

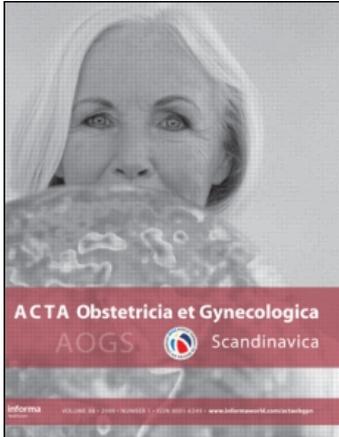
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SHORT REPORT

## Effectiveness of subcutaneous injection of sterile water to the lower back for pain relief in labor

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### Abstract

The analgesic efficacy of subcutaneous injection of sterile water compared to isotonic saline was investigated in a randomized, controlled study on a total of 100 women in the active phase of labor and who complained of low back pain. Pain perception was rated on a numerical rating scale before and at 10 and 45 minutes after the injection. The initial pain score was the same in both groups and pain relief was expressed by both groups irrespective of the solution injected, but the sterile water group had significantly higher relief scores compared to those receiving saline. This was not influenced by maternal age, parity, education, body mass index, cervical dilatation at intervention or fetal size, suggesting that subcutaneous injection of sterile water to the lower back provides relief from back pain during labor.

**Key words:** *Labor analgesia, low back pain, subcutaneous injection, sterile water*

### Introduction

Labor pain can be a fearful event in a woman's life. About 30% of women will have severe continuous pain in the lower back as a result of nociceptive transmission in the T<sub>10</sub> to L<sub>1</sub> segments (1). The distribution of T<sub>10</sub> to L<sub>1</sub> segments in the back overlies the lower three lumbar vertebrae and the upper half of the sacrum, the area to which the pain is referred (2). To alleviate this pain, a number of analgesic methods have been tried with varying success, such as transcutaneous electric nerve stimulation (3), epicutaneous application of a local anesthetic agents (4) and intracutaneous or subcutaneous infiltration with procaine hydrochloride (5). Besides epidural analgesia, none of the methods have proven to be effective in reducing low back labor pain (6). Some studies have, however, indicated that intracutaneous injections of sterile water may be effective (7–9). Intracutaneous injections are accompanied by intense pain, though transient. To date, there are only two studies assessing the pain relieving effect of subcutaneous injection of sterile water in labor, one each in women from the Middle East (10) and Europe (11). This study was planned to evaluate

the efficacy of this method for relieving disconcerting lower back labor pain.

### Material and methods

The study was conducted in the labor care facilities affiliated to Kasturba Medical College, Manipal from August 2006 to July 2007. A total of 100 women in the early part of the active phase of first stage of labor and complaining of lower back pain, were recruited. Women who had received any other analgesia were excluded. Demographic data and other labor characteristics were recorded. The study was carried out in accordance with the Declaration of Helsinki and its subsequent revisions, and approval of the Kasturba Hospital Ethics Committee was granted.

The recruited parturients were randomly allocated into two groups, with 50 women receiving sterile water and 50 receiving isotonic saline. Computer-based block randomization was used. The randomization schedule was laid down in a sealed envelope with codings in blocks of size 10. Each time a woman was recruited, the sealed envelope was opened by the

attending nurse midwife at the labor care facility, who drew 0.5 ml of the solution indicated by the number code into a 1-ml plastic syringe with a 26-gauge needle and gave it to the resident doctor. The doctor injected the solution subcutaneously only once and at one point near the center of Michaeli's rhomboid. The injection was given at the peak of uterine contraction to blunt the perception of pain due to the injection itself. The nurse midwife did not take part in pain assessment. She also did not inform any one on the staff on what solution was administered. The code list with the case number was confidentially maintained by the nurse midwife until the end of the study.

Recording of the pain perception was carried out on a numerical scale with ratings from 0 to 10, where 0 indicated no pain and 10 indicated severe intolerable pain. This was recorded on three occasions, before the injection and 10 and 45 minutes after the injection, by one of the authors (BBT).

Since there was significant interaction between the treatment and repeated measurements, the data were analyzed separately for each treatment group. The pain score was presented as median and the differences within each group was analyzed with the Kruskal-Wallis test using SPSS software (Statistical Programme for Social Sciences, SPSS Inc., India). This was followed by Wilcoxon's signed rank test adjusted for the level of significance. The median pain perception before the treatment was compared using the Mann-Whitney test.

