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EFFECTS OF CONTINUOUS FENTANYL INFUSION ON POSTOPERATIVE PAIN IN LUMBAR POSTERIOR FUSION OF ONE INTERVERTEBRAL SPACE - A RETROSPECTIVE STUDY

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ABSTRACT
Purpose: We evaluated postoperative analgesia of intravenous fentanyl infusion in lumbar posterior fusion of 1 intervertebral space retrospectively. **Methods:** We selected the patients who received intravenous fentanyl infusion (31 patients, fentanyl group) and who were only in a conventional postoperative analgesic protocol (15 patients, control group) after lumbar posterior fusion of 1 intervertebral space. Fentanyl 20 μg + droperidol 0.2 mg per hour were infused for 24 hours after surgery only in the fentanyl group. As a rescue analgesia when visual analog score (VAS) became 5 or more, analgesic protocol was active. Vital signs, VAS, frequency of rescue analgesics, and side effects were compared between the two groups. **Results:** The VAS scores were significantly lower in the fentanyl group during study period. Frequency of analgesics was significantly lower in the fentanyl group. **Conclusion:** Intravenous infusion of fentanyl 20 μg + droperidol 0.2 mg per hour had significant analgesic effect for postoperative 24 hours in lumbar posterior fusion of 1 intervertebral space.

KEYWORDS: Spine surgery, postoperative analgesia, fentanyl.

INTRODUCTION
There have been many reports of postoperative analgesia in spine surgery,[1,2] but many of them includes various number of vertebral bodies, different surgeons, and/or different anesthesia, those factors affect postoperative pain. We selected retrospectively lumbar posterior fusion of 1 intervertebral space performed by the same surgeon and same anesthesia method, and evaluated the effects of fentanyl infusion on postoperative pain.

MATERIALS AND METHODS
MATERIALS
We selected 2 groups of the patients from those who received lumbar posterior fusion of 1 intervertebral space by the same surgeon and anesthesiologist, 31 patients who were administered intravenous fentanyl infusion after surgery (fentanyl group), and 15 patients who received only a conventional postoperative analgesic protocol (control group). Those with Physical Status by the American Society of Anesthesiologists (ASA-PS) 3 or more were excluded.

In our hospital, informed consent to use any clinical data for presentation was obtained from all patients at preoperative informed consent of anesthesia. Ethics committee approval was obtained before data collection (No. 002).

Without any premedication, anesthesia was induced with midazolam, propofol, and fentanyl, and oro-tracheal intubation was facilitated with vecuronium. Anesthesia was maintained with desflurane and infusion of remifentanil. Flurbiprofen 50 mg was administered at the induction of anesthesia and acetaminophen 1000 mg was infused at the end of surgery in all patients.

For patients in the fentanyl group, fentanyl 20 μg and droperidol 0.2 mg per hour were infused intravenously for postoperative 24 hours. For patients in the control group, only the rescue analgesics were administered according to our protocol. The rescue analgesia was 1, intravenous flurbiprofen 50 mg; 2, diclofenac suppository 50 mg; 3, intravenous pentazocine 15 mg when visual analog scale (VAS, 0-10) was 5 or over with lock out time of 1 hour.

Blood pressure, heart rate, respiratory rate, percutaneous oxygen saturation (SpO_2), VAS, number of rescue analgesia, and side effects (nausea, vomit, and headache) for postoperative 24 hours were extracted from patient's record and were compared between the 2 groups.

Statistical analysis was done using chi-square test and factorial analysis of variance (ANOVA) and $P < 0.05$ was considered to be statistically significant. Post-hoc sample size test was performed using the G power 3.1.9.7 (University of Kiel, Germany) with the effect size of 0.25 and α of 0.05.

RESULTS

The power was 0.99.

No differences were observed in the back grounds of patients between the 2 groups (Table.1).

Table 1: Backgrounds of patients.

	Control group	Fentanyl group
Age (years)	73 ± 5	71 ± 6
Gender (Male/Female)	6/9	14/17
Height (cm)	160 ± 7	162 ± 6
Body weight (kg)	67 ± 6	65± 6
Duration of surgery (min)	101 ± 14	102± 11
Bleeding (mL)	97 ± 10	102 ± 17
Fentanyl dose (μg)	237 ± 40	252 ± 30
Remifentanil dose (mg)	0.37 ± 0.049	0.39 ± 0.038

Mean ± standard deviation or number of patients

Blood pressure, heart rate, and respiratory rate showed no intergroup differences during the study. SpO_2 at 10 hours and 24 hours were 95 ± 0.8 and 95 ± 0.8 in the control group, and 96 ± 1.2 and 96 ± 1.1 in the fentanyl group, respectively ($P < 0.05$). VAS was significantly smaller in the fentanyl group for 24 hours (Fig.1).

