

Intrathecal Analgesia Versus Non-analgesia in Labor on Maternal and Neonatal Outcomes

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ABSTRACT

Aims Spinal analgesia is the most common method that provides pain relief during labor and controversy exists about its effect on the maternal and fetal among the women.

This study was conducted to determine the effect of intrathecal analgesia (ITA) on perineal laceration, duration of the first, second, and third stage of labor, and Apgar score.

Materials & Methods Fifty primipara parturients with gestational age ≥ 37 weeks, in the active phase with cervical dilation of 3-4 cm participated in this randomized clinical trial study. Any participant with contraindication for vaginal delivery or spinal analgesia, the use of sedative drugs, and fetal malpresentation was excluded from the study. Based on whether they consented to ITA or Non-ITA parturients, they were divided to the ITA (n=25) and non-ITA (25) groups. The duration of the first, second, and third stage of labor, perineal laceration, birth weight, and Apgar scores were recorded and compared.

Results Duration of the first stage of labor was significantly higher in the ITA (7.34 ± 4.27) parturients compared to the non-ITA (5.52 ± 2.1) group ($p < 0.039$). There was no significant difference in the duration of third stage of labor between two groups ($p > 0.321$). The number of Perineal laceration increased significantly in the ITA group compared to the non-ITA parturients ($p = 0.001$). Neonatal outcomes demonstrated that there was no statistical significant difference in the first and fifth minute Apgar scores between 2 groups.

Conclusion Intrathecal analgesia can provide effective analgesia for labouring patients, but prolong the first and second stage of labor.

Keywords Apgar Score; Analgesia; Spine; Neonatal; Pregnancy Outcome; Labor

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Introduction

Pregnancy and childbirth are completely physiological and natural events and require accompaniment and support as well as intervention management [1]. However, the supportive measures and caesarean section will be needed, where delivery is not possible or it imposes danger for mother and baby [1]. Labor pain is one of the most severe pains and each woman has different experiences; depending on the source setting, techniques available and maternal different methods are used to relieve the labor pain [2].

Since it is necessary to use the safe and invasive methods for the labor pain, the conflict is always to develop the suitable methods in analgesia practices. Pharmacological agents such as inhalational of nitrous oxide or halogenated agents and systemic analgesics including pethidine, morphine, diamorphine, and fentanyl were used for labor pain relief [3].

In the past 3 decades, the rate of elective caesarean section increased more than 60% among the pregnant women in Iran due to fear of labor pain and the high maternal and neonate complications in vaginal delivery [4]. Severe pain during labor may be associated with risks to the mother and neonate, and pain control is necessary for their health [5].

Among the different analgesia methods for the pain management during labor, the intrathecal injection of analgesia is easy to use, cost benefit, and well-established modality in pain management [6].

In the epidural approach, the anesthetic substance is injected directly to the back and external of the dura mater that covers the spinal cord and spinal fluid, and the needle does not enter the spinal fluid. In the intrathecal analgesia, also called spinal block, subarachnoid block the needle, passes through the spinal cord, enters the spinal fluid, and injects it. In this method, the rate of anesthesia is faster than the epidural, because the anesthetic substance is completely injected into the cerebrospinal fluid (CSF).

Unlike inhalational anesthetic gas, Intrathecal Analgesia (ITA) is more reliable for relieve pain in the entire duration of the labor [7]. In the ITA approach, drugs deliver directly to the cerebrospinal fluid and could block impulses from the sensory nerve by blocking sodium channels in nerve cell membranes after 10 to 20 minutes of administration [6]. An intrathecal drug dose of 0.5 ml of 0.2% ropivacaine with 0.5 ml of fentanyl (25 µg) can be effective in pain management with no significant difference in the first and second duration of labor [8].

However, contrasting data exist on the ITA approach and increase the instrumented assisted delivery, cesarean section, extension of the first and second stages of labor, and neonatal complication [8, 9].