## Results

The main characteristics of the women were comparable between study groups (Table I). Significant pain relief was observed at 10 and 45 minutes after injection, irrespective of the solution injected. The median pain perception scores before injection were identical at 8 points in both groups, but at 10 minutes they were 7 points in the saline and 5 points in the sterile water group and at 45 minutes the median values were 7 and 4, respectively. The perception of pain relief after the injection was significant in groups irrespective of whether they received water (Wilcoxon's signed rank at 10 minutes: non-zero/positive differences ranked 40/820,  $p < 0.001$ , 95% CI 2–3.5, median difference 3; at 45 minutes: non-zero/positive differences ranked 27/281,  $p = 0.026$ , 95% CI 0–1, median difference 0.5) or saline (Wilcoxon's signed rank at 10 minutes: non-zero/positive differences ranked 32/519,  $p < 0.001$ , 95% CI 1–2, median difference 1.5; at 45 minutes: non-zero/positive differences ranked 26/243,  $p = 0.089$ , 95% CI 0–1, median difference 0).

Table I. Parturient characteristics and delivery outcome.

Characteristics	Saline group ( $n = 50$ )	Water group ( $n = 50$ )
Age in years (mean $\pm$ SD)	25.9 $\pm$ 3.6	26.1 $\pm$ 3.4
Nulliparity (cases (%))	38 (76)	33 (66)
Educational status (cases (%))		
Primary	12 (24)	10 (20)
Secondary	27 (54)	24 (48)
College/higher	11 (22)	16 (32)
BMI (mean $\pm$ SD)	22.1 $\pm$ 2.6	21.6 $\pm$ 2.5
Cervical dilation (mean $\pm$ SD)	4.8 $\pm$ 1	4.9 $\pm$ 1
Mode of delivery (cases (%))		
Spontaneous vaginal	39 (78)	44 (88)
Instrumental vaginal	5 (10)	2 (4)
Cesarean section	6 (12)	4 (8)
Injection-delivery interval in minutes (mean $\pm$ SD)	149 $\pm$ 73	143 $\pm$ 88.2
Fetal weight in grams (mean $\pm$ SD)	2931.4 $\pm$ 362	2871.5 $\pm$ 435.5

*n*, number of cases; SD, standard deviation.

Pain perception and its relief were not affected by maternal age, parity, educational status, BMI, cervical dilatation at study entry and/or birthweight. Two cases in the water group and three in the saline group were delivered by cesarean section before the pain assessment at 45 minutes. No parturient had injection-related reactions or site infection. All the babies were born with an Apgar score of 8 or more at 1 minute. One woman in the water group and two in the saline group required additional analgesics during the course of labor.

## Discussion

Subcutaneous injection to the lower back with sterile water appeared to have a small but significant short-time effect in relieving low back pain in labor; the effect of saline was much less, probably because the latter fails to produce osmotic or physical distension. In the present study, assessment of pain was recorded by one of the authors (BBT) who was unaware of the nature of the injection, whether water or saline, and was not involved in the patient's care. The pain relief by sterile water injection has been explained by the gate control hypothesis proposed by Melzack and Wall (12). Since inhibition of pain is not confined to one specific segment, the 'diffuse noxious inhibitory controls' theory of LeBars et al. (13) may explain some of the non-specific inhibition. Even though subcutaneous injection is less painful than intracutaneous injection (14), it need not necessarily result in less pain reduction. It has been demonstrated that subjectively non-painful stimuli can trigger pain inhibitory effects (15).

Better relief from low back pain in labor with sterile water injections has been reported (10,11). Martensson et al. (10) recorded 73% pain relief at 45 minutes from the initial score of 7.4. The present report could document 50% relief from the initial score of 8. The former used pricks at four different points in the vicinity at Michaeli's rhomboid; whereas only one push near the center was used in the present study. Bahasadri et al. (11) also observed 50% pain relief in the water group. The pain relief observed did not appear to be influenced by maternal age, parity, BMI and educational status, cervical dilatation at intervention and fetal size. Fetal position, e.g. occipitoposterior, could be a contributing factor to low back labor pain. The present study did not look into this aspect as an influencing variable, since fetal position changes in the course of labor.

In this study, the analgesic effect of subcutaneous injections was analyzed over 45 minutes only. There are no such studies addressing the total duration of analgesic action. But even after two hours from the intracutaneous injection, pain relief has been noted (16). It is possible that pain perception could differ in different ethnic groups. Because of its availability and ease of administration, a single sterile water injection to the lower back can be considered as an option for providing pain relief in labor.

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