Postcesarean pain: Characteristics and relationship with surgical anesthesia

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Short Title:

Postcesarean Pain: Characteristics and Relationship With Anesthesia

In fond memory of my friend, Julie Koestner.

May she enjoy eternal life.

Abstract

This study was designed to characterize postcesarean pain and examine its relationship with surgical anesthesia. Pain intensity was measured using a 0 to 10 numerical rating scale. The Short-Form McGill Pain Questionnaire was used to measure quality. The most common pain types reported were movement-associated and constant incisional pain (100% of subjects), gas pain (88.1%), and uterine contraction pain (83.3%). Each pain type differed in its intensity, duration and quality. Movement-associated incisional pain was the most intense and long-lasting pain type reported. On postoperative days 2 to 4, mothers who received complete epidural anesthesia during surgery reported less intense movement-associated incisional pain than those who received general or incomplete epidural anesthesia. However, statistical significance was not often obtained. These findings demonstrate the uniqueness of each pain type composing the postcesarean pain experience. The clinical data also support the hypothesis that epidural anesthesia diminishes the sustained hyperexcitability of the central nervous system caused by surgery.

Résumé

Cette étude fut élaborée dans le but de caractériser la douleur post-césarienne et d'en examiner la relation avec l'anesthésie opératoire. L'intensité de la douleur fut mesurée à l'aide d'une échelle numérique évaluative de 0 à 10, et sa qualité, à l'aide du "Short-Form McGill Pain Questionnaire". Les douleurs les plus communes furent la douleur incisionnelle due aux mouvements et la douleur incisionnelle constante (100% des sujets), la douleur de gaz (88.1%), et la douleur de contractions utérines (83.3%). Chaque type de douleur était différent au niveau de son intensité, de sa durée, et de sa qualité. La douleur incisionnelle due aux mouvements fut la plus intense et la plus durable. De la deuxième à la quatrième journée post-opératoire, la douleur incisionnelle due aux mouvements fut moins intense pour les mères ayant eu une anesthésie épidurale complète que pour celles ayant eu une anesthésie générale ou épidurale incomplète. Cependant, ces différences furent rarement significatives. Ces résultats démontrent l'unicité de chaque type de douleur composant l'expérience post-césarienne. Ces données cliniques soutiennent également l'hypothèse selon laquelle l'anesthésie épidurale réduit l'hyperexcitabilité soutenue du système nerveux central causée par la chirurgie.

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Introduction

Although the amount of research in the field of pain has increased in recent years, postoperative pain remains a less than adequately controlled problem (Bonica, 1983; Cohen, 1980; Donovan, Dillon, & McGuire, 1987; Melzack, Abbott, Zackon, & Davis, 1987; Stanley, 1983; Sweeney, 1977). For example, in Melzack et al.'s (1987) study only 44% of 88 postoperative patients reported 50 to 100% pain relief one hour after analgesic administration. Similarly, Donovan et al. (1987) found as many as 75% of 353 medical-surgical patients experiencing pain in the last 72 hours, 53% reporting pain at the time of the interview, and only 33% reporting total pain relief at any time during their hospital stay. In Cohen's (1980) study, 75% of the 109 postoperative patients interviewed reported moderate to severe pain within the first 48 to 72 postoperative hours. Why is the prevalence of pain so high?

Different pain types respond differently to various analgesic interventions (McCaffery & Beebe, 1989; Melzack & Wall, 1988), and thus it is very likely that each pain type is generated by a different physiological mechanism. Perhaps then, an inadequate understanding of the nature of each type of pain comprising the postoperative experience is partly responsible for its poor assessment and management (Bonica, 1983; Donovan et al. 1987).

Adequate pain management postoperatively is important for

several reasons. First, postoperative pain discourages the patient from engaging in activities such as deep breathing and coughing or getting in and out of bed (Sweeney, 1977). This can lead to postoperative complications such as pulmonary dysfunction, atelectasis, hypoxemia, pneumonitis, ileus, and thrombophlebitis (Bonica, 1983). Second, data from a recent study suggest that pain alters the quality of sleep, further reducing the body's natural ability for self-healing (Christoph, 1991). Third, evidence from Jeans (1989) suggests that pain persisting for more than one week may increase the risk of developing chronic pain. Finally, given the advances in medical technology, postoperative pain represents unnecessary suffering; it does not prevent further injury, nor does it ensure recovery, and therefore no longer serves any useful function (Melzack & Wall, 1988).

Postoperative pain is even more problematic for the postcesarean mother. As with other postoperative patients, postcesarean pain restricts the new mother in her physical activities and puts her at greater risk for circulatory and pulmonary problems, as well as impaired bowel and bladder functioning (Thomas, Ptak, Giddings, Moore & Oppermann, 1990). In addition, these women are already in a high risk category for circulatory problems following childbirth, particularly thrombophlebitis (Moore, 1983). MacDonald (1990) underscores the importance of relieving pain in the early postpartum period to enable the new mother to care for and bond with her

newborn. She adds that pain may disrupt sleep, which further alters the fatigued mother's ability to cope with the physiological changes experienced during the postpartum period. Findings from Marut's study (1978) suggest that during the early postpartum days, postcesarean pain can alter the quality and length of mother-infant contact, delay initiation of the mothering role and cause emotional upset if pain prevents the mother from holding and feeding her newborn. According to Faut-Callahan and Paice (1990), acute pain may interfere with the mother's ability to provide basic care such as feeding the newborn and may lead to avoidance of another pregnancy due to fear of another painful and difficult experience.

Cesarean delivery is a relatively common procedure. In 1987, the rate of cesarean sections in the United States reached 24.4% (Zdeb & Logrillo, 1989) and in 1988, it was as high as 25% in at least one Montreal hospital (L.P. Laberge, personal communication, 1989). Zdeb and Logrillo's (1989) projected cesarean section rates for the United States in 1990 and the year 2000 are respectively 28.8% and 40.3%. However, in spite of its growing clinical importance and its impact on the mothers' and infants' well-being, a recent literature review revealed only one pilot study designed specifically to describe postcesarean pain (Smith-Hanrahan, 1988). What is required now is a detailed description of each pain type involved in the total postcesarean pain experience. This

should help clinicians develop more effective pain assessment and management strategies to meet the specific needs of women experiencing postcesarean pain.

The purpose of this study was to characterize the pain experience of postcesarean mothers in the immediate and early postpartum period and up to the sixth postpartum week. More specifically, it was designed to: 1) identify the different types of postcesarean pain and their frequency; 2) determine the intensity, duration, and quality of the most commonly reported postcesarean pain types; and 3) determine if there is a relationship between the type of anesthesia used during surgery and the most commonly reported postcesarean pain types.

Literature Review

The Gate Control Theory of Pain

The gate-control theory of pain guided this study. This theory has been widely used in pain research, including the studies on postcesarean pain done by Smith, Guralnick, Gelfand, and Jeans (1986) and Smith-Hanrahan (1988) which lay the foundations for the present study.

The gate-control theory hypothesizes a neural mechanism in the substantia gelatinosa of the dorsal horn of the spinal cord which acts as a gate, modulating sensory input before it evokes pain perception and behavioral response (Melzack & Wall, 1988). There are two different types of nerve fibres responsible for the transmission of the pain message from the periphery to the central nervous system. Both originate in peripheral tissues and synapse with neurons in the substantia gelatinosa. These nerve fibres, or nociceptors, are the myelinated, small diameter, A-delta fibres which are fast conducting and the unmyelinated C fibres which are slow conducting. When tissue is damaged, A-delta fibres fire a volley of nerve impulses which are rapidly conducted to the central nervous system. A-delta fibres are responsible for the immediate reaction to pain such as retraction from the painful stimuli (Melzack & Wall, 1988).

Evidence suggests that C fibres are responsible for both peripheral and central changes. When the injury causes peripheral nerve damage, C fibres are activated and their

peripheral endings release substances which trigger an inflammatory response leading to vasodilation, edema, and hypersensitivity of nerve endings. This process leads to the formation of prostaglandins which further increase the sensitivity of nerve endings to noxious and innocuous stimuli. When C fibres are activated, they also massively release neuropeptides which are slowly transported to the substantia gelatinosa. This slow chemical transport is thought to produce hyperexcitability of spinal cord cells and expansion of their receptive fields thus leading to increased pain perception (Melzack & Wall, 1988).

Transmission of the pain signal can be enhanced by several mechanisms. Powerful controls from the brain can enhance the pain signal through anxiety, fear, and anticipation of pain. The release of prostaglandins increases the sensitivity of nociceptors in the inflammatory process (Chapman & Bonica, 1983) or can cause pain by increasing smooth muscle contractility, thereby leading to vasoconstriction and ischemia (Cooper, 1981).

Transmission of the pain signal can also be inhibited by a variety of mechanisms. When myelinated, rapidly conducting, large diameter, A-beta fibres are activated by non-painful, low-threshold tactile stimuli, they can trigger the inhibitory interneurons in the substantia gelatinosa (Melzack & Wall, 1988; Wall, 1984; Woolf, 1983). Other possible inhibitory mechanisms include activation of descending fibres from the

brain through distraction, biofeedback, imaging, or relaxation; release of endogenous endorphins; and the administration of various pharmacologic agents (Melzack & Wall, 1988; Wall, 1984; Woolf, 1983). Therefore, both psychological and physiological factors influence pain perception by acting directly or indirectly on the gate control system.

Wall (1984, 1988) has hypothesized that when surface and deep tissues are cut during surgery, the central nervous system receives a brief but maximal volley of nerve impulses which give rise to rapid central inhibitions and excitations as determined by the gate-control mechanism. Impulses in C fibres, particularly those originating from deep tissue, give rise to slow-onset, long-duration changes such as prolonged spinal cord hyperexcitability and postsynaptic spinal cord morphological changes. Consequently, previously innocuous stimuli such as light touch or movement, will trigger pain in and around the injured area. This provides an explanation for the widespread secondary tenderness which characterizes postoperative pain.

Wall (1988) has further hypothesized that if impulses in unmyelinated C fibres can be blocked during surgery, as can occur with epidural anesthesia, then the prolonged spinal cord hyperexcitability and subsequent lower pain threshold should be inhibited or prevented.

Postoperative Pain

Pain is a multidimensional, highly variable, and subjective phenomenon. It can vary in intensity, duration, quality, and in its response to physiological, psychological, and sociocultural variables. According to Melzack and Wall (1988), the sensation threshold is similar for everyone; it is the pain perception threshold that is highly variable. Therefore, the same stimuli will generate different perceptions and responses in different individuals. For example, an individual may report pain when his skin is pinched while another may only perceive a sensation of pressure.

Bonica (1983) reviewed the literature on postoperative pain back to 1933 and compiled rough estimates of the incidence, intensity, and duration of postoperative pain for lower intra-abdominal surgeries. Thirty-four percent of patients reported moderate constant incisional pain while it was severe for 45% of patients. Movement-associated incisional pain was moderate to severe for as many as 85% of patients. The mean duration of moderate to severe incisional pain was 2 days with a range of 2 to 4.

Melzack, Abbott, Zackon, Mulder, and Davis (1987) studied the duration and intensity of postoperative pain in 88 subjects on a general surgery ward. They rated pain intensity using the 5-point Present Pain Intensity scale (PPI) of the McGill Pain Questionnaire. Pain was rated only once, either

between postoperative days 1 and 4 (61 patients) or between postoperative days 5 and 18 (21 patients). For the patients who recovered without any complications (69.3%), pain diminished rapidly within the first 3 to 4 postoperative days. The mean pain intensity was 2.5 on the PPI. However, pain was rated as a general sensation, not considering the possibility that this experience may comprise several distinct pain types, such as incisional pain and gas pain.

Keats (1956) studied 43 postoperative patients. Ninety-nine percent of these patients complained of movement-associated incisional pain and 91% complained of constant incisional pain. Only 47% of patients reported satisfactory relief of the first pain type after morphine administration while 74% reported satisfactory relief of the latter pain type. Pain severe enough to require narcotics usually subsided 48 hours after surgery.

In a recent review of the literature, only one study was found that specifically reported the words used by patients to describe the quality of postoperative pain. Taenzer (1983) studied the quality of postcholecystectomy pain in 40 patients. The McGill Pain Questionnaire was administered in the morning and afternoon of postoperative days 1 to 3 and on the morning of postoperative day 6. More than 30% of subjects described their pain as being pulling, tiring, nagging, tight, tender, annoying, sharp, throbbing, dull, sore, stabbing, exhausting, and taut. However, there are two problems with

this study. First, no attempt was made to interview patients when analgesic effect was low, which may have affected the frequency of descriptors reported. Second, only the quality of the general pain experience was studied instead of specific pain types such as constant incisional pain, movement-associated incisional pain, or gas pain.

