International Journal of Healthcare Sciences ISSN 2348-5728 (Online)
Vol. 3, Issue 1, pp: (285-289), Month: April 2015 - September 2015, Available at: www.researchpublish.com

The Safety of Intravenous Fentanyl for Hospital Pain Management in Pregnant Patients and Inhaled Methoxyflurane for General Pain Management in Pre-Hospital Settings

Rayan Jafnan Alharbi

Bachelor of Paramedic Science, Flinders University. Master of Critical Care Paramedic, Edith Cowan University, Australia

Abstract: **A controversy exists among health care providers on the choices of safe and successful drugs for pregnant women as painkillers. Also the choice of safe and successful drugs in general pain management in pre-hospital settings.**

I searched on the Wiley Online Library, the Science Direct Database, the Pro Quest Database, Springer Link, Expanded Academic ASAP, and the ECU Library Database (from Jan 2006 to Sep 2014) to identify all relevant randomised controlled trials of pain management during pregnancy and general pain management in pre-hospital settings. Critically appraise four different articles on the safety of intravenous fentanyl for hospital pain management in pregnant patients and inhaled methoxyflurane for general pain management in pre-hospital settings.

There was an obvious shortage of studies on intranasal fentanyl for pre-hospital pain management in pregnant patients; it also has been noticed that they are limited of latest studies on inhaled methoxyflurane as pain management in pregnant women. Based on the literature, using IV fentanyl as a pain relief during labour in nulliparous and multi-pregnancy women has been proven to be safe and effective for both the women and neonates. Based on the findings, methoxyflurane was the most common opioid analgesia agent used by paramedics. Overall, methoxyflurane appear to be safe drug as pain management in pre-hospital setting for all group of age.

Acceding to the literature, IV fentanyl, as a analgesia in nulliparous and multi-pregnancy women during labour has been proven to be safe and effective for both the women and neonates. Finally, methoxyflurane has been proven to be to be a safe drug for pain management in pre-hospital settings for all age groups.

Keywords: **intravenous fentanyl, pain management, pregnant patients, inhaled methoxyflurane, pre-hospital pain management.**

1. INTRODUCTION

Pain management is a significant part of ethical practice in a pre-hospital setting. Offering efficient pain relief can also change the physiologic reaction to the injury (1). A controversy exists among health care providers on the choices of safe and successful drugs for pregnant women. Most of the present guidelines do not suggested preventing opioid drugs during pregnancy (2 & 3). However, some data recommends that the possibilities of exposure to the growing foetus may warrant the reassessment of present guidelines (4 & 5)

A study by Engeland, Bramness, Daltveit, Ronning, Skurtveit, & Furu, (6) has found that opioids were the most commonly used prescribed medication between drugs that work on the central nervous system in Norwegian pregnant

women in 2007. The authors found that approximately 6% of those had used opioid medications in the 3 months before, during, or after pregnancy. This paper will critically appraise four different articles on the safety of intravenous fentanyl for hospital pain management in pregnant patients and inhaled methoxyflurane for general pain management in pre-hospital settings.

2. RESEARCH ARTICLE

After spending time on researching for studies on the intranasal fentanyl for pre-hospital pain management in pregnant patients, it has been noticed that there are no many journal articles on this specific method of delivering the drug for those patients. Key words used in the research include, EMS intranasal fentanyl pregnant, pre-hospital obstetric pain. Finally, the articles used in this paper were found on Wiley Online Library, the Science Direct Database, and the Pro Quest Database. Other journals that were involved in the research include Springer Link and Expanded Academic ASAP.

Intravenous Fentanyl:

Article one: by Hosokawa, et al (7). The purpose of the study is to determine the safety of intravenous fentanyl patient-controlled analgesia (iv-PCA), which is used for pregnant women during labour in hospitals. The study retrospectively inspected the labour records at the Keio University Hospital in Tokyo in the period between January 2005 and December 2007. The study concentrates on the outcomes of both the mother and neonatal compared to non-analgesics labour records. Therefore, the study was designed to be a "retrospective evaluation of intravenous fentanyl patient-controlled analgesia during labour". The study appears to be appropriate to meet the purpose because the study has been approved from the Department of Anesthesiology review board at Keio University and the school of medicine in Tokyo. There were no ethical issues related to the study.

