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### Review article

# Sterile water injections for childbirth pain: An evidenced based guide to practice

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#### ARTICLE INFO

##### Article history:

Received 24 November 2017

Accepted 1 December 2017

Available online xxx

##### Keywords:

Sterile water injections

Childbirth

Low back pain

Pain relief

Guidelines

#### ABSTRACT

**Background:** About 30% of women in labour suffer from lower back pain. Studies of sterile water injections for management of low back pain have consistently shown this approach to be effective. The objective of this evidence-based guide is to facilitate the clinical use of sterile water injections to relieve lower back pain in labouring women.

**Methods:** To identify relevant publications our search strategy was based on computerised literature searches in scientific databases. The methodological quality of each study was assessed using the modified version of the Jadad scale, 12 studies were included.

**Findings:** Recommendations regarding the clinical use of sterile water injections for pain relief in labour are reported in terms of the location of injection administration, various injection techniques, number of injections used, amount of sterile water in each injection and adverse effects.

**Discussion:** Both injection techniques provide good pain relief for lower back pain during labour. The subcutaneous injection technique is possibly less painful than the intracutaneous technique administered, but we are unsure if this impacts on effectiveness. The effect seems to be related to the number of injections and the amount of sterile water in each injection.

**Conclusion:** The recommendation at present, based on the current state of knowledge, is to give four injections. Notwithstanding the differences in injection technique and number of injections the method appears to provide significant levels of pain relief and can be repeated as often as required with no adverse effect (apart from the administration pain) on the woman or her foetus.

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#### Statement of significance

##### Problem or issue

An evidence-based guideline to facilitate the use of sterile water injection as pain relief for low back pain during childbirth is missing.

#### What is already known

Studies of sterile water injections for management of low back pain have consistently shown this approach to be effective.

#### What this paper adds

An evidence based guide to use sterile water injection method as pain relief for low back pain during childbirth in clinical practice.

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## 1. Introduction

About 30% of women in labour suffer from lower back pain<sup>1</sup> associated with pressure on pain sensitive structures within the pelvis or referred pain.<sup>2</sup> It is likely that the spinal cord neuron receives impulses both from the internal organs and from the surface of the skin but the sensory cortex cannot distinguish between the two sources.<sup>2</sup> Studies of sterile water injections (SWIs) for management of low back pain have consistently shown this approach to be effective and the conclusion of a systematic review and meta-analysis of such studies concludes that women who received SWIs compared to placebo experienced less pain and were less likely to have Caesarean section births.<sup>3</sup>

### 1.1. Back pain in labouring women

Clinicians often associate back pain in labouring women with varying degrees of fetal malposition, particularly an occipito-posterior position, as this is thought to cause pressure on pain-sensitive structures within the pelvis.<sup>4</sup> However, there is little empirical evidence to support this association.<sup>5</sup> Back pain in labour may also be referred pain<sup>2</sup> where pain that originated in one part of the body is felt in another; hence pain from the cervix, uterus and surrounding structures is felt in the lower back. Sometimes back pain is intractable, persisting throughout the normally painless resting intervals between contractions.<sup>1</sup> It may be associated with greater use of pharmacological analgesia, including epidurals<sup>3</sup> which is correlated with a cascade of interventions and iatrogenic sequelae such as increased augmentation of labour, instrumental birth and urinary retention.<sup>6</sup> When asked about back pain in labour, women have provided powerful and vivid descriptions of extreme pressure, sensations of crushing, and intense localised back pain.<sup>5</sup> These findings support the conclusions of the study by Melzack and Schaffenberg<sup>1</sup> that this phenomenon has the potential to significantly impact upon women's interpretation of their labour.