The literature reviewed by Bonica (1983) suggests that the main factors that may influence postoperative pain are: 1) site, nature, and duration of the operation as well as the extensiveness of intraoperative trauma; 2) physiological and psychological makeup of the patient; 3) preoperative psychological, physical, and pharmacological preparation of the patient; 4) presence of serious postoperative complications; 5) anesthetic management before, during, and after the operation; and 6) quality of postoperative care.

Among earlier studies reviewed by Bonica (1983) to identify the main factors possibly influencing pain characteristics were those of Keats (1956) and Parkhouse and Lambrechts (1961). Keats (1956) found no correlation between postoperative pain and the patients' age, sex, medical and surgical history, personality, type and duration of anesthesia.

Parkhouse and Lambrechts (1961) estimated the severity and duration of pain in terms of analgesic requirements in 1000 postoperative patients. The most important factor determining the severity of postoperative pain was the

type/site of the operation. Gastric surgeries were associated with the most postoperative pain followed by gall bladder surgeries, other upper abdominal surgeries, lower abdominal surgeries, appendectomies, inguinal and femoral herniotomies, head and neck and limb surgeries, and finally, minor chest wall and scrotal surgeries. Age and sex had no effect on pain. Other factors identified as possibly influencing pain were anesthetic agent, type of incision, intraoperative handling of tissues and psychosociocultural characteristics of patients.

In order to improve our assessment and management of the pain experience, two things are required. First, as Jacox proposed in 1979 and Bonica in 1983, we need detailed descriptions of the frequency, intensity, duration, and quality of pain types experienced by patients suffering from different conditions or undergoing specific treatments. This will guide clinicians in the assessment of the pain experience of patients undergoing specific operative procedures, taking into account the site, nature and perhaps duration of the operation, degree of trauma, preoperative preparation, anesthetic management, and postoperative care. Second, a better understanding is required of the effects of physiological and psychological variables on the course of pain. This will enable clinicians to tailor their assessment and interventions according to the person's individual pain experience.

Postcesarean Pain

The pain of postcesarean mothers is probably not identical to the pain experienced after other types of major abdominal surgery. Postcesarean pain is not only composed of pain related to lower abdominal surgery, but also of the usual postpartum pains such as those resulting from uterine contractions and engorged breasts. Furthermore, the presence of one pain type can influence the pain experienced from a different source; for example, gas pain which results from the accumulation of gas in the bowel, increases the intraabdominal pressure and may increase incisional pain as it exerts pressure and traction on muscles, tissues and sutures (Sweeney, 1977). Bruegel (1971) found that women giving birth by cesarean section experience less intense pain than patients undergoing a cholecystectomy. This suggests that the positive meaning of the birth experience may influence the characteristics of pain felt by the new mother. MacDonald (1990) even hypothesized that the newborn baby's presence may reduce postcesarean pain through distraction.

Recent studies have shown that postcesarean pain is composed of several distinct pain types. In an exploratory study, Affonso and Stichler (1978) interviewed 105 mothers between postoperative days 2 and 4 on several aspects of their emergency cesarean delivery experience. When questioned about the sources of their pain, 100% reported pain due to movement, abdominal distention, and coughing. Sixty-four percent

reported incisional site, uterine contractions, intravenous site, foley catheter, and intramuscular injections as sources of discomfort.

Smith, Guralnick, Gelfand, and Jeans (1986), studied the effects of transcutaneous electrical nerve stimulation (TENS) on postcesarean pain in 18 mothers who underwent scheduled cesarean deliveries. They noted that the three most frequently reported pain types were: 1) incisional pain, both constant and movement-associated; 2) uterine contraction pain; and 3) gas pain due to decreased gastrointestinal activity.

The above findings prompted Smith-Hanrahan (1988) to carry out a pilot study examining the characteristics of postcesarean pain in 15 multiparous women who underwent scheduled cesarean deliveries. The women were interviewed up to three times a day and at least three hours after analgesic administration. Again, the most frequently reported types of pain were: 1) constant and movement-associated incisional pain (93% of subjects); 2) postcesarean uterine contraction pain (57%); and 3) gas pain (46%). By the third postoperative day, 33% of the mothers reported still experiencing constant incisional pain, and 66% movement-associated incisional pain. In general, mothers reported the highest pain scores for movement-associated incisional pain.

The uniqueness of each postcesarean pain type is further supported by a pharmacological study conducted by Niv, Rudick, Chayen, and Menachem (1983). They interviewed 120 women who

had undergone a cesarean section with epidural anesthesia. These women reported both incisional pain and uterine contraction pain. They described their pain as spasmodic in nature with an intensity of 2 to 3 on the 5-point Present Pain Intensity (PPI) scale of the McGill Pain Questionnaire (MPQ).

Several studies of other acute pain experiences suggest that they are also comprised of several distinct types of pain, each of which has its own characteristics. These various pain types probably arise from different physiological processes and therefore, likely require different treatments. Some of these studies, which will now be reviewed, provide scientific evidence to support Melzack and Bélanger's (1989) hypothesis. They propose that continuous pain, such as constant incisional pain, and rapidly rising pain, such as movement-associated incisional pain, are transmitted by different neural systems and therefore, respond differently to analgesic drugs.

Dubuisson and Dennis (1977) used the formalin test to study the effects of morphine on pain in cats and rats. In this test, a small dose of formalin solution is injected under the skin of the forepaw. This first produces a sharp pain which lasts for a few minutes followed by a dull pain lasting for over an hour. Six cats and six rats were first given morphine sulphate and then were subjected to the formalin test. Nine cats and 6 rats were not given morphine before the formalin test. The animals' pain response was measured using

a behavioral category scale converted to numerical values. They found that the acute initial response was the same in all animals whether or not they had been given morphine. However, the long-lasting, dull pain was strongly depressed by morphine.

Woolf and Wall (1986) studied the effect of a clinical dose of morphine given before a conditioning C fibre volley on the flexion reflex in 14 decerebrate-spinal rats. Morphine had no effect on the direct reflex action of C fibres, but it totally prevented the establishment of the prolonged reflex excitability increases.

Similarly, in Niv et al.'s (1983) study, postcesarean women were given epidural morphine at the onset of postoperative pain. Incisional pain was successfully relieved while uterine contraction pain was not relieved. Smith et al. (1986) found evidence to suggest that TENS is effective in reducing incisional pain, particularly movement-associated, but has no effect on gas pain or uterine contraction pain.

Together, these findings have important implications for the use of narcotics in the management of postoperative pain. It seems that narcotics have little or no effect on the rapidly rising, sharp pains associated with movement but do relieve the prolonged incisional pain tenderness (Melzack & Wall, 1988).

Therefore, what is required now is a study designed specifically to identify the different types of pain involved

in the postcesarean pain experience and to determine their frequency, intensity, duration and quality. Detailed knowledge of the characteristics of postcesarean pain will facilitate its assessment and management, thus leading to more effective control of pain.

Surgical Anesthesia and Postoperative Pain

The type of anesthesia used during surgery may influence pain postoperatively and this effect may be mediated, at least in part, by prolonged spinal cord hyperexcitability (Wall, 1988). Wall hypothesized that when surgery is performed under general anesthesia, the spinal cord receives a massive afferent barrage which sets off prolonged central hyperexcitability, possibly mediated by unmyelinated C fibres. Under epidural anesthesia, the afferent barrage is blocked from reaching the spinal cord. On the basis of this hypothesis, one would expect subjects who received general anesthesia during surgery to experience more pain postoperatively, in response to such stimuli as movement or touch, compared to those who received epidural anesthesia. However, other pain types such as constant incisional pain and gas pain would not be affected because they are not generated by external stimuli.

Tverskoy, Cozacov, Ayache, Bradley, and Kissin (1990) studied the effects of different types of surgical anesthesia on postoperative pain in patients scheduled for elective hernia repair. Twenty-four patients were randomly assigned to

receive spinal anesthesia (12) or general anesthesia (12) during surgery. Pain intensity was measured at 24 hours, 48 hours, and 10 days postoperatively, using a 10 cm visual analogue scale and always at least 3 hours after analgesic administration. When compared to the general anesthesia group, the intensity of constant incisional pain and movement-associated incisional pain in the spinal anesthesia group was significantly lower at 24 hours and 48 hours postoperatively ($p<0.0002$). Ten days after surgery, no differences were found in pain scores between the two groups. The authors concluded that spinal anesthesia decreases postoperative pain.

In their TENS study, Smith et al. (1986) unexpectedly found that, in a small group of women receiving placebo TENS, those who delivered under epidural anesthesia reported significantly less movement-associated incisional pain than those who were given general anesthesia, up to 48 hours following surgery. Epidural anesthesia had no effect on constant incisional pain, uterine contraction pain, or gas pain.

Similar results were obtained by Smith-Hanrahan in her pilot study on the characteristics of postcesarean pain (1988). Among the 15 multiparous women who participated in the study, 5 received general anesthesia and 10 received epidural anesthesia. When compared to women who received general anesthesia, those who had an epidural reported significantly lower intensities for constant incisional pain

up to the second postoperative day, and up to the first postoperative day for movement-associated incisional pain. No such differences were found in the intensities of uterine contraction pain or gas pain. When the levels of activity were compared, epidural mothers held and fed their newborn significantly sooner than mothers who had general anesthesia.

Webster (1986) also studied the effects of surgical anesthesia on postcesarean pain but failed to support his impression that patients receiving epidural anesthesia would have less pain than those receiving general anesthesia. He studied 58 elective postcesarean mothers. Twenty-six mothers delivered under general anesthesia while 32 delivered under epidural anesthesia. Postcesarean pain intensity was measured using a visual analog scale anchored with the words very comfortable at one end and worst pain imaginable at the other. Pain was measured several times up to 72 hours postdelivery, regardless of the time of analgesic administration. Significantly more general anesthesia mothers received intramuscular analgesics than epidural anesthesia mothers, up to 12 hours postoperatively. There were no significant differences in the use of oral analgesics. At 1, 4 and 24 hours postdelivery, significantly more mothers in the general anesthesia group described themselves as being very comfortable ($p<0.05$). However, there are several problems with this study. First, Webster measured total pain; therefore, a possible selective effect of epidural anesthesia

on incisional pain may have been hidden in the total pain score. Second, he made no attempt to interview patients when analgesic effect was low. Therefore, women may have been interviewed while under the effects of an analgesic, a confounding variable that could have affected the two groups differently. Third, general anesthesia mothers received more intramuscular analgesics and therefore may have had less pain for this reason only.

In a study by Juul, Lie, and Friberg Nielsen (1988), 92 postcesarean women, 35 who had epidural anesthesia and 57 who had general anesthesia, were interviewed on the seventh postoperative day. Using the MPQ, they measured the present pain intensity of wound pain and uterine contraction pain, and found no significant difference between the two groups. However, patients in the epidural group were ambulating sooner ($p<0.005$), and were also eating ($p<0.005$), passing flatus ($p<0.005$), and defecating ($p<0.001$) significantly earlier. Epidural women also reported less fatigue ($p<0.025$) than women in the general anesthesia group. However, by measuring pain intensity only on the seventh day postoperatively, the researchers probably missed the effect of anesthesia on postoperative pain observed during the first 48 to 72 hours in other studies (Smith et al., 1986; Smith-Hanrahen, 1988; Tverskoy et al., 1990;).

Although several researchers have studied the relationship between surgical anesthesia and postoperative

pain, the results are discrepant and the relationship remains unclear. What is required is a study designed specifically to examine the effect of surgical anesthesia on postcesarean pain. If indeed epidural anesthesia is associated with less pain in the postoperative period, it may be used not only to prevent complications associated with general anesthesia, or to allow mothers to witness the birth or their infant, but also as a means to prevent or minimize postoperative pain and its associated complications.

Methods

Purpose

The purpose of this study was to characterise the pain experience of postcesarean mothers during the immediate and early postpartum period and up to the sixth postpartum week, and to examine the relationship between this pain experience and the type of anesthesia used during surgery.

To characterise the postcesarean pain experience, this study focused on the following questions:

(1) What is the type and frequency of pain experienced during the first six postpartum weeks?

(2) What is the frequency, intensity and duration of the most common pain types?

(3) What words do mothers use to describe the quality of the most common pain types when at their highest intensity?

To examine the relationship between the characteristics of postcesarean pain and the type of anesthesia used during surgery, an attempt was made to answer the following questions:

(4) Does the frequency of the most common pain types differ between mothers who received general, complete epidural or incomplete epidural anesthesia during surgery?

(5) Does the intensity of the most common pain types differ between mothers who received general,

complete epidural or incomplete epidural anesthesia during surgery?

Several studies have found postoperative pain intensity to be related to anxiety levels (Johnson, Dabbs & Leventhal, 1970; Martinez-Urrutia, 1975; Scott, George & Peoples, 1983; Taenzer, Melzack & Jeans, 1986). In this study, it was impossible to randomly assign subjects to type of anesthesia. If mothers had chosen one type of anesthesia over another because of their anxiety level, it would have been unclear whether differences in pain characteristics between the three study groups were related to the type of anesthesia used during surgery or anxiety levels. Therefore, the following question was asked:

(6) Is there a relationship between mothers' preoperative level of anxiety and choice of surgical anesthesia?

