

Intravenous paracetamol versus intramuscular pethidine in relief of labour pain in primigravid women

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ABSTRACT

Background: Intramuscular pethidine is one of most common opioids used for labour analgesia. There are a number of concerns in the literature regarding the use of pethidine. The aim of this study is to compare analgesic efficacy of paracetamol with pethidine for labour pain in normal vaginal delivery. **Materials and Methods:** In this single-blinded, randomised control trial, 80 primigravid singleton women with full-term pregnancy candidate for normal vaginal delivery, were entered the trial and divided into pethidine (A) and paracetamol (B) groups. At the time of admission, age and body mass index of mother and gestational age based on last day of period were recorded. In both groups, intravenous promethazine and hyoscine were administered to each patient at the first stage of delivery. From beginning of active phase of delivery, patients in group A received 50 mg intramuscular pethidine injection. At the same time patients in group B, received an intravenous solution infusion containing 1000 mg paracetamol and 300 cc of normal saline. After child birth, average labour pain was assessed using Visual Analogue Scale (VAS) by direct questioning from patient in both groups. **Results:** After patients' selection, 19 individual omitted during study due to exclusion criteria and finally 30 patients in paracetamol group and 31 patients in pethidine group remained to enter the trial. There was no significant difference in age and BMI of mothers between both groups ($P > 0.05$). Maternal age and labour duration in paracetamol group had no meaningful difference with maternal age and labour duration of patients in pethidine group ($P > 0.05$). The average VAS pain score was significantly lower in paracetamol comparing to that of pethidine group (8.366 out of 10, 9.612 out of 10, respectively, $P < 0.001$). **Conclusion:** It is concluded that intravenous paracetamol is more effective than intramuscular pethidine to relief labour pain in normal vaginal delivery.

Key words: Labour pain, intramuscular pethidine, intravenous paracetamol, vaginal delivery

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INTRODUCTION

Labour is generally considered to be a painful experience and analgesia is regularly required. In a study comparing different painful medical conditions, the average labour pain scores in primigravid and multigravid women where more than that of sciatic, dental or bone fracture pain scores.^{1,2} Stretch of the cervix during dilatation, ischaemia

of the muscle wall of the uterus with buildup of lactate and stretch of the vagina and perineum in the second stage are the probable causes of labour pain.³⁻⁵

Labour pain which results in marked increase in minute ventilation and oxygen consumption during contractions, can causes severe respiratory alkalosis and a left shift of the maternal oxyhemoglobin dissociation curve, thus diminishing oxygen transfer to the foetus. Compensatory hypoventilation between contractions may cause transient maternal hypoxemia, and potentially, foetal hypoxaemia. These periods of hypoventilation may be exacerbated by analgesic techniques that result in respiratory depression (e.g., systemic opioid analgesia).⁵⁻⁷

Intramuscular pethidine is one of most common opioids used for labour analgesia. There are a number of concerns in the literature regarding the use of pethidine. Some

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studies have suggested that pethidine provides little or no pain relief in labour, its main effect being to cause sedation rather than analgesia. Pethidine also has a number of side effects on both the mother and the neonate which make it a less ideal choice for labour analgesia. It can cause nausea, vomiting and dysphoria in women receiving it during labour.^{8,9} All opioids cross the placenta. *In utero*, opioid exposure results in a slower foetal heart rate and decreased beat-to-beat variability. The risk of neonatal respiratory depression depends on the dose and timing of maternal opioid administration. The active metabolite of pethidine, normeperidine, has a half-life of 60 hours in neonates.^{8,10}

Although the exact mechanism of action is still a controversial issue, paracetamol (acetaminophen) is a safe and effective agent for pain management. Studies have suggested that paracetamol is an effective treatment for postoperative pain relief.^{11,12} Studies examining analgesic effect of paracetamol in obstetrics surgeries such as abortion,¹³ post-operative pain after Caesarean delivery^{14,15} and perineal pain after child birth^{16,17} have proposed that paracetamol has an admirable analgesic effect. Based on our knowledge, there are no significant clinical trials regarding paracetamol analgesic effect on labour pain in primigravid women.