The method and recruitment strategy that was employed in the study retrospectively examined all labour reports of obstetric patients from the first of January 2005 to the end of December 2007. The study involves 1,602 labour records, 776 of those patients were excluded from the study for some reason, and 129 of these records met the study criteria; however, 697 of those patients received no analgesia and were included in the study. According to the local protocol of the study, 0.05 mg IV fentanyl is usually the first dose of analgesia during labour, the dose increases to a maximum dosage of 0.24 mg per hour in total. The IV fentanyl was given prior to the second stage of labour, to reduce residual effects on the neonate. The study includes only women who were pregnant at 35 weeks or above at the time of delivery. The study excluded any records with inadequate information, patients who undertook caesarean sections, patients with earlier stages of gestation, and patients who used spinal-epidural analgesia as labour analgesia.

In the obstetric ward of Keio University Hospital, all labour patients and the delivery outcomes are regularly documented, involving the mother and foetus ages, body weight, the duration of labour, the foetus' appearance, the use of oxytocin, and the switch to emergency caesarean sections. "The data are presented as means ± standard deviation, unless otherwise specified. Student's t-test and Fisher's exact test were applied for numerical data and the v2test was used where appropriate; p values of \0.05 were considered as denoting statistical significance".

The study found that 229 ± 216 minutes was the approximately length of the usage of fentanyl analgesia, with a total dose of 0.43 ± 0.38 mg, with a consumption rate of 3.6 ± 3.0 lg/kg/h. In addition, 82 ± 86 minutes was the last dose-to-delivery time. Seven of the 129 patients (5.4%) experienced nausea. There were no incidents of respiratory depression. In terms of the neonatal outcomes, the study reported that in the iv-PCA group, there were no complications such as the requirement of naloxone, bag-and-mask ventilation with oxygen, or fairly sedated newborns. The neonatal Apgar scores were not different from the other group.

The study also showed a lower rate of emergency caesarean sections in patients given fentanyl iv-PCA through the first stage of labour than in patients who non-medicated labour. The limitations of the study include the high rate of emergency caesarean sections of 21.8% in the non- medicated labour group, which seemed to be greater than other institutions recorded **(**8 & 9).

Article two: by Miyakoshi, et al. (10). This study cohort included subjects examined in the previous study for the authors as critically appraised in article one. As the availability of regional blocks is dependent on the health care providers and the use of opioids agents are becoming a common practice in the health care sector for pain management in pregnant women. Therefore, the purpose of the study is to examine perinatal consequences, the effectiveness, the safety of analgesics, and the satisfaction of maternal in nulliparous pregnant women who used intravenous fentanyl patient-

controlled analgesia (iv PCA) compared with a non-analgesia control group. The study seems to be appropriate to meet the purpose. The study was approved by the local institutional review board and clinical research of Keio University. There were no ethical issues related to the study as written informed approval was taken from each patient prior to the onset of labour.

The study involved 1401 nulliparous patients; two-hundred and ninety of those received fentanyl i.v.-PCA (i.v.-PCA group) and 1111 nulliparous women have no analgesia (control group) in labour. The study retrospectively inspected all labour reports of obstetric patients from 2005 to 2010. The dose of fentanyl given to the iv-PCA was 0.05 mg increased to maximum dose of 0.24 mg per hour. Perinatal results were compared between the i.v.-PCA and the control groups. Retrospective sampling was appropriate to the aims of the research. The study excluded twin or triplet pregnancies. Retrospective studies normally examine a phenomenon or problem that has happened previously (11).

The data was collected by reviewing all the patient records in Keio University Hospital from 2005 to 2010 and selecting the patient's records who meet the study criteria. Data analysis was achieved employing "Student's t-test, Kruskal-Wallis test followed by Dunnett's post-hoc test, c2 test, or Fisher's exact probability test as appropriate, using JMP software". To display statistical significance, a P-value under 0.05 was measured.

The retrospective study found that from 2005 to 2010, 2678 nullipores women were presented to the hospital seeking care, a total of 1401 met the study criteria, and 290 of those received fentanyl i.v.-PCA. There were 1111 nulliparous women on the control group. Overall, the study has proven that there were no harmful influences to the mother and the foetus on the i.v.-PCA group compared to the control group, which had no analgesia. On the i.v.-PCA group, the study showed that no neonates needed naloxone for apnoea at birth.

Inhaled Methoxyflurane:

Article one: by Bendall, et al. (12). The purpose and design of the study is because the increase of patients who are presented to the ambulance service complain of moderate to severe pain. The aim of the present study was to describe the practice and the safety of inhaled methoxyflurane, IN fentanyl, and IV morphine when given to patients in pre-hospital settings by paramedics in New South Wales, Australia. There were no ethical issues as the study was approved by the Sydney South West Area Health Service Ethics Review Committee.

