

# National Survey of Postoperative Pain Control after Cesarean Delivery

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**ABSTRACT:** **Background:** Postoperative pain is a common problem after cesarean deliveries.

**Objectives:** To characterize common obstetric anesthesia practices after cesarean deliveries in Israel in order to standardize postoperative pain relief protocols.

**Methods:** A questionnaire was completed during an interview with every obstetric anesthesia unit in all 25 delivery wards in Israel. Data were gathered on intraoperative anesthesia and analgesia protocols as well as postoperative pain relief protocols. A sub-analysis compared units whose director completed a formal obstetric anesthesia training program with those whose directors did not.

**Results:** Neuraxial morphine was used routinely in 12% of hospitals. No unit providing intrathecal morphine complied with American Society of Anesthesiologists guidelines for respiratory monitoring after use of neuraxial opioids. Additionally, non-steroidal anti-inflammatory drugs (NSAIDs) were used routinely in only half the wards, while patient-controlled analgesia was used infrequently. Postoperative verbal analog scores were not recorded routinely in 71% of units on postoperative day 1. The unit director's training significantly influenced the unit protocols.

**Conclusions:** Intrathecal morphine, the gold standard of care in cesarean deliveries, is rarely used, mainly due to shortage of staff and lack of formal obstetric anesthesia training. In addition, NSAIDs are also underused. There is a need for more formal training for obstetric anesthesiologists in Israel.

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**KEY WORDS:** cesarean delivery (CD), postoperative pain, intrathecal morphine (ITM), non-steroidal anti-inflammatory drugs (NSAIDs), obstetric anesthesiology

common complaint after cesarean deliveries [3]. Although CD may share similar characteristics with other lower abdominal surgeries, pain relief after CD raises additional concerns including transfer of analgesic medication in breast milk, minimal sedation of the mother, and discharge within a few days.

Acute pain is particularly worrisome since it has been shown to be an associative and possible causative factor for chronic pain [4-6]. Retrospective studies have shown a 10–15% incidence of chronic pain following CD [7]. Acute pain during childbirth was also found to be a risk factor for the development of postpartum depression and post-traumatic stress disorder [8,9]. Effective analgesia after CD is strongly endorsed by many national professional organizations [10,11]. A study among parturients after CD found that pain was the most disturbing outcome of anesthesia [12].

As a first step towards developing a nationwide guideline for the management of CD postoperative pain relief, we conducted a survey of current analgesic practices among obstetric anesthesia unit directors. By compiling quantitative data from all hospitals, we aimed at developing recommendations to be adapted to Israel's unique needs, including numerous repeat cesarean sections, high rate of breast feeding, and limited nursing staff.

## MATERIALS AND METHODS

A multiple choice questionnaire was developed detailing CD postoperative pain control. The questionnaire was filled during an interview with the physicians responsible for obstetric anesthesia in all 25 hospitals in Israel. Questions related to practices such as the use and dosage of intrathecal morphine, intravenous patient-controlled analgesia, postoperative use of epidural catheter, and transverse abdominal plane block. The questionnaire also assessed the reasons for not using specific analgesia or anesthesia regimens. Physicians were questioned about pain protocols in the recovery and maternity wards and the medication used in these wards. Questions also related to

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The rate of cesarean deliveries is steadily increasing [1], reaching more than 1.24 million births in 2005 in the United States and representing 30.2% of all births [2]. Postoperative pain is a

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CD = cesarean delivery

monitoring protocols and estimation of the regimen's effectiveness. Respiratory monitoring was defined as the number of respiratory rate assessments each postoperative hour. Each questionnaire further assessed average verbal analog scores (from 0 to 10) in each unit. Also recorded was each unit director's training. A sub-analysis compared units whose directors had formal training in obstetric anesthesia with units whose directors had no such training.

Quantitative variables are presented as mean ± standard deviation and groups were compared using the Student *t*-test. Categorical data are presented as percentage and compared between groups using the chi-square test. A *P* value < 0.05 was considered statistically significant.

**RESULTS**

All 25 obstetric anesthesia units in Israeli hospitals completed the questionnaire, representing a 100% compliance rate. Overall, 18 units (72%) never used ITM, 4 units (16%) used ITM occasionally, and 3 units (12%) used it routinely [Figure 1]. Average ITM dose for the different units was 0.13 ± 0.03 mg. Among the 7 units that used ITM, 2 (28.6%) followed a protocol of respiratory monitoring every 2 hours for the first 24 postoperative hours, while 5 (71.4%) used respiratory monitoring less than every 2 hours for the first 24 postoperative hours.

Of the 18 units that did not use ITM, 17 (94.4%) stated that the main reason was the lack of nursing staff needed for respiratory monitoring. Two units added another reason for not using ITM – the fear of itching, and two other units stated that ITM was not used due to nausea and vomiting. In 18 units (72%) IV-PCA was not used, in 6 units (24%) IV-PCA was used occasionally, and in one unit (4%) IV-PCA was used routinely [Figure 2].