Conceptual Definitions

Pain.

In this study, Melzack and Togerson's (1971) definition of pain was used. They defined pain as a multidimensional experience comprised of: 1) a sensory dimension described in terms of temporal, spatial, pressure, thermal, and other properties; 2) an affective dimension described in terms of tension, fear, and autonomic properties that are part of the pain experience; and 3) an evaluative dimension described in terms of the subjective overall intensity of the pain

experience.

Frequency of a pain type.

Frequency was defined as the proportion of study subjects reporting a particular pain type over a specific period of time (Hamilton, 1988). It was expressed as a percentage.

Immediate postoperative period.

Immediate is the period of time extending from the end of the surgery to the end of the same day. This also is referred to as postoperative day 0.

Early postoperative period.

Early is defined as the first to the fourth day following the day of surgery i.e. postoperative days 1 to 4.

Type of surgical anesthesia.

In this study, subjects received either general anesthesia, complete epidural anesthesia, or incomplete epidural anesthesia.

1) General anesthesia is a loss of both sensation and consciousness induced by anesthetic agents given both intravenously and by inhalation (Hamilton, 1988). At the target hospital, anesthesia was first induced with intravenous Pentobarbital. Afterwards, one of the following combination of drugs was administered by inhalation to maintain an anesthetic state: Nitrous oxide, oxygen and Enflurane; or Nitrous oxide, oxygen and Isomurane.

2) Complete epidural anesthesia is the injection of a local anesthetic into the epidural space of the spinal cord

resulting in a complete loss of sensation from the level of injection downward (Hamilton, 1988). There is no loss of consciousness. The anesthetic agents used at the target hospital for epidural anesthesia were: Lidocaine; Lidocaine and Bupivacaine; or Lidocaine and Epinephrine.

3) Incomplete epidural anesthesia is when a subject receives an epidural anesthesia during surgery but still reports feeling pain during surgery. In the present study, 37% of mothers delivering under epidural anesthesia experienced severe diffuse pain during their cesarean section. According to Pederson et al. (1989), many mothers having a cesarean section under epidural anesthesia report pain during exteriorisation of the uterus and traction on the viscera in spite of seemingly adequate levels of sensory block and regardless of the anesthetic used. This is believed to be caused by a decreased concentration of local anesthetic in the cerebrospinal fluid, which allows activation of C fibres and transmission of visceral pain (Pederson et al., 1989)

Anxiety.

Spielberger, Gorsuch, Lushene, Vagg, and Jacobs (1983) identified two dimensions of anxiety: state anxiety and trait anxiety. State anxiety is defined as an unpleasant transitory emotional state varying in intensity and fluctuating over time. It is described as a feeling of tension, apprehension, nervousness, or worry and is associated with the arousal of the sympathetic nervous system (Spielberger, 1983). State

anxiety is a response to perceived threatening situations. Trait anxiety is relatively stable over time, it is a person's anxiety-proneness or usual emotional disposition. State anxiety will increase in response to a threatening situation, but trait anxiety will remain stable. This conceptual definition of anxiety was used in this study.

Design

A descriptive design was used to characterize the postcesarean pain experience. To examine the relationship between the characteristics of postcesarean pain and the type of surgical anesthesia, the ex post facto static group comparison was used (Campbell & Stanley, 1963).

Sample

The inclusion criteria were as follows:

1) admitted for an elective cesarean delivery
2) age 21 years or more
3) English or French-speaking
4) informed consent obtained
5) no preoperative or postoperative complications
6) only one type of surgical anesthesia administered (epidural or general)

Data collection took place over a period of five months. From March to August, 1990, 61 women admitted at the target hospital for an elective cesarean section were asked to participate. Twelve women were excluded from the study as they were not sufficiently fluent in English or French. Only

two women refused to participate saying they were too worried by the surgery. One mother was excluded from the study early in the preoperative period because a cesarean section was no longer indicated. One mother withdrew from the study on her first postoperative day saying that she was too weak and in too much pain to be able to complete the questionnaires. Finally, three mothers were excluded from the study shortly after surgery as they were first submitted to an unsuccessful epidural anesthesia followed by general anesthesia. The final convenience sample consisted of 42 women scheduled for an elective cesarean section.

Instruments

Pain frequency.

At each sampling time, subjects were asked if they were presently experiencing any pain. If yes, they were asked to describe its location. If they reported incisional pain, they were then asked if the pain occurred when still and/or when moving.

Pain intensity.

Among the different scales available to measure pain intensity, the present pain intensity scale (PPI) and the visual analog scale (VAS) of the Short-Form McGill Pain Questionnaire (see Appendix B) as well as an 11-point numerical rating scale (NRS) (Downie et al., 1978) were evaluated as possible tools for this study.

The PPI scale measures pain intensity on a 5-point verbal

rating scale as 0=none, 1=mild, 2=discomforting, 3=distressing, 4=horrible, and 5=excruciating. There are several disadvantages to the PPI. First, the patient is forced to translate the pain felt into words which do not necessarily express what he is experiencing; the intervals between each word do not represent equal increments in pain intensity although they are used as such; and the scale is not sensitive to small changes in pain intensity and may produce artificially augmented scores as a patient will use the next word on the scale to describe pain which has only slightly increased (Chapman et al., 1985; Ohnhaus & Adler, 1975). Furthermore, the researcher found the French and English versions of the PPI to be unequal as the former refers more to the sensory dimension of pain while the latter refers more to its affective dimension.

The researcher pilot tested the VAS as a possible pain intensity measure. However, it was found to be inappropriate in the recovery room, especially for mothers who were groggy from a general anesthesia, were in acute pain, and had difficulty to see the 10 cm line; it was cumbersome for mothers who were feeding their baby and had to free their hands to rate the VAS; and finally, it was impossible to use during telephone follow-up interviews.

Downie et al. (1978) compared pain scores registered on a 4-point simple descriptive scale (SDS) similar to the PPI, an 11-point NRS and a VAS. One hundred and four patients with

rheumatic diseases rated their pain on each scale presented in random order after answering diversional questions. The NRS correlated well with the SDS (r=0.88) and with the VAS (r=0.91) and was associated with less measurement error than the other two scales. The NRS also offers more choices and is less confusing to patients than the unmarked VAS.

Jensen, Karoly, and Braver (1986) evaluated the utility and validity of six different pain intensity scales including a VAS, a 5-point verbal rating scale (VRS) similar to the PPI, and a 101-point NRS. Seventy-five chronic pain patients rated current pain as well as the least, average, and worst pain experienced during the past week on each pain scale presented in random order. The intercorrelation coefficients among the scales varied from 0.65 to 0.88 (median r=0.74). All coefficients were statistically significant ($p<0.001$). The authors concluded that the six scales were adequate measures of pain but that the 101-point NRS was a superior measure as it is extremely easy to administer and score, may be administered verbally or in writing, and is more sensitive to changes in pain intensity.

Based on the above findings, it was decided to use the 11-point Numerical Rating Scale (NRS) with verbal responses to measure present pain intensity in this study. The verbal instructions given to subjects before completion of the NRS are found in Appendix A.

Pain quality.

The 15 descriptors of the Short-Form McGill Pain Questionnaire (see Appendix B) were used as a subjective measure of the quality of postcesarean pain (Melzack, 1987).

As each type of pain was to be measured repeatedly over a period of time, the investigator chose to use the short form (SF-MPQ) rather than the long form of the McGill Pain Questionnaire (MPQ) so as not to overburden subjects. The SF-MPQ takes only 2 to 5 minutes to complete while the MPQ takes 5 to 10 minutes.

The MPQ has been widely used in pain research and is known to be a valid and reliable measure of pain (Chapman & al., 1985; Reading, 1983; Reading, Everitt, & Sledmere, 1982). Its major properties and scoring methods are described in detail by Melzack (1975). The SF-MPQ correlates highly with the standard MPQ and demonstrates similar statistical sensitivity to changes in pain quality (Melzack, 1987). An equally sensitive, valid, and reliable French version of the SF-MPQ has been developed by Melzack (1987).

Demographics and data regarding obstetrical history, anesthesia, surgery, and the newborn.

Appendix C shows the demographic information that was collected.

Anxiety.

The State-Trait Anxiety Inventory (STAI) (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983) was used as a measure

of anxiety. It is composed of two scales, one to evaluate state anxiety and one to evaluate trait anxiety. The State Anxiety Scale (SAS) assesses how the respondent feels at the moment she or he is taking the test. The Trait Anxiety Scale (TAS) assesses how the person usually feels. Each scale consists of 20 numerically rated items. Each item is given a score of 1 to 4. For some of the items, a high rating indicates a high level of anxiety while for others it indicates the absence of anxiety. The weighted scores for the anxiety-present items are the same as those indicated on the test forms. The weighted scores for the anxiety-absent items are reversed. Keeping this in mind, the scores for the STAI are computed by adding the weighted scores for the 20 items composing each scale. Scores for both scales vary from a minimum of 20 to a maximum of 80. A score of 27 or less indicates normal anxiety, 28 to 33 indicates low anxiety, 34 to 42 indicates moderate anxiety, and a score of 43 or more indicates high anxiety (Vogelsang, 1988). Approximately 10 minutes are necessary to complete the STAI. Complete instructions for respondents are printed on the test forms. The State-Trait Anxiety Inventory (STAI) has established validity and reliability and has been used extensively as a measure of anxiety in surgical patients. An equally valid and reliable French version of the STAI has been developed (Bergeron, Landry, & Bélanger, 1976).

Procedure

On the day of admission, the unit secretary gave a recruitment form (Appendix D) to each woman who met the study's inclusion criteria. All potential subjects agreed to meet with the researcher who then gave them written (Appendix E) and verbal information concerning the study and the activities involved, and answered all questions. When potential subjects agreed to participate, signed informed consent was obtained (Appendix F).

As some of the descriptors used in the Short-Form McGill Pain Questionnaire (SF-MPQ) could be beyond the subject's vocabulary, the investigator discussed the content of the SF-MPQ and defined unclear words (Melzack, 1975). Words were redefined subsequently at the subjects' request.

Then, subjects completed the State-Trait Anxiety Inventory (STAI). Once the preoperative interview was completed, demographic and medical data were collected from the subject's hospital record (Appendix C). The hospital's standard procedure for the choice of surgical anesthesia was followed.

Within the first postoperative hour, as soon as subjects were oriented, they were asked if they were experiencing pain and where it was located. They then used the 0 to 10 verbal numerical rating scale (NRS) to rate the intensity of each pain type (Appendix A). This procedure was repeated once subjects were back on the postpartum unit, as soon as they

reported pain and before they received an analgesic. These interviews lasted approximately 5 minutes. Data related to surgery were then collected from the subject's hospital record (Appendix C).

From the first through third postoperative days, the researcher interviewed subjects twice a day, once in the morning and once in the afternoon, and always at least three hours after analgesic administration. On the fourth day, only the morning interview was done.

During each interview, the mother was first asked if she was experiencing any pain. If yes, the NRS was completed for each pain type. If mothers reported movement-associated or constant incisional pain, gas pain or uterine contraction pain, they were asked to complete the SF-MPQ for each pain type (Appendix B). Information concerning type, dosage, route, and time of administration of all analgesics and any other pain relieving interventions were collected from the chart before each interview. The researcher conducted the same interview by telephone two and six weeks postpartum (see Appendix G for a copy of the follow-up interview form and Appendix H for a copy of the procedure flow-sheet).

Results

Sample Characteristics

The final convenience sample consisted of 42 women scheduled for an elective cesarean section. The demographic data for the total sample are shown in Table 1, and data regarding the subjects' obstetrical history, anesthesia, and surgery are shown in Table 2.

Eighteen obstetricians/surgeons and 6 anesthetists were involved in the care of these women. The majority of women were premedicated with Cimetidine (92.8%). Of these, 33.8% were also given atropine. Women were not given any opiates preoperatively. Intravenous oxytocin was administered to all women postoperatively. It was discontinued between 9 and 48 hours postoperatively (mean=24.32 ± 8.31).

Type of surgical anesthesia.

Fifteen mothers received general anesthesia during their cesarean delivery, 17 received complete epidural anesthesia, and 10 received incomplete epidural anesthesia, i.e. they reported experiencing acute and diffuse abdominal pain during the surgical procedure. For ethical reasons, subjects could not be assigned randomly to the anesthesia groups. At the target hospital, women scheduled for an elective cesarean section chose the type of surgical anesthesia they preferred in consultation with the anesthetist and attending obstetrician.