The sampling method and recruitment strategy that was used on this study is the retrospective analysis of data from the patient's records. The study includes 97,705 patients who received inhaled methoxyflurane, IN fentanyl, or IV morphine alone or in combination. The study involves cases in which an analgesic agent was administered and includes patients aged 100 or less who have an initial documented pain score of > or =5.

The data was collected from the database information of the patients' health record, which were documented on the scene for those who were given analgesic agents including methoxyflurane, fentanyl, and morphine in the New South Wales ambulance service between 01 July 2007 through to 30 June 2008. Data analysis was completed with SAS version 9.1 (SAS Institute, Cary, NC, USA). "Changes in proportions were compared using chi-squared statistics, and presented as relative risk (RR) or risk difference (RD), and 95% confidence intervals as appropriate". P-values under 0.05 were measured.

The study has found that 60% (58,224) of all cases were managed by inhaled methoxyflurane, as it was the most common opioid agent used by paramedics in NSW between July 2007 and June 2008. Methoxyflurane was also the most common combination of agents either with fentanyl or morphine; however, 87% of cases were managed with a single agent. Moreover, males were likely to receive an opiate compared to females. The study is considered as one of the largest retrospective studies in pre-hospital settings that defines the use of analgesics in an Australian ambulance service, with analysing around 100,000 patient records.

The limitations of the study may include the availability of the drugs at the time of the study, which may have affected the result. Furthermore, because methoxyflurane is the most commonly authorized agent for paramedics to administer to patients, this may have influenced the study.

Article two: by Babl, et al. (13). The purpose of this study is to investigate the efficacy and safety of inhaled methoxyflurane as an analgesic agent for children in pre-hospital settings. The study was designed because of the limitations of data on the value and safety of methoxyflurane for children in Australia. The statistics of children who are given analgesia in the pre-hospital setting are limited; therefore, it is an appropriate study to meet the purpose.

Prospective and non-randomized sampling was employed in the present study. The study was conducted between the ED of the Royal Children's Hospital and the Ambulance Service in Melbourne. One-hundred and five children, aged between 15 months and 17 years, agreed to participate and received methoxyflurane en route to the ED. All the participants had 3 mL of methoxyflurane via the hand-held Penthrox inhaler that lasted around 25–30 minutes. The dose could be increase to prolong the time of analgesia to about 55–60 minutes. Children were routinely assessed to determine their level of consciousness. The study also assessed the parents, patients, and paramedics' satisfaction of the drug. All major adverse events were recorded. The study length was eight months.

Data was collected using questionnaires with primarily closed and several open questions. Parents, patients, paramedics, and the staff on the ED were asked to answer these questionnaires. The paramedics' questionnaires were about the indications, doses, time, and length of the drug. The study also recorded the sedation and pain scores before, during at 2–5, 10, and 20 minutes, and after using the patients record card. The study also questioned the parent and the child about the previous medical history and of their satisfaction with methoxyflurane. Lastly, final diagnoses and adverse events were documented from the ED staff questionnaires. Data analysis was completed using descriptive statistics. "Confidence intervals (CI) calculations were performed on Stata software (version 8.0 Stata Corporation).

During the eight-month study period, 105 patients were registered on the study with an average age of 11 years. Nine patients on the study had a history of asthma. The study found that trauma was the highest indication for methoxyflurane use in 86 patients (81.9%). Approximately (91.4%) of children received 3 mL doses of methoxyflurane and (8.6%) received two doses (6 mL). In general, there were no major adverse events. The minor adverse events included drowsiness and behaviour changes. The study concludes that methoxyflurane appears to have some features that make it a valuable drug for pre-hospital painkillers in children. On the other hand, one limitation was the small size of the study, which may have influenced the findings.

3. RECOMMENDATIONS

Based on the literature, using IV fentanyl as a pain relief during labour in nulliparous and multi-pregnancy women has been proven to be safe and effective for both the women and neonates. Therefore, IV fentanyl could be a useful practice for pain relief in obstetric patients both in the hospital and the pre-hospital, especially when the regional blocks are unavailable. More studies are needed for IN fentanyl for pre-hospital pain management in pregnant women (7 & 10).