When epidural analgesia was used during CD, 17 of 25 units (68%) removed the epidural catheter at the end of the surgery and did not utilize it for postoperative pain relief. In 2 units (8%), the epidural catheter was used postoperatively for

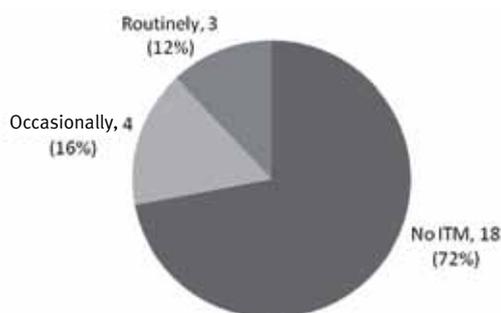
patient-controlled epidural analgesia, while in 6 units (24%) morphine was administered via the epidural catheter prior to removing it. In the 23 units that removed the epidural catheter at the end of the surgery, reasons for doing so included shortage of nursing staff required for respiratory monitoring (18 units, 78.3%), concerns regarding motor weakness (4 units, 17.4%), respiratory depression (2 units, 8.7%), neurological sequelae (1 unit, 4.3%), and urinary tract damage (1 unit, 4.3%). Additionally, two units (8.7%) cited the lack of proper equipment. Two units (12%) performed TAP blocks occasionally, and no unit used TAP blocks routinely after surgery.

Medications administered in the recovery and maternity wards are listed in Table 1. Of note, non-steroidal anti-

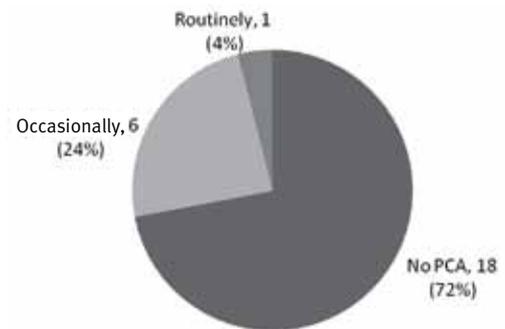
TAP = transverse abdominal plane

ITM = intrathecal morphine  
IV-PCA = intravenous patient-controlled analgesia

**Figure 1.** Intrathecal morphine use



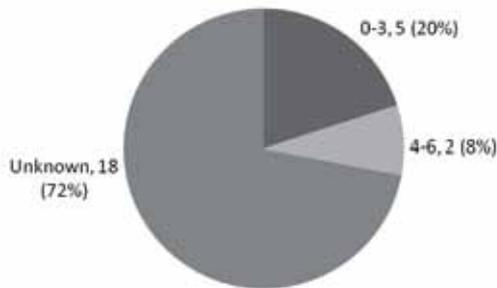
**Figure 2.** IV PCA use



**Table 1.** Postoperative pain relief in the recovery and maternity wards

Recovery ward, no ITM (n=18)	
Intravenous opioids	15 (78.9%)
Multimodal analgesia	14 (77.8%)
Tramadol	12 (63.2%)
NSAID	9 (47.4%)
Dipyrone	7 (36.8%)
Paracetamol	7 (36.8%)
Intramuscular opioids	4 (21.1%)
Per os opioids	3 (15.8%)
No medication	1 (5.2%)
Recovery ward, ITM (n=7)	
Multimodal analgesia	5 (71.4%)
Dipyrone	4 (57.1%)
Paracetamol	3 (42.9%)
NSAID	3 (42.9%)
Intravenous opioids	1 (14.3%)
Tramadol	1 (14.3%)
No medication	2 (33.3%)
Maternity ward (n=25)	
Multimodal analgesia	20 (80%)
Dipyrone	12 (48%)
NSAID	11 (44%)
Paracetamol	9 (36%)
Intramuscular opioids	7 (28%)
Per os opioids	5 (20%)
Intravenous opioids	3 (12%)
Repeated-dose tramadol	3 (12%)
Single-dose tramadol	2 (8%)
Unknown	5 (20%)

**Figure 2.** Average VAS score



inflammatory drugs are used in only half the units, in both the recovery and the maternity wards.

In 18 units (72%), anesthesiologists do not routinely monitor postoperative verbal analog scores (0–10) of parturients on postoperative day 1. Only in seven hospitals was VAS measured postoperatively by the anesthesiology staff: the average VAS was 0–3 in five of these hospitals and 4–6 in the other two [Figure 3].

Of the 25 units, the directors of 4 had been formally trained outside Israel with a subspecialty in obstetric anesthesia. We found that their anesthesia and analgesia protocols differed significantly from those of the other 21 units. Compared with units whose directors had no formal subspecialty in obstetric anesthesia, formally trained directors were more likely to use ITM (100% vs. 21.2%,  $P = 0.0005$ ), to routinely use patient-controlled analgesia (25% vs. 0%,  $P = 0.02$ ), to have average VAS scores of 0–3 on the first postoperative day (100% vs. 5.2%,  $P < 0.0001$ ), and to have routinely measured VAS on the first postoperative day (100% vs. 15.8%,  $P = 0.0002$ ).