Table 1

Demographic Data

Variable	Mean (N=42)	SE	Range
Age	30.59	0.68	23-39
	Percent (N=42)		
Smoking			
Yes	7.70		
No	92.30		
Marital status			
Married	85.71		
Single	14.28		
Language			
English	52.38		
French	23.81		
Other	23.81		
Ethnic origin			
North American	59.52		
Other	40.48		
Occupation before pregnancy			
Working	61.90		
Staying home	38.09		

Table 2

Obstetrical History, Anesthesia and Surgery

Variable	Percent (N=42)
Para	
0	11.90
1	66.67
2	21.43
Number of previous cesarean sections	
0	26.19
1	57.14
2	16.67
Present indication for cesarean section	
Repeat cesarean	40.48
Previous CPD	23.81
Breech	21.43
Cerebrovascular malformation	4.76
Treated with heparin for DVT	4.76
Herpes	4.76
Type of surgical incision	
Transverse-low	97.62
Vertical	2.38
Sutures	
Clips/staples	83.33
Sutures/stitches	16.67
Postoperative infections	
Wound	11.90
Urinary tract	11.90
None	76.20
Feeding method	
Breast	57.14
Bottle	42.86

CPD: Cephalopelvic disproportion
DVT: Deep vein thrombosis

Table 3 outlines the demographic data for each of the three anesthesia groups. No significant between group differences were found. Details regarding the subjects' obstetrical history, anesthesia and surgery are shown in Table 4. The duration of administration of epidural anesthesia was significantly longer than the duration of administration of general anesthesia (p=0.0002). Tukey's posthoc analysis revealed that this difference was between the general anesthesia group and both epidural anesthesia groups. Furthermore, with general anesthesia, the mother is awake and in pain shortly after extubation while the effects of epidural anesthesia usually last from 2 to 3 hours after the anesthetic is administered and have been reported to last up to 8 hours (Burke, 1985; Carp, 1990; Rimar, 1985). Other variables examined were the obstetricians/surgeons and anesthetists involved in the care of the cesarean mothers, existing medical problems, preoperative medications, blood loss, and the mean postoperative time at which intravenous oxytocin was discontinued. No other significant between group differences were found. There were also no significant differences in the type of anesthetics received by women in the complete and incomplete epidural anesthesia groups.

As can be seen in Table 5, there were no significant differences in the levels of preoperative trait or state anxiety between the general, complete epidural and incomplete epidural anesthesia groups. Therefore, no relationshp was

Table 3

Demographic Data in the General (GA), Complete Epidural (CEA) and Incomplete Epidural (IEA) Anesthesia Groups

Variable	GA (N=15) Mean	SE	CEA (N=17) Mean	SE	IEA (N=10) Mean	SE	F	p
Age	28.87	1.27	31.06	0.97	32.40	1.21	2.17	.13

	GA (N=15) Percent	CEA (N=17) Percent	IEA (N=10) Percent	X^2	p
Marital status					
Married	73.33	94.12	90.00	3.01	.22
Single	26.67	5.88	10.00		
First language					
English	46.67	64.70	40.00	13.34	.65
French	13.33	23.53	40.00		
Other	40.00	11.76	20.00		
Occupation					
Work outside	53.33	70.59	60.00	1.03	.60
Home	46.67	29.41	40.00		
Smoking					
Yes	13.33	5.88	0.00		
No	86.67	76.47	100.00	1.51	.47
Ethnic origin					
North American	40.00	70.59	70.00	3.69	.16
Other	60.00	29.41	30.00		

Table 4

Obstetrical History, Anesthesia and Surgery in the General (GA), Complete Epidural (CEA) and Incomplete Epidural (IEA) Anesthesia Groups

Variable	GA (N=15) Mean	SE	CEA (N=17) Mean	SE	IEA (N=10) Mean	SE	F	p
Duration of surgery (min.)	31.73	3.72	33.76	4.27	34.60	3.66	.12	.88
Postop time of first pain measure (min).	45.00	5.25	35.00	3.45	36.30	2.65	1.51	.23
Postop time of second pain measure (min.)	189.9	12.7	182.9	10.6	200.3	16.8	.41	.66

	GA (N=15) Percent	CEA (N=17) Percent	IEA (N=10) Percent	X^2	p
Para					
0	6.67	17.65	10.00	3.77	.44
1	73.33	70.59	50.00		
2	20.00	11.76	40.00		
Number of previous cesareans					
0	13.33	29.41	40.00	1.74	.78
1	60.00	58.82	50.00		
2	13.33	11.76	30.00		
Indication for this cesarean					
Repeat	46.67	29.41	50.00	1.59	.95
Previous CPD	20.00	29.41	20.00		
Breech	20.00	23.53	20.00		
Other	13.33	17.65	10.00		

CPD: Cephalopelvic disproportion

Table 4 (continued)

Variable	GA (N=15) Percent	CEA (N=17) Percent	IEA (N=10) Percent	X^2	p
Sutures					
Clips	80.00	94.12	70.00	2.82	.24
Stitches	20.00	5.88	30.00		
Tubal ligation					
Yes	13.33	5.88	30.00		
No	86.67	94.12	70.00	3.01	.22
Wound infection					
Yes	6.66	5.88	30.00	4.09	>.10
No	93.33	94.12	70.00		
Urinary tract infection					
Yes	13.33	11.76	10.00	.07	>.95
No	86.67	88.23	90.00		
Type of anesthetic					
.N2O2+O2+ Enflurane	53.33	.00	.00	____	____
.N2O2+O2+ Isomurane	26.67	.00	.00	____	____
.Unknown	20.00	.00	.00	____	____
.Lidocaine	.00	29.41	30.00	____	____
.Lidocaine+ Epinephrine	.00	58.82	60.00	____	____
.Lidocaine+ Bupivacaine	.00	11.76	10.00	____	____

Table 5

Preoperative Anxiety Levels in the General (GA), Complete Epidural (CEA) and Incomplete Epidural (IEA) Anesthesia Groups

	GA (N=15)		CEA (N=17)		IEA (N=10)			
Variable	Mean	SE	Mean	SE	Mean	SE	F	p
Trait	35.27	1.82	32.00	2.05	33.70	2.58	0.68	.51
State	39.47	2.72	34.41	1.83	37.50	3.72	1.09	.35

found between mothers' preoperative anxiety level and choice of surgical anesthesia. In light of this, preoperative anxiety was not considered as an intervening variable in the relationship between type of anesthesia and postcesarean pain.

Table 6 outlines the mean number of doses of analgesic taken by each subject in each anesthesia group. Because the time of surgery varied considerably between subjects, the total number of doses administered to each patient on the day of surgery was divided by the number of hours from the end of surgery to midnight (2400h); this value was then multiplied by 24 hours so that the rate of intake was consistent with the succeeding three postcesarean days. A significant between group difference was found only on the day of surgery, and Tukey's posthoc analysis revealed that it was between the general and the incomplete epidural anesthesia groups.

Table 7 outlines the characteristics of the newborns within each anesthesia group. The one minute apgar score was significantly lower in the general anesthesia group babies, and Tukey's posthoc analysis revealed that this difference existed between the general and the incomplete epidural anesthesia groups. No other significant group differences were found in the characteristics of the newborns.

Chi-square analysis and ANOVA revealed few significant differences in subject characteristics between the general, complete epidural and incomplete epidural anesthesia groups. Therefore, the three groups were considered equivalent.

Table 6

Mean Number of Doses of Analgesic Ingested per Subject in the General (GA), Complete Epidural (CEA) and Incomplete Epidural Anesthesia (IEA) Groups on Postoperative Days 0 to 3

	GA (N=15)		CEA (N=17)		IEA (N=10)			
Variable	Mean	SE	Mean	SE	Mean	SE	F	p
POD 0	13.27	2.05	6.06	0.41	5.90	0.48	10.47	.0002
POD 1	4.53	0.19	5.23	0.20	5.20	0.49	2.21	.12
POD 2	3.40	0.25	3.88	0.39	4.50	0.27	2.29	.11
POD 3	3.53	0.29	3.06	0.43	3.90	0.28	1.21	.31

Table 7

Characteristics of Newborns in the General (GA), Complete Epidural (CEA) and Incomplete Epidural Anesthesia (IEA) Groups

Variable	GA (N=15) Percent	CEA (N=17) Percent	IEA (N=10) Percent	X^2	p
Sex					
Female	57.14	35.29	80.00	5.16	.07
Male	42.86	64.70	20.00		
Feeding method					
Breast	46.67	70.59	50.00	2,13	.34
Bottle	53.33	29.41	50.00		
Complications					
None	100.00	94.12	90.00	____	___
Jaundice only	0.00	0.00	10.00		
Lung tear & jaundice	0.00	5.88	0.00		

	GA (N=15)		CEA (N=17)		IEA (N=10)			
	Mean	SE	Mean	SE	Mean	SE	F	p
Weight (gm)	3233	196	3429	97	3643	90	1.70	.19
Apgar 1 min.	7.21	0.41	8.06	0.35	8.60	0.16	3.44	.04
Apgar 5 min.	9.00	0.17	9.23	0.20	9.70	0.15	3.01	.06

Type and Frequency of Postcesarean Pain

A list of all pain types reported by subjects during the first six postpartum weeks appears in Table 8. The frequencies represent the percentage of mothers reporting a pain type at least once during the first six postpartum weeks. The most commonly reported postcesarean pain types were movement-associated and constant incisional pain, gas pain, and uterine contraction pain. Throat pain was reported only by general anesthesia mothers while interscapular pain was reported only by epidural anesthesia mothers. Back pain was still reported by 11.9% of mothers in the second postpartum week and up to 17.1% by the sixth postpartum week. Only 7.1% of mothers were still reporting pain associated with engorged breasts in the second postpartum week and 2.9% in the sixth postpartum week. The intramuscular injection sites were still tender to touch in 14.3% of mothers in the second postpartum week and in 11,4% of mothers in the sixth postpartum week.

Frequency, Intensity and Duration of the Most Common Pain Types

Table 9 lists the frequencies of the four most commonly reported postcesarean pain types for each pain measure completed during the immediate and early postoperative period and up to the sixth postpartum week. Figure 1 illustrates the mean pain intensity for each of these pain types upon each pain measure completed during the immediate and early postoperative period and up to the sixth postpartum week.

Table 8

Percent of Subjects Reporting Each Pain Type at Least Once During the First Six Postpartum Weeks

Pain type	Percent (N=42)
Movement-associated incisional	100.00
Constant incisional	100.00
Gas	88.09
Uterine contractions	83.33
Back	73.81
Engorged breasts	47.62
Intramuscular injection sites	23.81
Interscapular	19.05
Throat	16.67
Intravenous catheter	14.28
Urinary catheter	2.38

Table 9

Percent of Subjects Reporting Movement-Associated and Constant Incisional Pain (MAIP and CIP), Gas Pain (GP) and Uterine Contraction Pain (UCP) on Postoperative Days 0 to 4 and Postpartum weeks 2 and 6

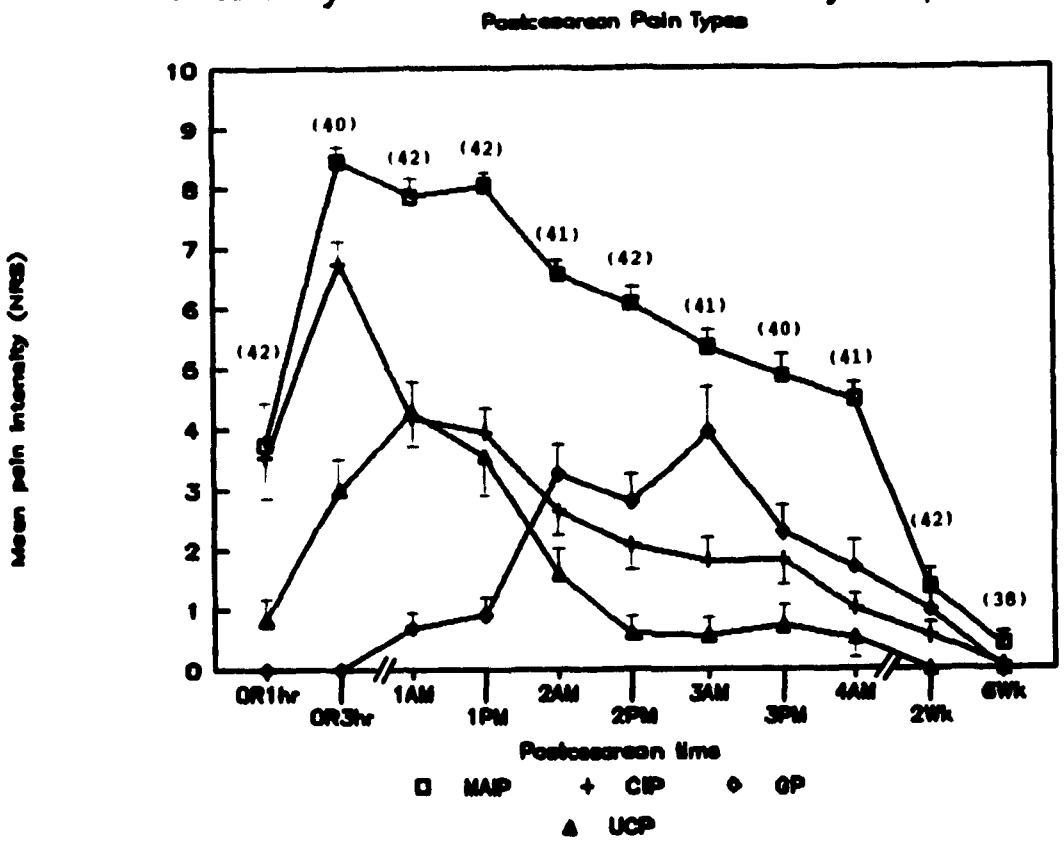
Postpartum time	MAIP	CIP	GP	UCP
Day 0 1hr (N=42)	42.86	42.86	0.00	9.52
Day 0 3hr (N=40)	100.00	95.00	0.00	42.50
Day 1 AM (N=42)	100.00	92.86	11.90	61.90
Day 1 PM (N=42)	100.00	76.19	16.67	52.38
Day 2 AM (N=41)	100.00	58.54	58.54	21.95
Day 2 PM (N=42)	97.62	45.24	50.00	9.52
Day 3 AM (N=41)	97.56	41.46	55.00	7.32
Day 3 PM (N=40)	97.50	37.50	42.50	10.00
Day 4 AM (N=41)	97.56	29.27	31.71	4.88
Week 2 (N=42)	47.62	11.90	21.43	0.00
Week 6 (N=38)	11.43	2.86	0.00	0.00

Figure 1. Mean intensity scores of the four most common pain types (movement-associated incisional pain or MAIP, constant incisional pain or CIP, gas pain or GP and uterine contraction pain or UCP).