For midwives and anesthesiologists, maintenance of the neonatal Apgar during childbirth is very

important. A study in this field demonstrated that the spinal anesthesia could preserve the neonatal Apgar better than cesarean section [10].

Regional labor analgesia such as caudal and lumbar epidural analgesia could effectively relieve labor pain, which are more popular and common among women [11]. It has been shown that the regional labor analgesia cause prolongation of the first and second stage of labor and increase the device vaginal delivery rate [12]. However, controversy exists about the effect of regional labor analgesia on the progress of labor and on the maternal and neonate outcomes.

The effect of spinal anesthesia or non-analgesia on maternal and neonatal outcome was evaluated in various studies. In our small hospital, the setting of epidural analgesia was unavailable and ITA was used more to relieve labor pain, and sometimes this technique was associated with complications for parturients or neonates. Hence, the aim of this study was to evaluate the effectiveness of ITA and non-ITA on the duration of the first, second, and third stage of labor, perineal laceration, and Apgar scores in vaginal delivery.

Materials and Methods

A total of 50 parturients participated in this randomized clinical trial study; they were aged between 18 and 35, primipara with pregnancy ≥ 37 weeks gestation, and in the active phase of labor with cervical dilation of 3 to 4 cm. Any participant with contraindication for vaginal delivery or spinal analgesia, multiple pregnancies, use of sedative drugs, pregnancy-related disease, and fetal malpresentation was excluded. The sample size was determined, using the Snedecor and Cochran formula. Then, informed consent was obtained from each parturient and 50 pregnant woman for vaginal delivery were randomly divided to ITA (n=25) and non-ITA (n=25) groups in the Imam Sajad Hospital affiliated to Yasuj university of medical sciences, between Mars 2015 and January 2016.

Some demographic characteristics of the pregnant women including age, weight, height, gravid, parity were recorded by the interviewer. After obtaining informed consent, they were examined in the ward by a midwife to confirm the parturient in the primary phase of labor.

Intrathecal analgesia: For achieving the ITA, the parturients received 500 ml ringer lactate in the sitting position. The ITA was started by the commencement of active phase with cervix dilatation 3 cm to 4 cm, effacement $\geq 40\%$, and fetal heart rate between 110 to 160 beats per minute. The intervertebral space of L4 to L5 was identified and after aseptic precautions, the spinal needle (27-gauge) was placed at the back and back of his spine into the the intervertebral ligament. These ligaments have high degree, while epidural space has a low resistance to needle penetration. Then, with the suddenly decrease of resistance, the anesthesiologist

recognizes the needle enters the epidural space. Then, spinal needle was entered into the subarachnoid space with the observation of backflow of cerebrospinal fluid (CSF). Afterwards, 2CC sufentanil 50mcg/10ml plus 0.2CC Marcaine (bupivacaine HCL) 0.5% in were injected in 2 stages. The insertion of the needle into the back of the back may have some pain. Therefore, before entering, the area's skin usually becomes anesthetized with a smaller infusion. A feeling of shock, an electric shock, or a loss in the lumbar region may be felt at the tip of the needle around the spinal cord. When anesthetic substance is injected into the CSF, a feeling of heat in the legs may develop.

Parturients in ITA group received intrathecal injection dose including 0.2ml bupivacaine (10 mg) plus 0.2ml mepridine (10mg) in 2 stages. In the first stage, a third of this compound was injected and the remaining two-third was injected 5 minutes later. Then, the parturient was placed supine with the head end of the bed elevating up to 30°. Parturients who required cesarean section or alternative analgesia were excluded from the study. Based the management protocol, for both groups, perineal laceration, duration of first, second, and third stage of labor were recorded by an obstetric in labor ward. Obstetric perineal lacerations were recorded at any stage regardless of its degree. Apgar score was recorded in first and fifth minute after delivery. In the non-analgesia group, all the things such as receiving oxytocin during labor and ringer lactate were carried out similarly on the other group with the exception of analgesia treatment.

