EFFECTS OF INTRAOPERATIVE-INTRATHECAL SUFENTANIL INJECTION ON POSTOPERATIVE PAIN MANAGEMENT AFTER SINGLE LEVEL LUMBAR DISCECTOMY

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Abstract

Background: For lumbar disc operation a chain of painful procedures including skin incision, muscle dissection and sometimes laminectomy should be performed. The combination of these manoeuvres results in significant post-operative pain.

The standard way to reduce post-operative pain consist of intra-operative injection of local anaesthetic (Bupivicaine or Lidocaine) to the superficial tissues and intravenous, oral or rectal prescription of Opioid analgesics or other analgesics after operation, but inadequate analgesia, constipation and delayed mobilisation are frequent side effect of those treatments. The goal of this study was to reduce postoperative pain of patients which causes a reduction in analgesic consumption and eventually shortened hospital stay and acceleration in physical therapy programs and ambulation.

Materials and Methods: After ethical comitte approval, patients allocated in two groups A and B. Each group consisted 30 patients which all of them underwent general anesthesia. All of operations performed by same surgeon... After discectomy and at the end of surgerybased on patients odd or even number of hospital admission, one group (*group*-A) received sufentanil (Iranian pharmaceutic company) 0.05/kg intrathecaly injected in surgical level and the placebo group (*group*-B) normal saline was injected. In recovery room when patients were sufficiently awake for pain assessment, patients were asked to score pain on the verbal pain assessment score In both groups we compaired pain scores pre and postoperativly. The total dose of opioid requirement for patients and its time after operation was recorded.

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Results:

Of the 60 patients (ASA classes I and II) entering the study, no one excluded during our study. 30 patients received intrathecal injection of sufentanil as group-A or case and 30 patients normal saline as group-B or control. Mean age between two groups showed no significant difference. 45.7 year (SD = 11.5) for group-A and 44.3 year (SD = 9.9) for group-B which did not differ between two groups (P = 0.617). Urinary retension happened in 3 patients of group-A and 3 patients of group-B (P = 1). Pruritis happened in 1 patient of group-A and no patient in group-B (P = 0.15). Patients in group-A had reduced analgesic requirments (P = 0.01). Preoperative low back pain based on NPS (numerical pain scores) criteria in group-A shows score 1, (n = 7) score 2, (n = 10) score 3, (n = 11) and score 4 (n = 2) (mean = 2.2667 and SD = 0.9072). These scores in group-B showed score 2 (n = 4) score 3 (n = 16) and score 4 (n = 10) (mean = 3.2 and SD = 0.6644) (P <0.001). After surgery low back pain assessment in two groups shows in group-A three patients had score 1, score 2, (n = 7) score 3, (n = 11) score 4, (n = 8) score 5 (n = 1) (mean = 2.9 and SD = 1.0289) and in group-B score 4 (n = 17) score 5 (n = 13) (mean = 4.4333 and SD = 0.5040) (P <0.001). Preoperative lower extremity radicular pain assessment in two groups shows a mean pain score of 8.3 with SD = 0.9523 in group-A and a mean of 8.3448 with SD = 1.1109 in group-B and after operation a mean pain score of 1.7333 with SD = 0.8277 in group-A and a mean of 4.1667 with SD = 0.7466 in group-B. In walking ability assessments pre and postoperatively based on Mann-Whitney test it is shown that in group-A walking ability is better than group-B (P <0.001).

Conclusion: In this study we studied the efficacy of intraoperative-intrathecal sufentanil injection versus placebo on post operative pain management. Our study showed that intrathecal (IT) sufentanil provided more effective analgesia postoperatively after single level disccectomy. Urinary retention was equal in two groups. For more exact conclusions it is better to do a similar study on more patients.

Key words: intrathecal sufentanil -postoperative pain-lumbar discectomy.

Introduction

Lumbar disc herniation surgery is a common surgical procedure performed within neurosurgical and some orthopedics departments. It is usually carried out for lumbar degenerative condition mostly affecting those patients between 30 to 40 years old[1]. For lumbar disc operation a chain of painful procedures including skin incision, muscle dissection and sometimes laminectomy should be performed. The combination of these maneuvers results in significant post-operative pain.

The standard way to reduce post-operative pain consist of intra-operative injection of local anaesthetic (Bupivicaine or Lidocaine) to the superficial tissues and intravenous, oral or rectal prescription of Opioid analgesics or other analgesics after operation, but inadequate analgesia, constipation and delayed mobilization are frequent side effect of these treatments[1,3]. Lumbar intrathecal (IT) opioids have been used as an adjunct to post thoracotomy analgesia[4,5,6,7] but the available literature[6] has not clearly demonstrated the clinical usefulness of this technique for pain reduction in lumbar disc operaiton. Intrathecal analgesia has been used after "lumbar spine procedures"[7], spinal fusion[8], laminectomy, discectomy, hemilaminotomy, and foraminotomy[9].