## DISCUSSION

In obstetric anesthesia units in Israel there are no nationally accepted uniform pain relief protocols after cesarean delivery. In this study we aimed to characterize current analgesic practices to serve as a baseline prior to the introduction of national recommendations for CD anesthesia and analgesia protocols. Our results show that a) neuraxial morphine is used relatively infrequently, b) no hospitals using neuraxial morphine complied with the American Society of Anesthesiologists guidelines for postoperative respiratory monitoring, c) NSAIDs are not routinely used, d) intravenous PCA was not used, e) VAS is not routinely monitored on the first postoperative day, and f) the unit director’s training significantly influenced the unit protocols.

We found that only 25% of units used epidural morphine and 28% used ITM. Our findings contrast with a survey of the Society of Obstetric Anesthesia and Perinatology-affiliated obstetric units in the U.S. where 79% of respondents used ITM

[13]. ITM is almost universally used for post-CD analgesia [14]. We also found that 68% of responders did not use ITM because of the lack of nursing staff to monitor respiratory depression. The American Society of Anesthesiologists guidelines state that the respiratory rate should be monitored hourly for the first 12 hours and once every 2 hours for the next 12 hours [14]. None of the units using ITM was able to comply with this standard.

We found that only 54.5% of units use NSAIDs postoperatively in the maternity ward, in contrast with the 81% noted by the survey mentioned above [13]. The use of NSAIDs has been found to be extremely effective in preventing postoperative cesarean section pain [16–18] and the National Institute of Clinical Excellence in Britain stated that NSAIDs should be offered after cesarean section [19].

Only one unit (4%) in our survey used postoperative morphine IV-PCA. According to the survey mentioned above [13] the rate of postoperative morphine patient-controlled analgesia in the U.S. is low as well – 12%. However, the low use in the USA may be explained by the higher use of ITM, precluding intravenous morphine use. The NICE guidelines recommend that patient-controlled analgesia be offered to women after CD who do not receive long-acting neuraxial opioids [19].

The Royal College of Anaesthetists recommends that 90% of women should have a VAS score of 0–3 postoperatively [20]. This occurred in only 20.8% of our surveyed units. In 72% of units, VAS score was not routinely measured by the anesthesiologist. In one hospital that did not use ITM or routinely check postoperative VAS scores, a prospective observational study of postoperative pain found the mean pain score on the first postoperative day to be  $8.1 \pm 1.9$  [21]. As a result of this alarming finding, postoperative pain in this hospital was modified.

Finally, unit directors who were fellowship-trained obstetric anesthesiologists were more likely to use both neuraxial morphine and patient-controlled analgesia, more likely to routinely measure VAS score, and more likely to have patients with an average VAS score of 0–3 on the first postoperative day. The presence of an obstetric anesthesiologist was found to alter practice in other aspects of obstetric anesthesia, including extension of epidural analgesia to labor [22] and use of patient-controlled epidural analgesia in the delivery suite [23]. Two recent articles demonstrate that a formal teaching program changed national obstetric anesthesia practices [24,25]. For more than 2 years we have been conducting a fellowship training program in obstetric anesthesia, the first anesthesia subspecialty in Israel to do so.

Our study is limited by its nature as a questionnaire-based data-extracting study. Moreover, it measures units only in Israel and therefore is more a national than an international study. Furthermore, only anesthesia providers were inter-

VAS = verbal analog scores

NSAIDs – non-steroidal anti-inflammatory drugs

NICE = National Institute of Clinical Excellence

viewed. Since we did not interview parturients or other staff members such as nurses, we were not able to report actual VAS scores. The fact that most anesthesia providers do not assess postoperative VAS scores is problematic.

In conclusion, the gold standard of cesarean delivery analgesia today, the ITM, is underused in Israel. The main reason is shortage of staff and lack of formal obstetric anesthesia training. In addition, NSAIDs are also underused. Finally, there is a need for more formally trained obstetric anesthesiologists in Israel, which hopefully will promote the initiation of formal obstetric anesthesia programs.

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#### Capsule

#### Stimulus-triggered fate conversion of somatic cells into pluripotency

Obokata et al. from Japan report a unique cellular reprogramming phenomenon, called stimulus-triggered acquisition of pluripotency (STAP), which requires neither nuclear transfer nor the introduction of transcription factors. In STAP, strong external stimuli such as a transient low-pH stressor reprogrammed mammalian somatic cells, resulting in the generation of pluripotent cells. Through real-time imaging of STAP cells derived from purified lymphocytes, as well as gene rearrangement analysis, the authors found that committed somatic cells give rise to STAP cells by reprogramming rather than selection.

STAP cells showed a substantial decrease in DNA methylation in the regulatory regions of pluripotency marker genes. Blastocyst injection showed that STAP cells efficiently contribute to chimeric embryos and to offspring via germline transmission. They also demonstrate the derivation of robustly expandable pluripotent cell lines from STAP cells. These findings indicate that epigenetic fate determination of mammalian cells can be markedly converted in a context-dependent manner by strong environmental cues.

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