Ethical approval was obtained from the research ethics committee of Yasuj university of medical sciences before the study (Ethics code: ir.yums.REC.1394.34).

The ethics committee of Yasuj university of medical sciences approved the present research (RCTcode: IRCT201111218109N2).

Quantitative data were presented as mean±standard deviation. A comparison of duration of the first, second, and third stage of labour, perineal laceration, and Apgar score between 2 groups was performed, using the independent samples t-test. Confidence coefficient was 95%, and P- value less than 0.05 was considered statically significant.

Findings

Of the 50 parturients, 4 participants of the ITA and 3 of non-ITA groups received the cesarean section for different reasons, such as small pelvic outlet, fetal malposition, and large baby; hence, they were excluded from the study. There were no significant differences in age, body mass index (BMI), gestational age of the parturients between 2 groups (Table 1).

There was no significant difference in the duration of third stage of labor between 2 groups. The

number of perineal laceration in ITA group, regardless of its degree, was twice more than the non-ITA parturients. Neonatal outcomes demonstrated that there was no statistical significant difference in the first and fifth minute Apgar scores and in birth weight between 2 groups (Table 2).

Table 1) Parturients demographic in both groups (Mean±S.D)

Parturients demographic	ITA	Non -ITA	P-value
Maternal age (Years)	27.4±2.7	26.9±3.1	0.179
Body Mass Index (kg/m ²)	25.9±1.4	26.2±2.2	0.326
Gestational age (weeks)	38.9±1.4	39.2±2.1	0.701

Table 2) Maternal and neonatal outcomes in different groups

Delivery Characteristics	ITA	Non-ITA	P-value
Duration of first stage of labor (h)	7.34±4.27*	5.52±2.1	0.039
Duration of second stage of labor (min)	52.33±7.33*	31.2±3.1	0.041
Duration of third stage of labor (min)	7.52±4.02	8.9±1.6	0.321
Receiving oxytocin during labor (n,%)	14 (54.0%)	13 (48.0%)	0.942
Perineal laceration (n, %)	10 (38.0%)	4 (15.0%)	0.001
1 st min apgar scores	8.14±1.21	8.23±2.20	0.631
5 st min apgar scores	8.35±3.11	9.33±1.16	0.401

Discussion

Spinal analgesia is widely used for labor pain management and improves mobilization in labor with more satisfaction among the parturients [8, 13, 14]. This technique is easy to achieve and more reliable to prolong the pain relief time of the labor [15]. However, there are controversial about the efficiency of this technique on mother and neonate, because spinal analgesia prolongs the second stage of labor and reduces the blood pressure [6, 16]. In the present study, the mean duration in the first and second stage of labor in the ITA group increased 108 and 21 minutes, respectively, compared to the non-ITA group. The results of this study were comparable to a retrospective case-control study on 184 nulliparous with vaginal deliveries, demonstrating that the labor epidural analgesia prolonged first and second stages of labor for 105 and 17.5 minutes, respectively [17]. In Alexander's study, this difference was 60 minutes in the first stage and 17 minutes in the second stage of labor [18]. This difference may be due to the use of epidural anesthesia approach in Alexander's study [18]. Compared to the epidural analgesia, intrathecal can provide better pain management with long analgesia [19]. Furthermore, the intrathecal of 0.5% meperidine