OR1hr=first postoperative hour, OR3hr=third postoperative hour, 1AM=morning of postoperative day 1, 1PM=afternoon of postoperative day 1, 2AM=morning of postoperative day 2, 2PM=afternoon of postoperative day 2, 3AM=morning of postoperative day 3, 3PM=afternoon of postoperative day 3, 4AM=morning of postoperative day 4, 2Wk=second postoperative week, and 6Wk=sixth postoperative week.

The vertical bars through each point represent the standard error of the mean and the numbers in parenthesis, the sample size.

Intensity of the Most Commonly Reported



Movement-associated incisional pain was the most frequent, intense, and long lasting of all pain types reported by postcesarean mothers from the day of surgery to the sixth postpartum week. It reached its highest intensity on the third postoperative hour (8.45 ± 0.30) and was reported by 100% of subjects at that time. Its intensity decreased slowly from the afternoon of the first postoperative day to the morning of the fourth postoperative day when it was still at a mean of 4.49 ± 0.32. In that same time interval, the frequency of movement-associated incisional pain remained stable varying only between 100% and 97.56%. By the second postoperative week, although its intensity had diminished considerably, this pain type was still reported by close to 50% of mothers and by 11.43% on the sixth week postpartum. Fifteen percent of mothers reporting movement-associated incisional pain on the second postpartum week and 75% of mothers reporting it on the sixth postpartum week had a wound infection.

The frequency and intensity of constant incisional pain also peaked on the third hour following surgery when it was reported by 95% of mothers at a mean intensity of 6.72 ± 0.41. However, its frequency and intensity decreased rapidly afterwards. On the fourth day postpartum, it was reported by 29.27% of subjects at a mean intensity of 1.00 ± 0.27. Constant incisional pain was still reported by 5 mothers in the second week postpartum, one of which had a wound

infection, and by 1 mother on the sixth week postpartum (no wound infection). The mean intensities were 0.55 ± 0.25 in the second and 0.06 ± 0.05 in the sixth week postpartum. On average, constant incisional pain was reported at a lower frequency and intensity, and also had a shorter duration when compared to movement-associated incisional pain.

Although gas pain was reported by 11.90% of mothers as early as postoperative day 1, its frequency peaked on the second day following surgery and decreased slightly on the third and fourth days. Its intensity rose sharply between the afternoon of postoperative day 1 (0.90 ± 0.33) and the morning of day 2 (3.24 ± 0.51). It peaked on the morning of day 3 (3.95 ± 0.77). It subsequently decreased steadily although by the second week postpartum, 9 mothers were still reporting gas pain at a mean intensity of 0.98 ± 0.34. Gas pain was not reported on the sixth week postpartum. A total of 14.28% of mothers never experienced gas pain.

As many as 42.50% of mothers experienced uterine contraction pain 3 hours following surgery. Its frequency and intensity increased steadily and peaked on the morning of the first postoperative day when it was reported by 61.90% of mothers at a mean intensity of 4.29 ± 0.56. At this time, 69% of mothers were receiving an intravenous infusion of oxytocin. By the afternoon of the first postoperative day, half the mothers were still experiencing uterine contraction pain. Its frequency and intensity decreased steadily until the afternoon

of the second postoperative day, when intravenous oxytocin infusions had been discontinued in all mothers, and then remained mild. On the morning of the fourth postoperative day, only 2 mothers reported this pain type. Uterine contraction pain was not reported in the second and sixth weeks postpartum and was never experienced by 16.67% of mothers.

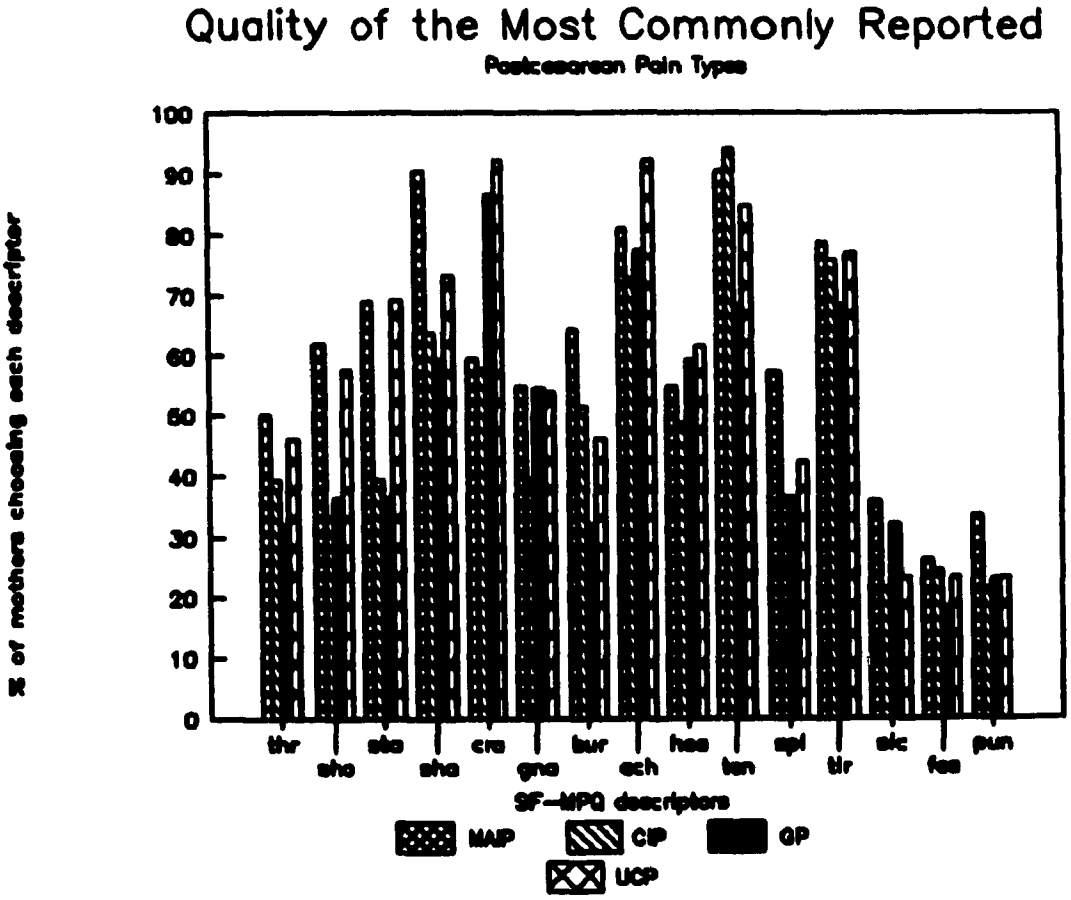
Words Used to Describe the Quality of the Most Common Pain Types

Subjects' descriptions of the quality of the four most commonly reported postcesarean pain types were consistent across the postpartum period. Therefore, the investigator reported the percentage of mothers choosing each descriptor when the pain types were at their highest mean intensity. Only mothers reporting pain were included in the data analysis of the quality of pain. Therefore, the percentages were computed on the basis of n being the number of mothers experiencing each pain type.

Figure 2 illustrates the percentage of mothers choosing each descriptor for each pain type. The words tender (90.5%), sharp (90.5%), aching (80.9%), tiring (78.6%), and stabbing (69%) were used by more than 65% of subjects to describe movement-associated incisional pain. For constant incisional pain, the words tender (93.9%), tiring (75.7%), and aching (72.7%) were most frequently chosen. For gas pain, the most common descriptors were cramping (86.4%), aching (77.3%),

Figure 2. Percent of mothers choosing each word to describe the four most common pain types when reported at their highest mean intensity (incisional pains and uterine contraction pain on day 1, gas pain on day 3).

MAIP=Movement-associated incisional pain, CIP=constant incisional pain, GP=gas pain, and UCP=uterine contraction pain. Thr=throbbing, sho=shooting, sta=stabbing, sha=sharp, cra=cramping, gna=gnawing, bur=burning, ach=aching, hea=heavy, ten=tender, spl=splitting, tir=tiring, sic=sickening, fea=fearful, and pun=punishing-cruel.


Quality of the Most Commonly Reported
Postcesarean Pain Types
% of mothers choosing each descriptor
100
90
80
70
60
50
40
30
20
10
0
thr
sho
abs
sha
cra
gna
bur
ach
hea
ten
spl
tir
sic
fea
pun
SF-MPQ descriptors
MAP
CIP
OP
UCP

tender (68.2%), and tiring (68.2%). Uterine contraction pain was most frequently described as a cramping (92.3%), aching (92.3%), tender (84.6%), tiring (76.9%), sharp (73.1%), and stabbing (69.2%) sensation. Interestingly, the words tender, aching, and tiring were used by more than 65% of subjects to describe all four pain types.

Relationship Between the Frequency of the Most Common Pain Types and the Type of Surgical Anesthesia

Figures 3 to 6 illustrate the frequency of mothers reporting each of the four most commonly reported postcesarean pain types for each pain measure completed during the immediate and early postoperative period and up to the sixth postpartum week. Very few significant differences were found between the three anesthesia groups in the frequency of each pain type.

While 100% of mothers in the general anesthesia group reported movement-associated and constant incisional pain within the first postoperative hour, only 11.76% of mothers in the complete epidural and 10% in the incomplete epidural anesthesia group reported these pain types (see Figures 3 & 4). Chi-square analysis revealed that this difference was significant ($X^2=31.11$; $p=0.01$) and comparison of the observed and expected frequencies for each anesthesia group cells revealed that all three groups significantly contributed to this difference.

The frequency of movement-associated incisional pain was

Figure 3. Frequency of subjects reporting movement-associated incisional pain in the general (GA), complete epidural (CEA) and incomplete epidural (IEA) anesthesia groups.

OR1hr=first postoperative hour, OR3hr=third postoperative hour, 1AM=morning of postoperative day 1, 1PM=afternoon of postoperative day 1, 2AM=morning of postoperative day 2, 2PM=afternoon of postoperative day 2, 3AM=morning of postoperative day 3, 3PM=afternoon of postoperative day 3, 4AM=morning of postoperative day 4, 2Wk=second postoperative week, and 6Wk=sixth postoperative week.

An asterisk (*) indicates a significant between group difference at the 0.05 level.