Moreover, based on the findings, methoxyflurane was the most common opioid analgesia agent used by paramedics (12). Overall, methoxyflurane appear to be safe drug as pain management in pre-hospital setting for all group of age. Inhaled methoxyflurane could be valuable in pre-hospital scoter as it is the most commonly authorized analgesic for paramedics to administer. Further research is required for inhaled methoxyflurane for pre-hospital pain management in pregnant women (12 & 13).

4. CONCLUSION

A controversy exists among health care providers on the choices of safe and successful drugs for pregnant women as painkillers. Most of the present guidelines do not suggest preventing opioid drugs during pregnancy. There was an obvious shortage of studies on intranasal fentanyl for pre-hospital pain management in pregnant patients; it also has been noticed that they are limited of latest studies on inhaled methoxyflurane as pain management in pregnant women. Acceding to the literature, IV fentanyl, as a analgesia in nulliparous and multi-pregnancy women during labour has been proven to be safe and effective for both the women and neonates. Finally, methoxyflurane has been proven to be to be a safe drug for pain management in pre-hospital settings for all age groups.

REFERENCES

[1] Mudd, S. (2011). Intranasal Fentanyl for Pain Management in Children: A Systematic Review of the Literature., Journal of Pediatric Health Care, 25(5), 316-322.

[2] American College of Obstetricians and Gynecologists and American Society of Addiction Medicine. (2012). Opioid abuse, dependence, and addiction in pregnancy: committee opinion. Obstet Gynecol, 119:1070-6.

[3] American Academy of Pain Medicine. (2013). Use of opioids for the treatment of chronic pain: a statement from the American Academy of Pain Medicine. American Academy of Pain Medicine.

[4] Heil, S. H., Jones, H. E., Arria, A., Kaltenbach, K., Coyle, M., & Fischer, G. (2011). Unintended pregnancy in opioid-abusing women. J Subst Abuse Treat, 40(2), 199-202.

[5] Unger, A. S., Martin, P. R., Kaltenbach, K., Stine, S. M., Heil, S. H., & Jones, H. E. (2010). Clinical characteristics of central European and North American samples of pregnant women screened for opioid agonist treatment. Eur Addict Res, 16(2), 99-107.

[6] Engeland, A., Bramness, J. G., Daltveit, A. K., Ronning, M., Skurtveit, S., & Furu, K. (2008). Prescription drug use among fathers and mothers before and during pregnancy. A population-based cohort study of 106 000 pregnancies in Norway Br J Clin Pharmacol (65), 653–660.

[7] Hosokawa, Y., Morisaki, H., Nakatsuka, I., Hashiguchi, S., Miyakoshi, K., Tanaka, M., Yoshimura, Y., & Takeda, J. (2012). Retrospective evaluation of intravenous fentanyl patient-controlled analgesia during labor. Journal of Anesthesia, 26 (2), 219-224.

[8] Liu, E. H., Sia, A. T. (2004). Rates of cesarean section and instrumental vaginal delivery in nulliparous women after low concentration epidural infusion or opioid analgesia: systematic review. BMJ. (328), 1410–5.

[9] Wong, C. A., Scavone, B. M., Peaceman, A. M., McCarthy, R. J., Sullivan, J. T., Diaz, N. T., Yaghmour, E., Marcus, R. J. L., Sherwani, S. S., Sproviero, M. T., Yilmaz, M., Patel, R., Robles, C., & Grouper, S. (2005). The risk of cesarean delivery with neuraxial analgesia given early versus late in labor. N Engl J Med. (352), 655–65.

[10] Miyakoshi, K., Tanaka, M., Morisaki, H., Kim, S., Hosokawa, Y., Matsumoto, T., Minegishi, K., &Yoshimura, Y.,. (2013). Perinatal outcomes: Intravenous patient-controlled fentanyl versus no analgesia in labor. J. Obstet. Gynaecol., 39(4), 783–789.

[11] Fleiss, J. L., Levin, B. and Paik, M. C. (2003). Comparative Studies: Prospective and Retrospective Sampling, in Statistical Methods for Rates and Proportions, Third Edition, John Wiley & Sons, Inc., Hoboken, NJ, USA. doi: 10.1002/0471445428.ch7.

[12] Bendall, J., Simpson, P., & Middleton, P.,. (2011). Prehospital Analgesia in New South Wales, Australia. ProQuest Central, 26(6), 422-426.

[13] Babl, F. E., Jamison, S. R., Spicer, M., & Bernard, S. (2006). Inhaled methoxyflurane as a prehospital analgesic in children. Emergency Medicine Australasia, 18(4), 404-410.