The aim of this randomised, single-blinded, placebo-controlled clinical study is to compare efficacy and safety of single dose intravenous paracetamol with intramuscular pethidine in treatment of labour pain in primigravid women.

MATERIALS AND METHODS

This study protocol was approved by the Ethics Committee of Tabriz University of Medical Sciences (TUMS), which was in compliance with Helsinki Declaration. After written informed and verbal consents had been obtained, 80 primigravid singleton women with full-term pregnancy (Gestational Age (GA) more than 37 weeks based on ultrasound findings) candidate for normal vaginal delivery, were entered to the trial. During present single-blind control trial (IRCT201207215506N5), a computer-generated random table was used and a hospital nurse allocated women in to two groups: Pethidine (group A) and Paracetamol (group B). All the patients were blinded to the study group assignment. Exclusion criteria were history of cardiac, liver and renal diseases, anti-convulsive medication consumption, malpresentation of foetus, abnormal foetal monitoring during labour and multiple gestations.

At the time of admission, age and Body Mass Index (BMI) of mother, and GA based on last day of period were recorded. During first stage of delivery, foetus was monitored using a non-stress test (NST) and transvaginal ultrasonography. All NSTs were conducted by a nurse and evaluated by our

gynaecologist. Each individual with abnormal finding of NST (late deceleration or variable deceleration) was omitted from the trial. All ultrasound imaging were performed by our gynaecologist in order to evaluate foetus before delivery.

In both groups, intravenous promethazine and hyoscine were administered to each patient at the first stage of delivery. From beginning of active phase of delivery (50 mm of cervical dilatation and 100 % effacement), patients in group A received 50 mg intramuscular pethidine injection. At the same time patients in group B, received an intravenous solution infusion containing 1000mg paracetamol and 300 cc of normal saline. After child birth, average labour pain was assessed using Visual Analogue Scale (VAS) by direct questioning from patient in both groups.

Apgar score of neonate, duration of labour and incidence of complications including dyspnea, elevated liver enzymes, skin rash, thrombocytopenia, and systolic blood pressure less than 90 mmHg in 24 hours after delivery were recorded in each group.

RESULTS

Eighty primigravid full term women candidate for normal vaginal delivery were randomly allocated in to two groups of paracetamol ($N = 40$) and pethidine ($N = 40$). Nineteen individual omitted during study due to exclusion criteria and finally 30 patients in paracetamol group and 31 patients in pethidine group remained to enter the trial.

At the time of admission, age and BMI of mother, and GA based on last day of period were recorded. During first stage of delivery, foetus was monitored using (NST) and transvaginal ultrasonography. There was no significant difference in age and BMI of mothers between both groups ($P = 0.704$ and $P = 0.496$, respectively) [Table 1].

Maternal age and labour duration in paracetamol group had no meaningful difference with maternal age and labour duration of patients in pethidine group ($P = 0.503$ and $P = 0.418$, respectively).

Table 1: Comparison of paracetamol and pethidine group

	Paracetamol (N = 30)	Pethidine (N = 31)	P
Mother age (y)	25.93±3.87	25.54±4.00	0.70
BMI of mother	26.92±2.49	26.49±2.48	0.49
Gestational Age (w)	38.45±0.21	38.51±0.18	0.50
Labor duration (h)	2.85±1.47	3.14±1.34	0.41
Extra analgesic	6.66±2.30%	25.80±8.31%	0.03
Complication	3.33±1.30%	3.22±1.31%	—

*Data were shown as Mean ± Standard Deviation

Only one individual in paracetamol group and two patients in pethidine group had systolic blood pressure less than 90 mmHg, which did not need further intervention. There were no records of other complications in 24 hours after delivery in both groups. Apgar score of neonates in both groups was above 8/10.

The estimated pain score based on verbal questioning from mothers at the end of delivery using VAS of pain, was significantly lower in paracetamol group comparing to that of the pethidine group (8.366 out of 10, 9.612 out of 10, respectively, $P < 0.001$), [Figure 1].