Epidural analgesia was used after lumbar laminectomy[10], posterior, anterior or combined fusion[11], posterior fusion[2,4] with or without decompression[10], and after posterior or anterior-posterior lumbar fusion[3]. For continuous postoperative analgesia, epidural administration is an established and safe method used routinely for other operative procedures. Epidural opioids[10], ropivacaine[3,4], or a combination of opioids with bupivacaine[2,11], have been reported to be useful after spine surgery. Patients' postoperative functional rehabilitation is hampered by intense postoperative pain. Although fairly high doses of IV opioids are typically necessary, epidural analgesia may result in fewer side effects. The goal of this study was to reduce postoperative pain of patients which causes a reduction in analgesic consumption and eventually shortened hospital stay and acceleration in physical therapy programs and ambulation.

Materials and Methods

The ethical committee of our university approved this interventional double blind &case series study. This study was performed on patients which needed a surgical intervention for lumbar disc herniation in ayatollah kashani hospital of Isfahan university of medical sciences. Number of patients allocated for this study was based on 1% of general population which experience low back pain during their life and 10% of them which may need surgical intervention (0.0001 of general population). Patients were excluded if they had more than one level disc herniation, previously underwent operation for disc herniation, age more than 60 years, spinal canal stenosis, patients refusal for intrathecal injection and patients who encountered a surgical complication (eg. nerve root injury, thecal or sac laceration…).

Based on these statistical information and exclusive criteria 60 patients entered our study which were divided in to two 30 patients groups based on their hospital admission number. In all patients general anesthesia was induced with thiopental(5-7 mg/kg) and fentanyl (1-1.5 microgm/kg). Atracurium (0.6 mg/kg) was administrated to facilitate endotracheal intubation. Anesthesia was maintained with Nitrous Oxide (N20/O2 ratio50% /50%) and Isoflurane (up to1.3 MAC). Atracurium increments were used to facilitate mechanical ventilation of the lung. Also morphine (0.15 mg/kg administrated intravenously at the start of surgery. Whenever the blood pressure or heart rate increased by more than 30%, so that depth of anesthesia was judged inadequate, hemodynamic control was ensured with incremental doses of IV fentanyl (50-100 microgm). All operations were performed by the same surgeon. After discectomy and at the end of surgery based on patients number of hospital admission, one group (*group*-A) received sufentanil (Iranian pharmaceutic company) 0.05/kg intrathecaly injected in surgical level and the placebo group (*group*-B) normal saline was injected. Resident which should control post operative pain scores questionare don't knows which substance is injected. Then it was blinded to type of injection. In recovery room when patients were sufficiently awake for pain assessment, patients were asked to score pain on the verbal pain assessment score (Table 1).

Table 1
Numerical pain score

Score	Quality of Pain
1	No pain
2	Mild pain
3	Pain that cause the patient discomfort
4	Pain that cause the patient searching medical care
5	Moderate pain that is still supportable
6	Pain that make the patient fill completely discomfort
7	Pain that cause the patient to stop all activities
8	Severe pain rarely have been experienced
9	Very severe pain
10	Pain as worst as possible

The motor ability of patients was assessed based on 1-5 criteria. Pain assessment was performed every 12 hours for first two postoperative days and morphine was administrated if pain score was greater than 9 (0.05 mg/kg). Most of patients were discharged after two days of hospitalization. In both groups we compared pain scores pre and postoperativly. The total dose of opioid requirement for patients and its time after operation was recorded. Hemodynamic variables, vertigo, pruritis and urinary retention were recorded in two groups of study. All of these probable side effects were monitored in post operation period and if happened recorded. The primary outcome measure was a visual analogue pain score which recorded in recovery, on the first and second post-operative days. Secondary outcome measures were length of post-operative hospital stay, post-operative analgesia required-total dose and types per 24 hours for first two days. All opiod analgesics will be converted to morphine equivalents and side effects by day 2 including urinary retention, nausea, vomiting and pruritis and hemodynamic variables.

Statistical Analysis

Pain scores were ranked data that should be distributed in a normal distribution. Analysis was therefore by a Mann Whitney rank sum test.

Length of hospital stay was continuous data so the t test was used for analyzing.

The prevalence of side effects will be analysed using a Chi2 test. The total intra and post-operative analgesia requirement was converted to morphine equivalents and I\IIanalyzed using a t test. No subgroup analysis was undertaken.

Trial termination

The trial ended when the last patient was discharged from hospital

Results

Sixty patients were included, 30 in Group A and 30 in Group B. No patient was excluded from the study. The two groups were similar with respect to demographic variables, duration of surgery and anesthesia (Table 1).

Table 1
Demographic and intra-operative data (ASA I\II)

	Group A (n = 30)	**Group B** (n = 30)
Age (yr)	45.7 ± 11.5	44.3 ± 9.9
Gender (M/F)	21/9	19/11
Weight (kg)	82/3 ± 11.1	77.8 ± 12.3
Duration of anesthesia (min)	54.0 ± 7.1	52.7 ± 7.4
Duration of surgery (min)	39.0 ± 5.6	36.8 ± 5.8

Data are presented as mean± SD or number of patients.
There was no significant difference between two groups.

