 16 hr. | 7438.00 ± 198.75 | 7650.00 ± 134.10 |
| 24 hr. | 7416.00 ± 177.54 | 7608.00 ± 123.14 |

**TABLE V. Mean tidal volume variations in Group I and Group II (ml).**

| | GROUP I | GROUP II |
|---|---|---|
| Control | 491.00 ± 8.95 | 479.00 ± 5.51 |
| 10 min. | 482.80 ± 10.26 | 465.60 ± 6.47 |
| 30 min. | 482.20 ± 8.75 | 464.00 ± 7.17 |
| 60 min. | 477.40 ± 11.14 | 457.80 ± 6.33 |
| 2 hr. | 469.60 ± 11.77 | 468.20 ± 5.09 |
| 4 hr. | 431.60 ± 10.74 | 474.00 ± 5.14 |
| 8 hr. | 457.60 ± 9.92 | 480.20 ± 5.30 |
| 16 hr. | 483.40 ± 8.89 | 479.00 ± 5.63 |
| 24 hr. | 487.40 ± 9.73 | 479.40 ± 5.53 |

**TABLE VI. Mean commencing and finishing times of motor blockade in both groups.**

| | Commencing time (sec.) | Finishing time (min.) |
|---|---|---|
| GROP I | 242.40 ± 27.81 | 137.52 ± 3.85 |
| GROUP II | 142.80 ± 10.28 | 128.20 ± 3.44 |