DISCUSSION

This study attempted to compare analgesic effect of intravenous paracetamol with intramuscular pethidine in reducing labour pain. Based on findings of this trial, in order to decrease labour pain in singleton primigravid women candidate for normal vaginal delivery, intravenous infusion of paracetamol is more effective than single-dose injection of intramuscular pethidine. There were no significant drug complications, and Apgar scores of neonates were similarly normal in both groups of the study. This may be suggestive of safety of using paracetamol as an analgesic agent in labour pain.

Pain during the first stage of labour originates predominantly in the cervix and the lower uterine segment, rather than the body of the uterus. During the late first stage and second stage of labour, the foetus descends in the birth canal and progressively greater pressure of the foetus on the vagina and perineum form additional sources of pain.⁶⁻⁸

Chou *et al.*, reviewed 10 randomised clinical trials comparing analgesic efficacy of single-dose paracetamol with placebo for perineal pain in early postpartum period. They concluded that more women experienced pain relief and fewer had additional pain relief with paracetamol compared with placebo, although potential adverse effects were not assessed and generally the quality of study was unclear.¹⁶

Another trial comparing effect of paracetamol with placebo on postoperative pain management in Caesarean operations showed that paracetamol is a safe and effective treatment option in post-Caesarean pain.¹⁵ Although there

are numerous studies in favour of our findings which show efficacy of paracetamol for pain management in gynaecological operations, but trials examining normal vaginal delivery pain are not adequate.

Intramuscular opioids are one form of analgesia regularly employed to relief labour pain. There are a number of concerns in the literature regarding the use of pethidine. Some studies have suggested that pethidine provides little or no pain relief in labour, its main effect being to cause sedation rather than analgesia.^{18,19} Pethidine also has a number of side effects on both mother and neonate which make it a less ideal choice for labour analgesia. It can cause nausea, vomiting and dysphoria in women receiving it during labour.²⁰ It also crosses the placenta and can cause reduced foetal heart rate variability and fewer heart rate accelerations.²¹ Effects on the neonate include respiratory depression, impaired feeding and altered crying.^{22,23}

The reason that we selected intravenous paracetamol instead of oral paracetamol is that peak analgesic effect of IV paracetamol occurs in 1 hour, with duration of approximately 4-6 hours. Intravenous administration of propacetamol has been shown to be at least as effective as oral administration of an equivalent dose of paracetamol, and the target concentration achieved more rapidly and with less variability in plasma concentrations compared with enteral formulations.²⁴⁻²⁶

A number of physical factors may influence the severity and duration of labour pain and suffering which include maternal age, parity, maternal condition, the condition of the cervix at the onset of labour, and the relationship of the size and position of the foetus to the size of the birth canal.⁷ Based on such factors, we tried to make the diversity of maternal age, GA, and delivery duration similar in both groups as much as possible.

There is a limitation for this study. Although we assessed pain score just at the end of delivery, but it would have been better if we had evaluated labour pain before and after paracetamol administration, in order to have better understanding of pain relief during labour.

Finally, our study suggested that in order to relief labour pain in primigravid singleton women candidate for normal vaginal delivery, it is better to use intravenous paracetamol instead of intramuscular pethidine, since paracetamol has better analgesic efficacy and at least complications are as same as those of pethidine.

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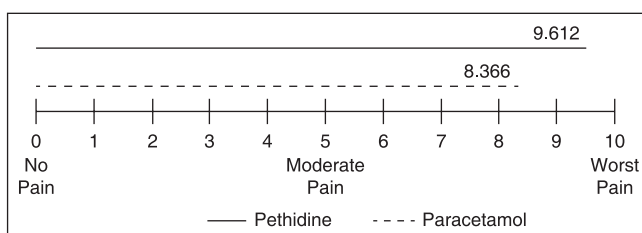


Figure 1: Visual analog score comparing normal vaginal pain between paracetamol and pethidine groups

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