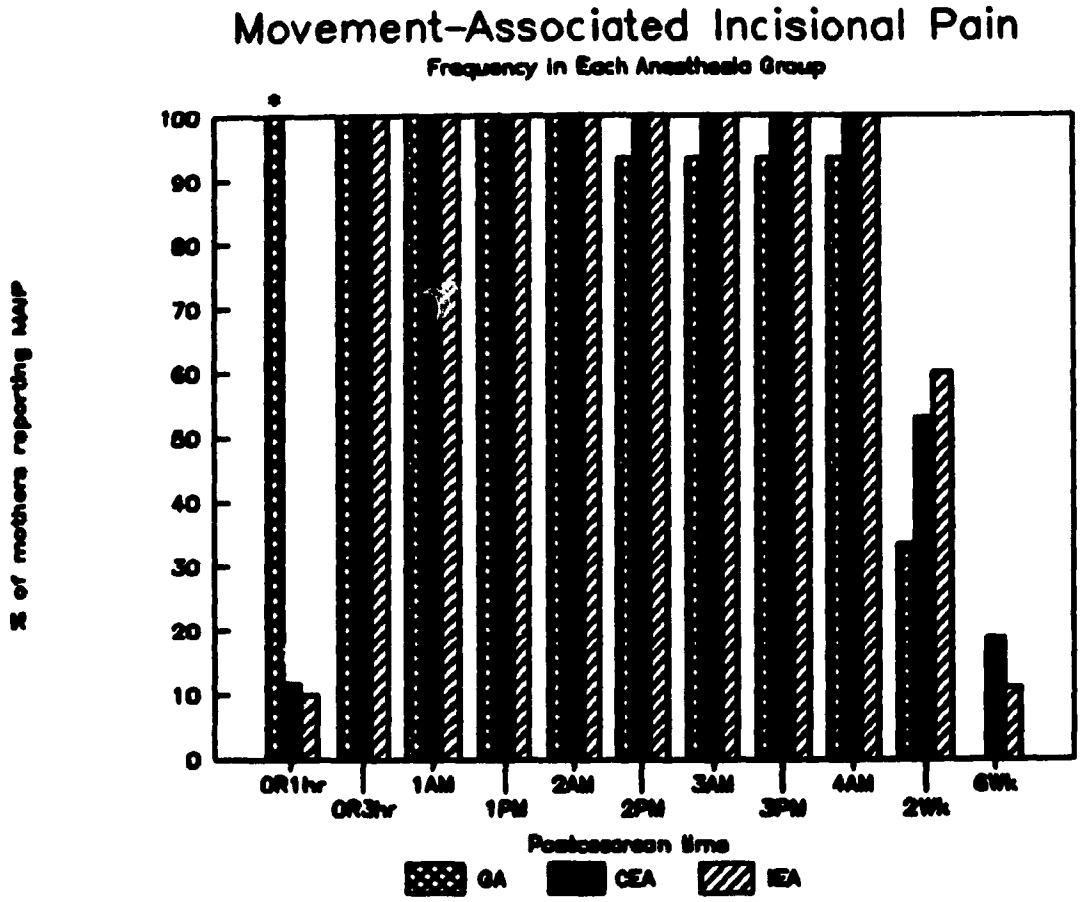
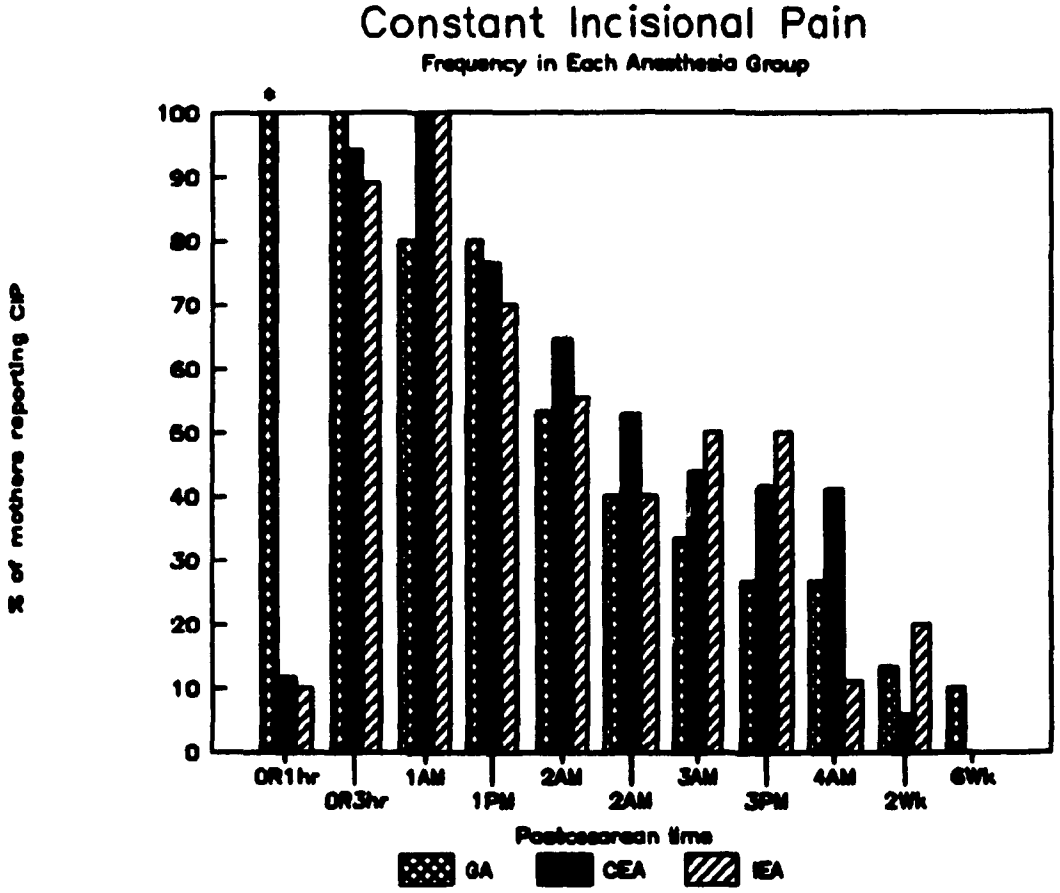

Movement-Associated Incisional Pain
Frequency in Each Anesthesia Group
% of mothers reporting MAIP
100
90
80
70
60
50
40
30
20
10
0
OR1hr
OR3hr
1AM
1PM
2AM
2PM
3AM
3PM
4AM
2Wk
6Wk
Postcesarean time
GA
CEA
IEA

Figure 4. Frequency of subjects reporting constant incisional pain in the general (GA), complete epidural (CEA) and incomplete epidural (IEA) anesthesia groups.

OR1hr=first postoperative hour, OR3hr=third postoperative hour, 1AM=morning of postoperative day 1, 1PM=afternoon of postoperative day 1, 2AM=morning of postoperative day 2, 2PM=afternoon of postoperative day 2, 3AM=morning of postoperative day 3, 3PM=afternoon of postoperative day 3, 4AM=morning of postoperative day 4, 2Wk=second postoperative week, and 6Wk=sixth postoperative week.

An asterisk (*) indicates a significant between group difference at the 0.05 level.


Constant Incisional Pain
Frequency in Each Anesthesia Group
% of mothers reporting CIP
100
90
80
70
60
50
40
30
20
10
0
OR1hr
OR3hr
1AM
1PM
2AM
2AM
3AM
3PM
4AM
2Wk
6Wk
Postcesarean time
GA
CEA
IEA

consistently high in all three anesthesia groups from the third postoperative hour to the fourth postoperative morning. It decreased considerably within the second and sixth postpartum weeks (see Figure 3). The frequency of mothers reporting constant incisional pain decreased steadily from the morning of the first postoperative day to the sixth postpartum week in all three groups (see figure 4).

Chi-square analysis revealed that significantly more general anesthesia mothers (46.67%) were still experiencing mild gas pain in the second postpartum week compared to 6.25% in the complete epidural anesthesia group and 10% in the incomplete epidural anesthesia group ($X^2=8.88$; $p<0.02$) (see Figure 5). Comparison of the observed and expected frequencies in each anesthesia group cells indicated that the general anesthesia group was the only significant contributor to this difference. By the sixth week postpartum, no mothers in either group reported gas pain.

No significant between group differences were observed for uterine contraction pain (see Figure 6).

<u>Relationship Between the Intensity of the Most Common Pain Types and the Type of Surgical Anesthesia</u>

Figures 7 to 10 illustrate the mean pain intensity curves for each of the four most commonly reported postcesarean pain types on postoperative days 0 to 4, and 2 and 6 weeks postpartum, in the three anesthesia groups.

Figure 5. Frequency of subjects reporting gas pain in the general (GA), complete epidural (CEA) and incomplete epidural (IEA) anesthesia groups.

OR1hr=first postoperative hour, OR3hr=third postoperative hour, 1AM=morning of postoperative day 1, 1PM=afternoon of postoperative day 1, 2AM=morning of postoperative day 2, 2PM=afternoon of postoperative day 2, 3AM=morning of postoperative day 3, 3PM=afternoon of postoperative day 3, 4AM=morning of postoperative day 4, 2Wk=second postoperative week, and 6Wk=sixth postoperative week.

An asterisk (*) indicates a significant between group difference at the 0.05 level.

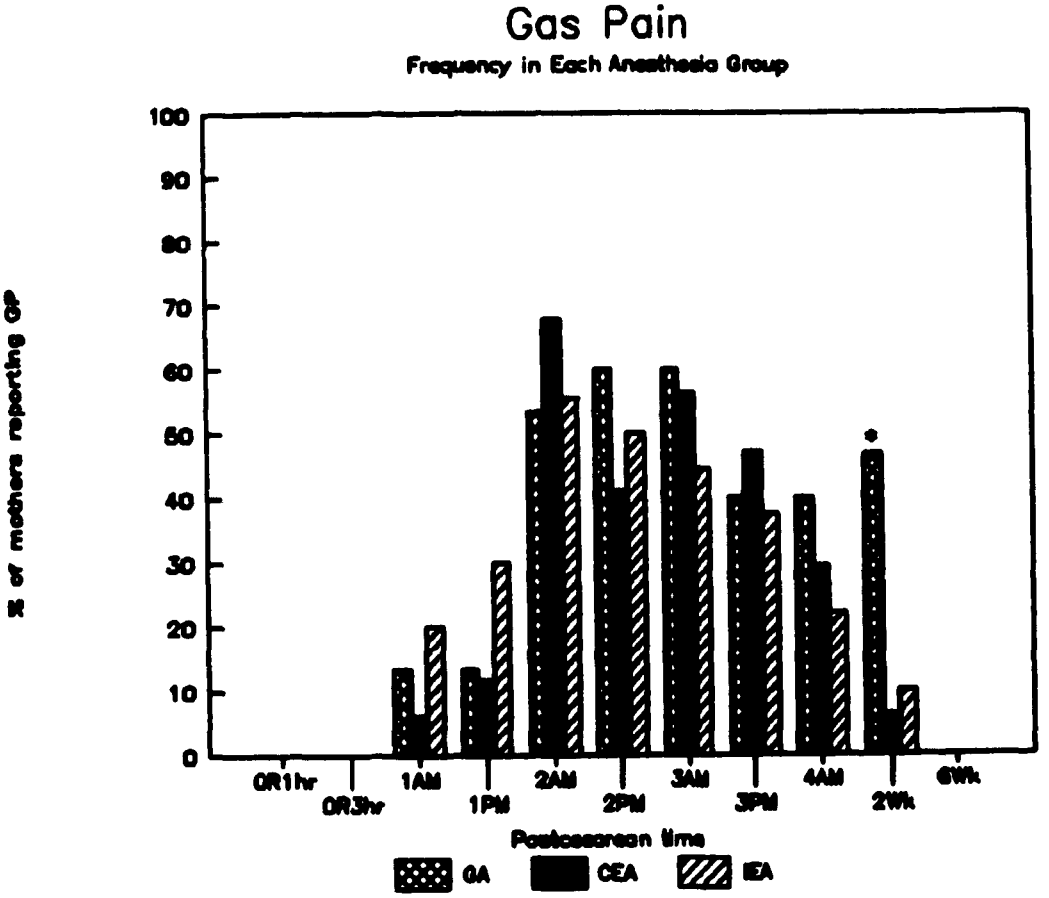
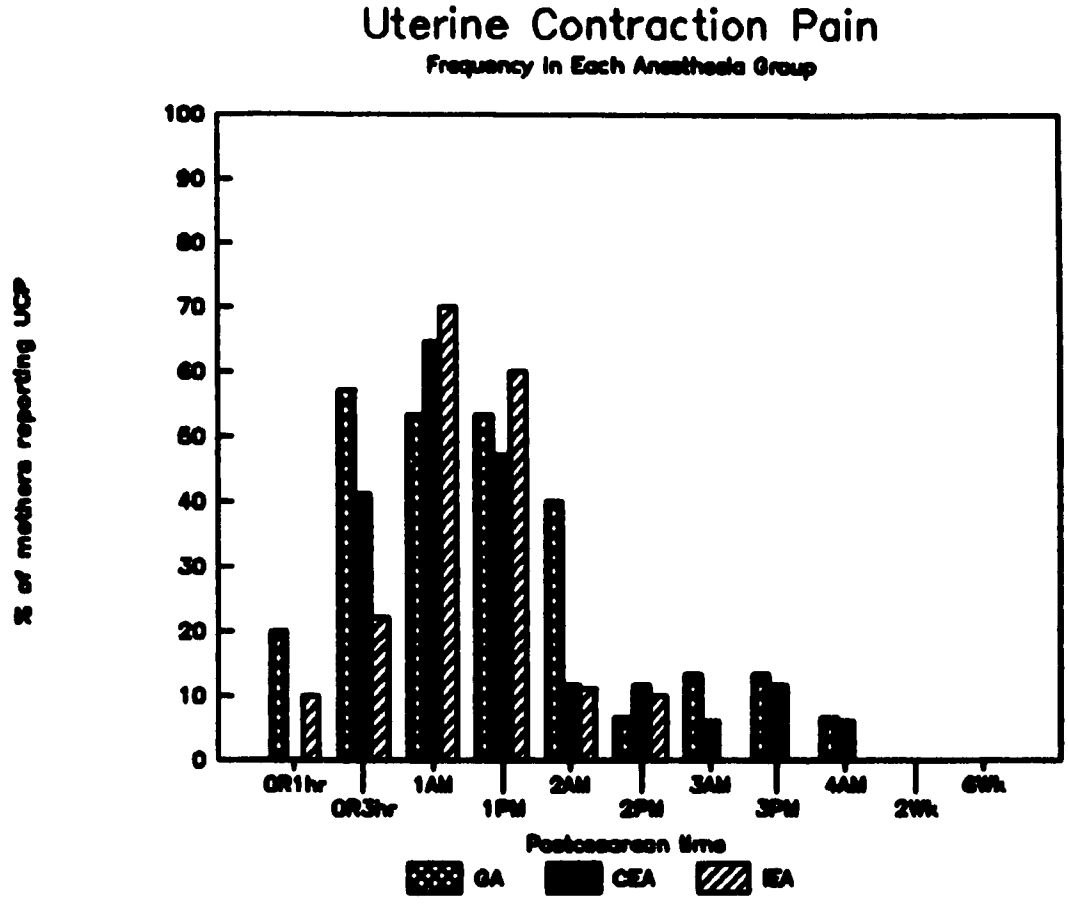