Three patients in each group had urinary retention (P = 1.0). One patient in group A and no patient in group B had pruritus (P = 0.15). The postoperative morphine requirements were significantly less in group A when compared with group B (5 mg vs 20. mg, P = 0.01). Preoperatively, there was no significant difference in mean (± SD) NPS score at rest in two groups (3.0 ± 0.5 in group A vs. 3.1 ± 0.6 in group B, P = 0.64). After surgery, mean (± SD) NPS score was significantly less in group A compared with group B (2.9 ± 1.03 in group A vs. 4.4 ± 0.5 in group B, P < 0.001). Incidence of different NPS scores in two groups was shown in figure 1.

Preoperatively, there was no significant difference in mean (± SD) lower extremity radicular pain assessment score (NPS score) in two groups (8.3 ± 0.9 in group-A vs. 8.3 ± 1.1 in group-B, P = 0.803). After surgery, mean (± SD) lower extremity radicular pain assessment score (NPS score) was significantly less in group-A compared with group-B (1.7 ± 0.8 in group-A vs. 4.2 ± 0.7 in group-B, P <0.000). Incidence of different lower extremity radicular pain assessment score (NPS score) in two groups was shown in figure 2. In walking ability assessments pre and postoperatively based on Mann-Whitney test it is shown that in group-A walking ability is better than group-B (P <0.001). Walking ability of patients was assessed based on scores listed in table 1.

Fig. 1
The incidence of different NPS scores in group A and group B

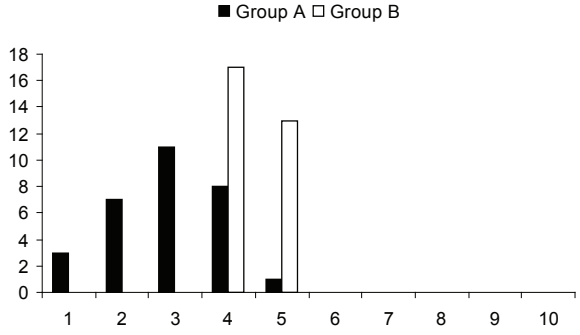

Table 1
Walking ability scores after lumbar discectomy

1	Patient is returned to near normal lifestyle and normal movements with no significant pain.
2	Significant improvement in patients' movements with mild restriction due to low back pain and some degree of pain in extremities.
3	Partial improvement in patients movements with some intermediate pain and discomfort but the patient is able to walk.
4	Only mild improvement in movements and pain that make the patient fill completely discomfort.
5	There is no difference between preoperative and post operative pain and walking ability.

Discussion

The aim of postoperative pain relief is to provide subjective comfort in addition to inhibiting nociceptive impulses. Autonomic and somatic reflexes responses to pain can be blunted, allowing the patient to breathe, cough and move more easily. It is not only the humanitarian feature of pain that must be assessed but also its ability to restore normal function. It is therefore necessary to assess and treat pain not only at rest but also during activity. In this study we studied the efficacy of intraoperative-intrathecal sufentanil injection versus placebo on post operative pain

management.

Our study showed that intrathecal (IT) sufentanil provided more effective analgesia postoperatively after single level disccectomy. Urinary retention was equal in two groups of sufentanil and distilled water IT injection. Urinary retention has not been studied in previous[7] studies. Pruritis happened in one of patients in group-A which was mild and spontaneously releafed and would be an expected side effect of opioids. In the study of Schenk et al on Postoperative Analgesia After Major Spine Surgery after intrathecal morphin injection on 72 patients 5 experienced pruritis[1]. Patients in group-A had reduced pain scores and analgesic requirments in comparision with group-B which only received distilled water as placebo. Mean pain scores in group-A which received IT sufentanil was 2.2667 but in group-B our study showed a higher score of about[2,3]. In the study of Riad et al Patients in the morphine group had significantly lower median numerical rating score (NRS) for pain on movement at 4h [0 versus 3.5] (P = 0.0008) and 8h [0 versus 4] (P = 0.0083)[12]. In addition, median PCA morphine consumption was significantly reduced at 4h [0 versus 1] (P = 0.0005), 8h [0.5 versus 6] (P = 0.0063) and 12h [3 versus 8.5] (P = 0.0426) in the morphine group[12]. After surgery low back pain assessment in two groups shows that in n group-A the mean pain score is 2.9 compared with 4.43 in group-B. Preoperative lower extremity radicular pain assessment in two groups shows a mean pain score of 8.3 with SD = 0.9523 in group-A and a mean of 8.3448 with SD = 1.1109 in group-B which shows an equlity. After operation a mean pain score of 1.7333 with SD = 0.8277 in group-A and a mean of 4.1667 with SD = 0.7466 in group-B that shows a very effective pain reduction with sufentanil. In walking ability assessments pre and postoperatively based on Mann-Whitney test it is shown that in group-A scores are better than group-B. (P <0.001) which means a better quality of walking ability between patients reaciving sufentanil inntraoperativly. As a final conclusion from this study it is obviated that intrathecal sufentanil causes better pain tolerance and eventually reduction of post operative analgesic needs and more satisfaction and better walking abilities after surgery compaired with patients who have reacived placebo. Side effects like pruritis or urinary retention were negligible for patients. For more exact conclusions it is better to do a similar study on more patients.

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