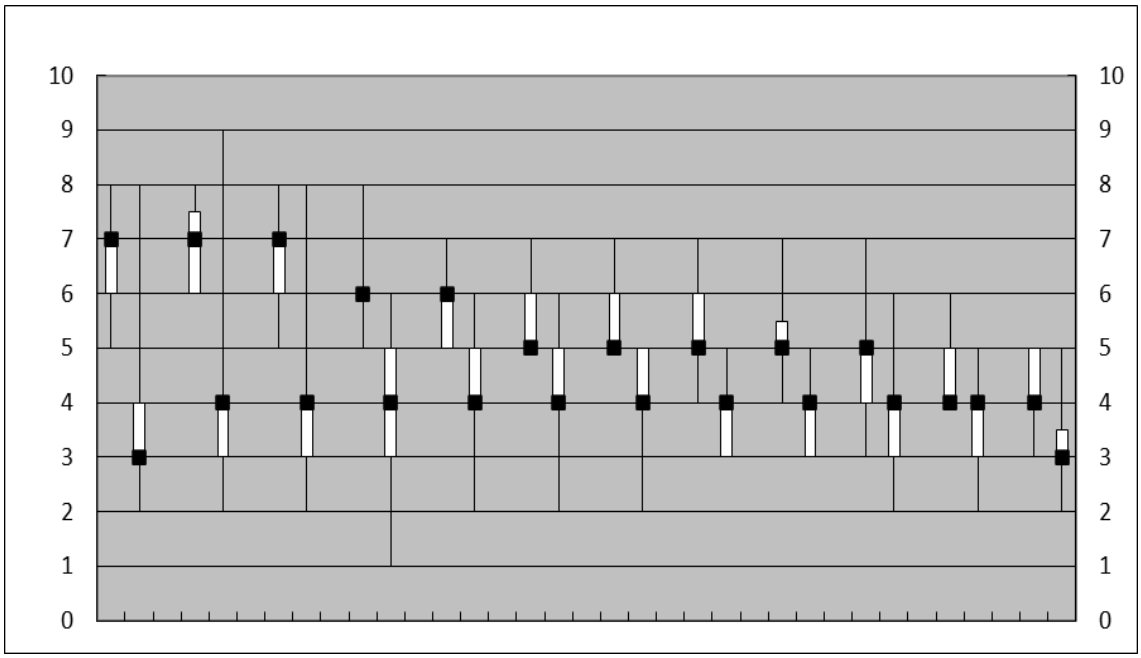

Figure 1. Visual analog scale

Vertical axis shows VAS and horizontal axis shows time (minutes)

VAS,visual analog scale; C,Control group; F,Fentanyl group; ■,median; ϒ,25%, 75% percentile; Bars, maximum and minimum; h,hour; ＊, P < 0.05 vs. the value at time 0; +, P < 0.05 vs. the value in the Control group

Number of rescue analgesia was 5 (median) (4-6; minimum - maximum) in the control group and 3 (2 -5) in the fentanyl group with $P < 0.0001$. The number of patients with nausea, vomit, or headache were 7,4 and 5 in the control group, and 14, 8 and 9 in the fentanyl group, respectively with no intergroup differences.

DISCUSSION

Our previous report[3] showed postoperative infusion of fentanyl 20 μg and droperidol 0.2 mg per hour showed significant analgesia only for 30 minutes in posterior lumbar decompression of 1 – 2 intervertebral space. However, the present study showed that the same protocol had significant effects for 24 hours in lumbar posterior fusion of 1 intervertebral space. Sample size analysis showed the power of 0.99, therefore, the present results were reliable.

As we already showed in the discussion of our previous report,[3] Kang et al.[4] administered fentanyl 0.125

μg/kg/h after posterior lumbar fusion of 1 intervertebral space to get numerical rating scale 2-5/10 for postoperative pain. Their fentanyl dose was significantly smaller than our dose, but similar analgesic effects were obtained. We do not know the reason of this difference between the 2 studies, but surgical stress might be different.

For continuous intravenous analgesia after lumbar fusion, morphine has been most widely studied.[5] Continuous infusion of small dose of morphine is reported to be more effective than fentanyl to decrease rescue analgesia after lumbar fusion.[6] However, morphine induces more nausea, vomit, or urinary disturbance.[5] Considering these side effects, we usually use fentanyl, not morphine.

Bernard et al.[7] reported that intravenous fentanyl 25 μg/h + clonidine 0.3 μg/kg/h was as effective as intrathecal morphine 0.3 mg. Their fentanyl dose was close to our dose, while they added clonidine. We had no experience with clonidine, but it's analgesic effects might not be so strong.

Using meta-analysis, epidural block was superior to intravenous infusion of morphine or fentanyl in analgesia for 2 days after spinal fusion, but in the third day, there was no difference between the two methods.[8] In scoliosis surgery, 2 days later, epidural block was more effective than intravenous infusion of morphine or fentanyl.[8] Our study was done for only 1 day after surgery, but we used epidural block in some patients, therefore, further comparative analysis will be necessary.

Many studies include various kinds of spine surgery or different numbers of interspinal spaces. The study by Geisler et al.[9] was the first one to do meta-analysis of only lumbar posterior fusion of 1 -2 intervertebral spaces. They included 3 studies using intravenous infusion of fentanyl, but they had no discussions about these 3 studies.

The analgesic effects lasted longer in lumbar posterior fusion of 1 intervertebral space than in lumbar posterior decompression of 1 to 2 intervertebral space showed in our previous study.[3] Pain sensitivity decreases with age over 65 years old.[10] The patients in the present study were older than our previous study,[3] therefore, analgesic effects might last longer in fusion surgery than in decompression surgery.

This study showed that in lumbar posterior fusion of 1 intervertebral space, intravenous infusion of fentanyl showed significant postoperative analgesia, but VAS was more than 3. Therefore, we need to study more effective analgesic methods.

In conclusion, in lumbar posterior fusion of 1 intervertebral space, intravenous infusion of fentanyl 20 μg + droperidol 0.2 mg per hour had significant post operative analgesia for 24 hours than the conventional methods without increasing nausea, vomit and headache.

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