Gas Pain
Frequency in Each Anesthesia Group
% of mothers reporting GP
100
90
80
70
60
50
40
30
20
10
0
OR1hr
OR3hr
1AM
1PM
2AM
2PM
3AM
3PM
4AM
2Wk
6Wk
Postcesarean time
GA
CEA
EA

Figure 6. Frequency of subjects reporting uterine contraction pain in the general (GA), complete epidural (CEA) and incomplete epidural (IEA) anesthesia groups.

OR1hr=first postoperative hour, OR3hr=third postoperative hour, 1AM=morning of postoperative day 1, 1PM=afternoon of postoperative day 1, 2AM=morning of postoperative day 2, 2PM=afternoon of postoperative day 2, 3AM=morning of postoperative day 3, 3PM=afternoon of postoperative day 3, 4AM=morning of postoperative day 4, 2Wk=second postoperative week, and 6Wk=sixth postoperative week.


Uterine Contraction Pain
Frequency in Each Anesthesia Group
% of mothers reporting UCP
100
90
80
70
60
50
40
30
20
10
0
OR1hr
OR3hr
1AM
1PM
2AM
2PM
3AM
3PM
4AM
2Wk
6Wk
Postcesarean time
GA
CEA
IEA

Movement-associated incisional pain.

Throughout the first 4 postoperative days, the intensity of movement-associated incisional pain reported by subjects who received general anesthesia was consistently higher than that reported by those receiving complete epidural anesthesia (see Figure 7). However, analysis of variance (ANOVA) revealed that those differences only attained statistical significance at 1 hour ($F=105.33$; $p=0.00$), 3 hours ($F=3.35$; $p=0.04$), and 2 days ($F=5.83$; $p=0.006$) following surgery.

From the afternoon of postoperative day 2 to the morning of day 4, pain intensities in the general and incomplete epidural anesthesia groups were very similar and higher compared to the complete epidural anesthesia group, although these differences were not statistically significant. During the remainder of the study, intensities declined gradually for all three groups. By the sixth week postpartum, no mothers in the general anesthesia group experienced this pain type whereas 3 in the complete epidural group and 1 in the incomplete epidural group experienced a mild form of it.

Constant incisional pain.

Constant incisional pain reached its highest intensity on the day of surgery for all three anesthesia groups (see Figure 8). ANOVA revealed that mothers in both epidural anesthesia groups reported significantly lower intensities for constant incisional pain within the first hour after surgery ($F=85.96$; $p=0.00$) as well as 3 hours following surgery ($F=4.58$; $p=0.02$).

Figure 7. Mean intensity of movement-associated incisional pain in the general (GA), complete epidural (CEA) and incomplete epidural (IEA) anesthesia groups.

OR1hr=first postoperative hour, OR3hr=third postoperative hour, 1AM=morning of postoperative day 1, 1PM=afternoon of postoperative day 1, 2AM=morning of postoperative day 2, 2PM=afternoon of postoperative day 2, 3AM=morning of postoperative day 3, 3PM=afternoon of postoperative day 3, 4AM=morning of postoperative day 4, 2Wk=second postoperative week, and 6Wk=sixth postoperative week.

An asterisk (*) indicates a significant between group difference at the 0.05 level.

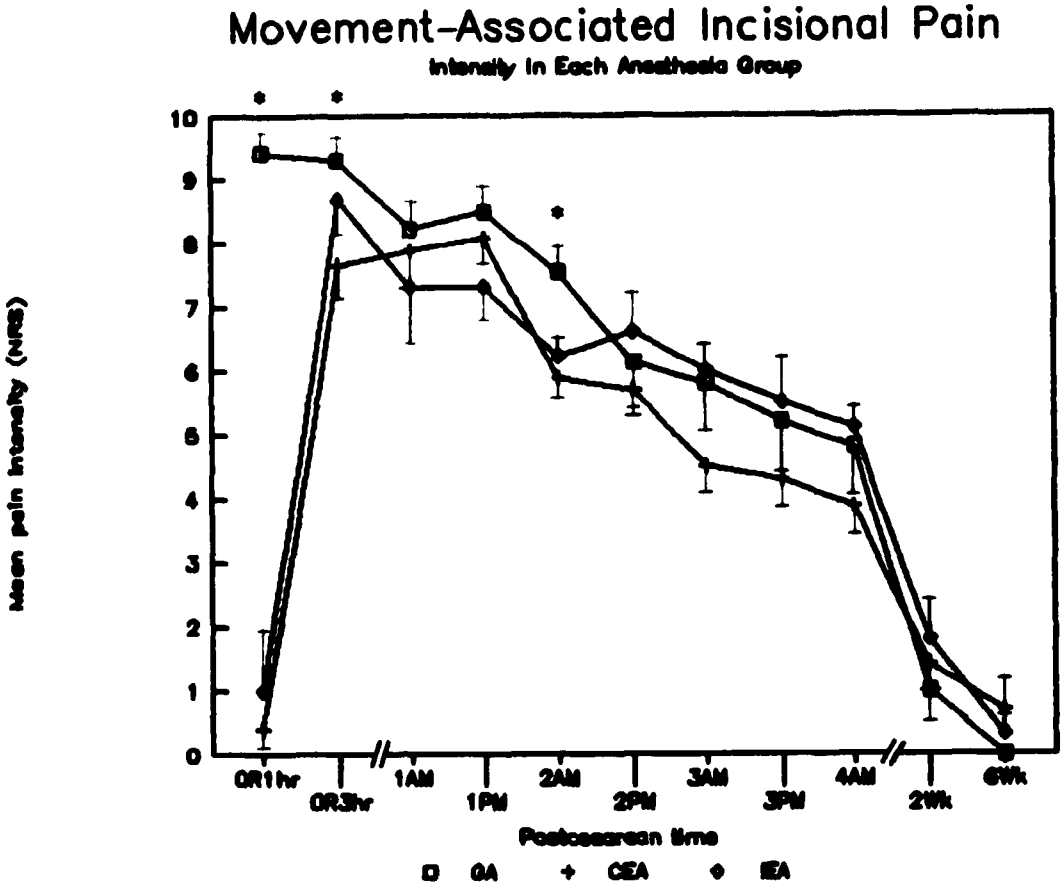
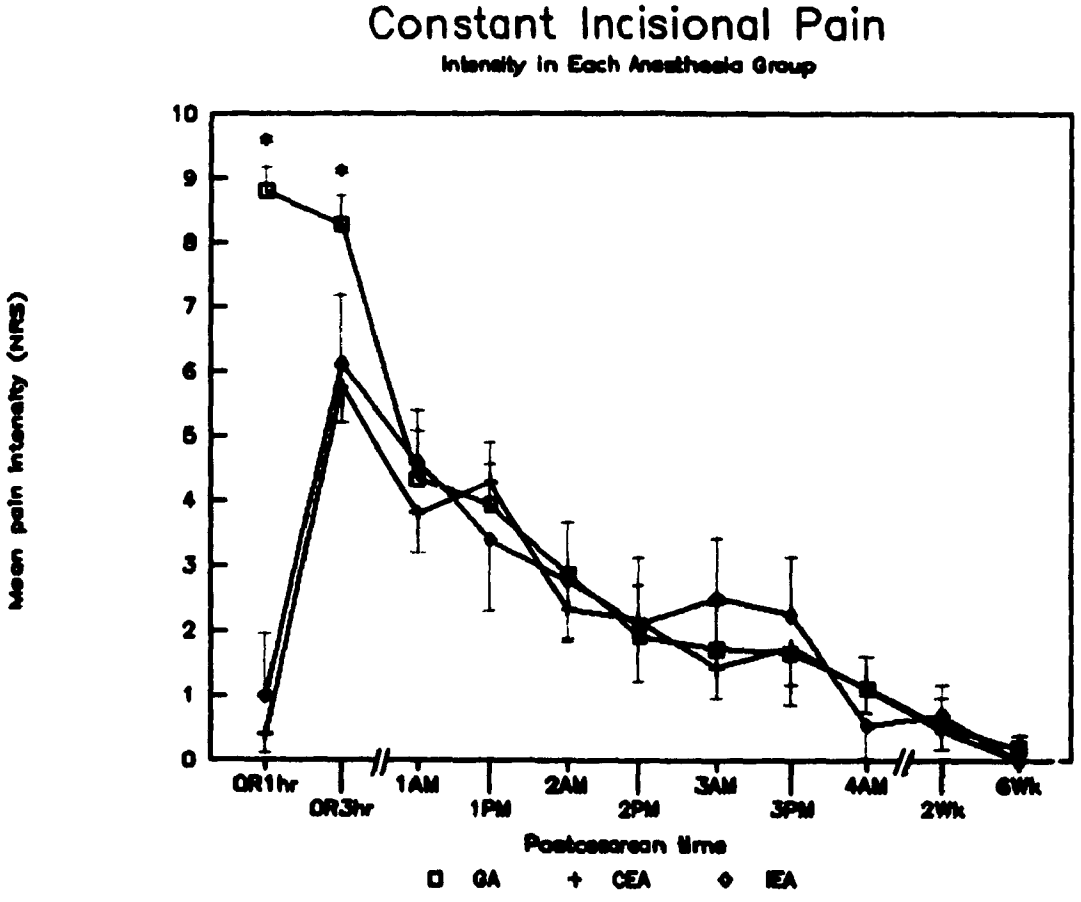

Movement-Associated Incisional Pain
Intensity in Each Anesthesia Group
Mean pain intensity (NRS)
10
9
8
7
6
5
4
3
2
1
0
OR1hr
OR3hr
1AM
1PM
2AM
2PM
3AM
3PM
4AM
2Wk
6Wk
Postcesarean time
GA
CEA
EA

Figure 8. Mean intensity of constant incisional pain in the general (GA), complete epidural (CEA) and incomplete epidural (IEA) anesthesia groups.

OR1hr=first postoperative hour, OR3hr=third postoperative hour, 1AM=morning of postoperative day 1, 1PM=afternoon of postoperative day 1, 2AM=morning of postoperative day 2, 2PM=afternoon of postoperative day 2, 3AM=morning of postoperative day 3, 3PM=afternoon of postoperative day 3, 4AM=morning of postoperative day 4, 2Wk=second postoperative week, and 6Wk=sixth postoperative week.

An asterisk (*) indicates a significant between group difference at the 0.05 level.


Constant Incisional Pain
Intensity in Each Anesthesia Group
Mean pain intensity (NRS)
10
9
8
7
6
5
4
3
2
1
0
OR1hr
OR3hr
1AM
1PM
2AM
2PM
3AM
3PM
4AM
2Wk
6Wk
Postcesarean time
GA
CEA
IEA

No significant between group differences were noted at any other time.

Gas pain.

The majority of women experienced mild to moderate gas pain between the morning of the second postoperative day and the morning of the fourth postoperative day (see Figure 9). During that time period and until the second week postpartum, epidural mothers consistently reported lower intensities of gas pain when compared to general anesthesia mothers. However, ANOVA revealed that the differences were significant only in the second postpartum week ($F=6.69$; $p=0.003$). By 6 weeks postpartum, no mothers were reporting this pain type.