### 1.2. Sterile water injections

In 1885, American surgeon, Halsted, described the use of sterile water for pain management when he wrote *'The skin can be completely anaesthetised to any extent by cutaneous injections of water'*.<sup>7</sup> By the early 1900s, SWIs were used as a local anaesthetic during minor surgeries of, for example, haemorrhoids, fistulas and polyps. At that time the mechanism of action was explained thus: the SWIs stretched the tissue, resulting in a paralysing effect on the nerve fibre function. The more distended tissues, the better the analgesia.<sup>8</sup> The injections were considered difficult due to discomfort associated with their administration, but were nevertheless thought to be a good alternative for patients with hypersensitivity to pharmacological pain relief substances.<sup>8</sup>

Since the 1980s, SWIs have become increasingly used for pain relief in labour. In Sweden where they are used in all birthing areas,<sup>9</sup> whereas, in countries such as Australia,<sup>10</sup> Canada,<sup>11</sup> Denmark,<sup>12</sup> Egypt,<sup>13</sup> India,<sup>14,15</sup> Iran,<sup>16</sup> Spain,<sup>17</sup> Thailand<sup>18</sup> and USA<sup>19</sup> the uptake has been less widespread.

### 1.3. Other cutaneous injections

Other cutaneous injection methods evolved with positive results reported. One example used a mixture of sodium chloride, sodium sulphate and distilled water which was injected at different depths into the skin for treatment of sciatica pain.<sup>20</sup> In the field of obstetrics in the late 1920s, two studies reported in the New England Journal of Medicine describe how intracutaneous injections were used to administer a type of local anaesthetic

(Novocain 2%)<sup>21,22</sup> for relief of back pain as well as lower abdominal pain. Rose<sup>22</sup> reported that the treatment was more effective for abdominal pain than for back pain.

### 1.4. Mechanisms of actions

The anti-nociceptive mechanisms underlying SWIs are not fully understood but several possible theories are found in the literature, i.e. the gate control theory,<sup>23</sup> descending pain relief systems<sup>24</sup> and the diffuse noxious inhibitory control (DNIC).<sup>25</sup> Sterile water is salt-free and thus causes osmotic irritation as well as mechanical stimulation of the skin due to increased local pressure in the tissue,<sup>26</sup> which results in an activation of afferent nerve fibres (A-delta and C fibres). The sudden noxious stimulation of the larger somatic A-beta fibres produces the initial rapid reduction in pain as the neural gate is blocked to the visceral A-delta and C fibres as detailed by the gate control theory.<sup>23</sup> Simultaneously, descending pain modulation systems may be stimulated involving the release of endogenous opioids as described by DNIC<sup>27</sup> and Heterotopic Noxious Conditioning Stimulations (HNCS). However, one premise of descending systems such as DNIC is that modulation of pain can be stimulated by counter-irritation applied to any part of the body remote from the original site of pain. The analgesic effects of counter-irritation methods such as SWI have been demonstrated to be most effective when applied to the skin directly over or in the vicinity of the pain.<sup>28</sup> This is further illustrated by the observation that SWI into the lower back has no apparent effect on the abdominal contraction pain. Such features of the analgesia provided by SWI indicate the actual mechanism for the analgesia provided by SWI remains uncertain and is undoubtedly an area for further research.

### 1.5. Clinical procedure

Administration of SWIs is a simple technique, fast to administer and inexpensive to use.<sup>29</sup> When administered into the lower back they have been demonstrated to provide analgesia without negative outcomes; hence their suitability for women wishing to avoid regional anaesthesia or labouring in localities where this service is not available.<sup>3</sup> The equipment consists of ampules of sterile water, disposable sterile syringes and short needles, up to 20 mm. The injections are usually administered into the lower back area. Onset of pain relief is rapid, most often within only a few minutes, and it persists for up to two hours.<sup>3</sup> Treatment can be repeated at any time and as often as required, with one report of SWIs being administered 30 times in labour.<sup>30</sup> The lumbar region is the most common treatment location but the method is also used for pubic symphysis pain, lower abdominal pain and inguinal pain.<sup>9</sup> Special training is required only if the care giver does not have any knowledge or training in administering intracutaneous or subcutaneous injections.

## 2. Objective

The key objective of this evidence-based guide is to facilitate the clinical use of sterile water injections (SWIs) to relieve lower back pain in labouring women. These evidence-based guidelines sought to provide the best available evidence about SWIs in relation to: locations of the injections, injection techniques, number of injections, amount of sterile water in each injections, when to administer and adverse effects.

### 2.1. Systematic reviews

A number of systematic reviews have been published in this field, the first of which was undertaken by Martensson and

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