2.0 plus 0.5% bupivacaine 2.0 had greater prolongation of analgesia compared to the 0.5% bupivacaine 2.0 plus normal saline (234 versus 125 minutes) [20]. The mechanism stating that regional analgesia could extend the duration of labor is not known. The main goal of this method is reducing pain during normal delivery and it has been demonstrated that this method helps reduce maternal blood pressure by reducing the amount of stress and anxiety [21]. Mother's anxiety releases stress hormone such as epinephrine and norepinephrine, and these hormones reduce the contraction of the uterus and increase the length of delivery [22]. A study demonstrated that labor pain relief improves mother's condition during childbirth and causes more oxygen to the child [23]. However, the inhibition of prostaglandin by epidural or spinal anesthesia could impede the uterine contraction and prolong the duration of the first stage of labor [18, 24]. The concentrations of plasma prostaglandin F2 alpha metabolite decreased significantly in epidural analgesia compared to the control group [25]. In addition, spinal block reduces the muscle reflex to exert force and diminishes or stops the contraction of abdomen and pelvic muscles during labor [26]. In a randomized trial on 200 parturients, 97% of spinal analgesia women versus 48% of the individuals in control group received oxytocin; this difference was significant [27]. Moreover, compared to the spontaneous vaginal delivery (60%), the use of vacuum extraction (77%) and forceps (84%) is increased by using epidural analgesia during the vaginal deliveries [8, 28]. Likewise, in an original study, vacuum was used greater in spinal block (17% vs 6%) compared to the non-spinal block in parturients [29]. The results of this study also showed that the perineal laceration in the ITA group was twice more than the non-ITA group. In turn, the increased rate of instrumental delivery is accompanied by maternal trauma, perineal laceration, and more risk of neonatal problems [27]. Third- or fourth-degree lacerations and risk of fecal incontinence have been seen in nulliparas with epidural analgesia [30]. However, conflicting data showed that the regional analgesia was not associated with the increase of instrumental-assisted delivery and chance of complication neonatal outcomes [17]. Another study suggested the following intrathecal labor analgesia; there was no difference in the rate of cesarean section due to low fetal heart rate or bradycardia [31]. Labor intrathecal analgesia in 150 parturients volunteered demonstrated that this approach is cost saving, well popularity, and has high profound pain control [32]. In the present study, the mean Apgar score found in ITA (8.35) was comparable with a study conducted by Bakhsha *et al.* [33]. Different contributing factors, such as prematurity, low birth weight, and maternal preeclampsia could greatly affect the low Apgar score, and anesthesia had no negative effect on

Apgar score in the first and fifth minutes after birth delivery [33]. Spinal analgesia is the most effective method for pain management in the labor and nearly 60% of the parturients used this technique for pain relief [34]. Fear of labor pain is the main reason for mothers' tendency to perform cesarean section [35]. If mothers know that a natural delivery is painless by this methods, many mothers, who go to cesarean section, tend to find this way [35]. So, if this method can be pervasive in a country like Iran with high cesarean deliveries, it will also benefit mothers and greatly improve the health of mothers and neonates [36]. The use of this method is sometimes accompanied by disadvantages; for examples, for unknown reasons it does not work, and only some parts of the abdomen become numb and, to some extent, cause the pain continues of normal labor [37]. In this case, an anesthetist should increase the dose. The spinal block may affect the person's ability to empty the bladder and sometimes the women must use the catheter to drain his bladder [37]. However, because the spinal block reduced the blood pressure during the childbirth, it is necessary that the blood mother's pressure be checked every 5 minutes after the onset of anesthesia. The fetal heartburn should also be checked in the first 30 minutes after starting the procedure. Because the mother feels less pain by this method, the physician should encourage the mother to give birth to the infant; unfortunately, the chance of using forceps in this method is high [38]. More simple labor spinal analgesia section was done with single-injection spinal anesthesia; it provided a quick and convenient motor and sensory block that was affordable and more efficiently [39]. The dose of medication used in intrathecal analgesia is less than that of the epidural; so, the absorbed systemic drug is minimal [40]. The main disadvantage of this technique is reducing the blood pressure. More randomized clinical trial studies with larger parturients are required to evaluate the effect of intrathecal analgesia on the maternal and neonate outcome.

Conclusion

Intrathecal analgesia can provide effective analgesia for labouring patients but prolong the first and second stage of labor.

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Authors' Contribution: Rad P. (First author),

Introduction author/Original researcher/Statistical analyst (30%); Hossein H. (Second author), Assistant (10%); Delaviz H. (Third author), Methodologist/Original researcher/Discussion author (50%); Vanda R. (Fourth author), Assistant (10%)

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