Uterine contraction pain.

The intensity of uterine contraction pain peaked 3 hours following surgery for the general anesthesia group and remained high until the afternoon of postoperative day 2 when it decreased sharply to levels similar to that reported by the epidural anesthesia groups (see Figure 10). In both epidural anesthesia groups, the intensity of uterine contraction pain did not peak until the morning of postoperative day 1. It then declined rapidly in both groups. This decline coincided with discontinuation of oxytocin. Intensities in all groups remained low and similar throughout the rest of the study. No significant between group differences were found. By 2 weeks postpartum, no subjects were reporting this pain type.

Figure 9. Mean intensity of gas pain in the general (GA), complete epidural (CEA) and incomplete epidural (IEA) anesthesia groups.

OR1hr=first postoperative hour, OR3hr=third postoperative hour, 1AM=morning of postoperative day 1, 1PM=afternoon of postoperative day 1, 2AM=morning of postoperative day 2, 2PM=afternoon of postoperative day 2, 3AM=morning of postoperative day 3, 3PM=afternoon of postoperative day 3, 4AM=morning of postoperative day 4, 2Wk=second postoperative week, and 6Wk=sixth postoperative week.

An asterisk (*) indicates a significant between group difference at the 0.05 level.

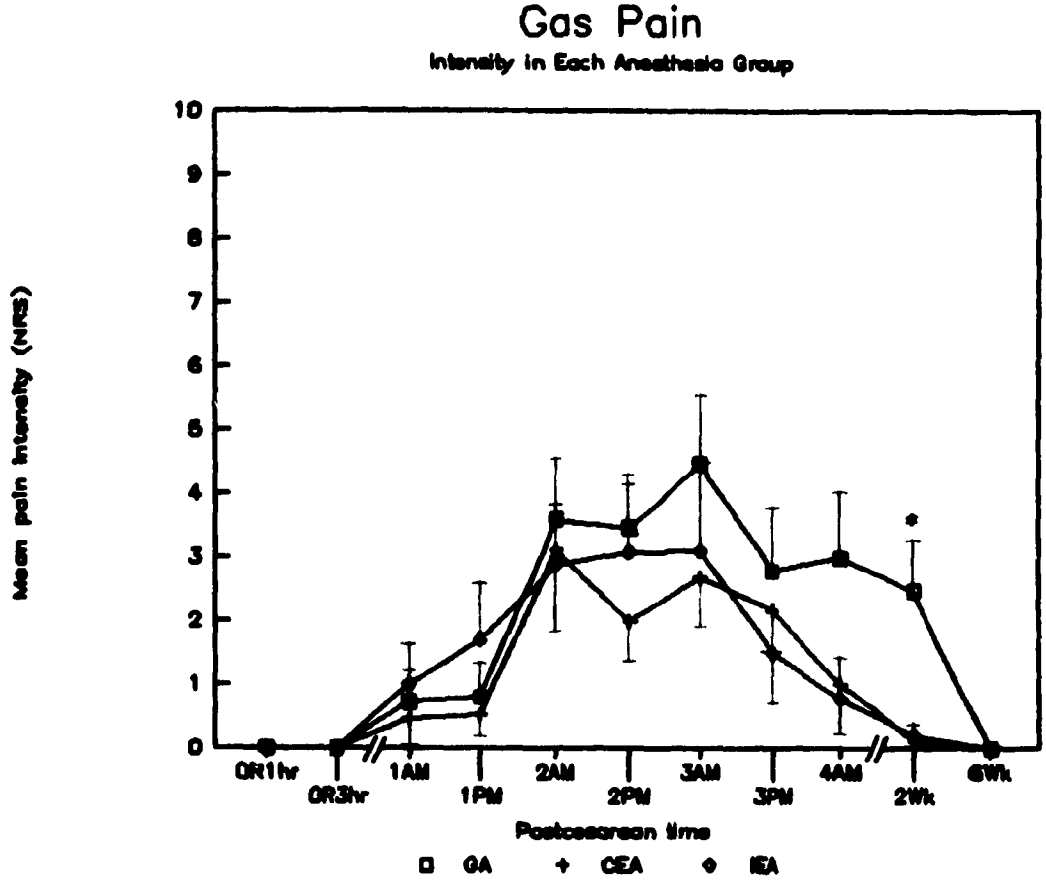
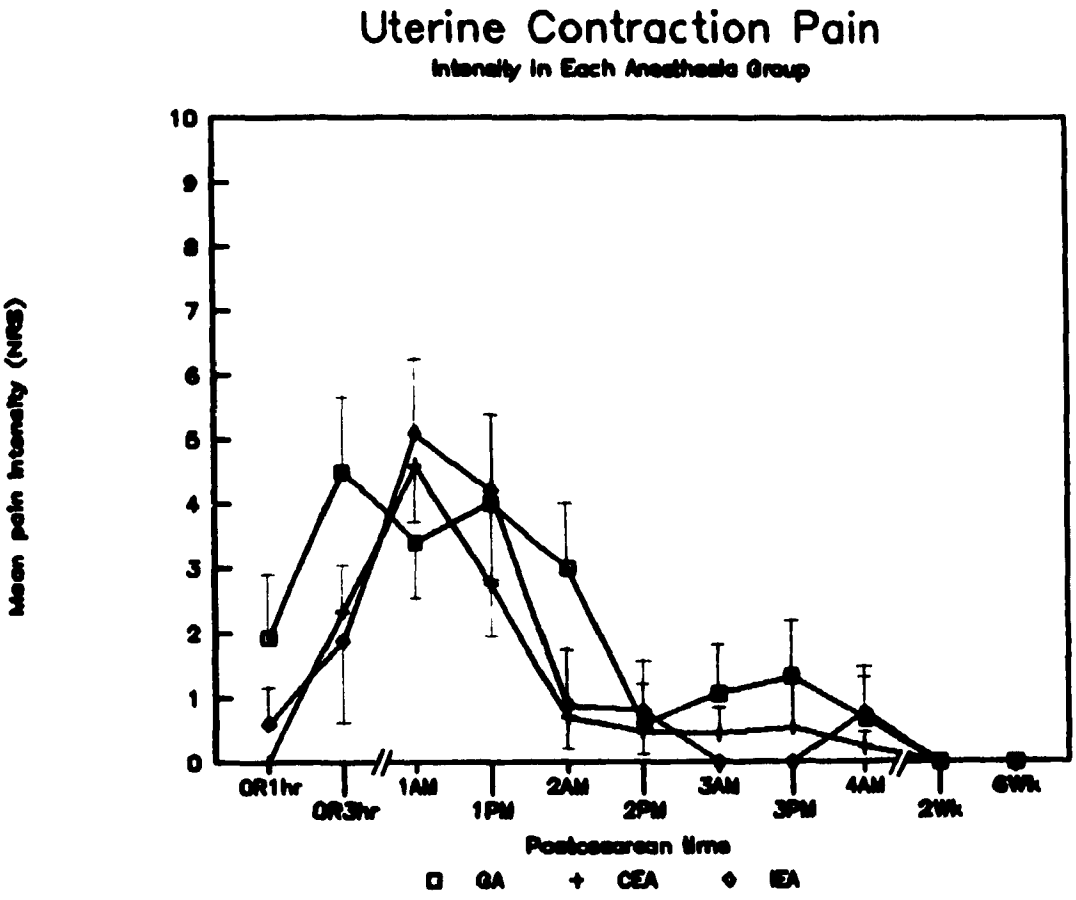

Gas Pain
Intensity in Each Anesthesia Group
Mean pain intensity (NRS)
10
9
8
7
6
5
4
3
2
1
0
OR1hr
OR3hr
1AM
1PM
2AM
2PM
3AM
3PM
4AM
2Wk
6Wk
Postcesarean time
GA
CEA
IEA

Figure 10. Mean intensity of uterine contraction pain in the general (GA), complete epidural (CEA) and incomplete epidural (IEA) anesthesia groups.

OR1hr=first postoperative hour, OR3hr=third postoperative hour, 1AM=morning of postoperative day 1, 1PM=afternoon of postoperative day 1, 2AM=morning of postoperative day 2, 2PM=afternoon of postoperative day 2, 3AM=morning of postoperative day 3, 3PM=afternoon of postoperative day 3, 4AM=morning of postoperative day 4, 2Wk=second postoperative week, and 6Wk=sixth postoperative week.


Uterine Contraction Pain
Intensity in Each Anesthesia Group
Mean pain intensity (NRS)
10
9
8
7
6
5
4
3
2
1
0
OR1hr
OR3hr
1AM
1PM
2AM
2PM
3AM
3PM
4AM
2Wk
6Wk
Postcesarean time
GA
CEA
IEA

Summary

Among pain types reported by postcesarean women, movement-associated and constant incisional pain (reported by 100% of subjects), gas pain (88%), and uterine contraction pain (83%) were the most common. The data suggest that movement-associated incisional pain was the least well controlled pain type of the postcesarean pain experience. Its intensity remained in the moderate to severe range up to the fourth postcesarean day when it was still reported by 97% of mothers. In describing the quality of these pain types, the words tender, aching, and tiring, were used by more than 65% of subjects to describe all four pain types.

Comparisons of the general anesthesia to the complete epidural anesthesia group revealed consistent between group differences for movement-associated incisional pain only, with the general anesthesia group reporting higher pain intensities. However, most of these differences were not statistically significant. Interestingly, on postoperative days 2 to 4, the pain intensities reported by the incomplete epidural anesthesia group for movement-associated incisional pain were more similar to those reported by the general anesthesia group than to those reported by the complete epidural anesthesia group.

Once the anesthetic effect of the epidural had worn off, the pain intensity trajectories of constant incisional pain, gas pain, and uterine contraction pain were very similar

between all three anesthesia groups. Gas pain intensity was somewhat higher in the general anesthesia group on postoperative days 2 to 4 and 14.

Discussion

The Characteristics of Postcesarean Pain

In this study, the most commonly reported pain types were movement-associated and constant incisional pain, gas pain, and uterine contraction pain. These findings are consistent with previous work (Smith, Guralnick, Gelfand, & Jeans, 1986; Smith-Hanrahan, 1988) although the frequencies of pain were higher in the present study. A detailed discussion of the characteristics of each of these pain types follows.

Movement-associated and constant incisional pain.

Of all pain types studied, movement-associated incisional pain was reported most frequently and assigned the highest mean intensity throughout this study, a finding which is consistent with those of Smith-Hanrahan (1988). The mean intensity of movement-associated incisional pain was in the moderate to severe range for at least four days following surgery. This finding appears to conflict with earlier reports which suggest that the intensity of postoperative pain following a variety of surgical procedures diminishes rapidly within the first 3 to 4 postoperative days (Bonica, 1983; Keats, 1956; Melzack, Abbott, Zackon, Mulder & Davis, 1987). However, it should be emphasized that it is unclear which pain type was being measured in these earlier studies. It is also likely that different surgical procedures have different postoperative pain trajectories.

In any case, the findings of this study suggest that the

intensity of movement associated incisional pain in this population is higher for a longer duration than previously reported for other types of postoperative pain. In fact, almost half of the subjects in this study were still reporting this pain type 2 weeks following surgery.

Constant incisional pain was reported less frequently and assigned a lower intensity compared to movement-associated incisional pain. On average, it was in the moderate range through postoperative day 1. By day 2, it was in the mild range but still reported by over 50% of the mothers. This pain trajectory follows more closely that reported in earlier work (Bonica, 1983; Keats, 1956; Melzack, Abbott, Zackon, Mulder & Davis, 1987) for postoperative pain following a variety of surgical procedures. Although it is not clear, subjects in these earlier studies most likely described constant incisional pain when questioned about their present pain.

In spite of the fact that postcesarean mothers in this study were prescribed narcotic analgesics, movement-associated incisional pain was still in the moderate to severe range up to at least 4 days postpartum and constant incisional pain in the moderate range through postoperative day 1. The reasons for this are not clear. In this study, a medication nurse made rounds twice during each 8 hour shift and administered analgesics on demand. If mothers experienced pain between rounds, they had to request an analgesic. It is well known

that to be effective, analgesics must be administered at fixed intervals and also in anticipation of pain rather than at the patient's request (MacDonald, 1990).

It is also possible, as some studies suggest (Dubuisson & Dennis, 1977; Woolf & Wall 1986), that narcotics have little or no effect on movement-associated incisional pain. However, it is very likely that constant incisional pain could have been more effectively relieved by narcotics (Dubuisson & Dennis, 1977; Woolf & Wall 1986) which bind to opiate receptors, thus preventing transmission of the pain signal to the central nervous system.

Another possible explanation for inadequate pain management lies with the fact that 29% of breastfeeding mothers in this study reported limiting their analgesic intake, fearing that the drugs would be absorbed by the newborn. This is unfortunate as acetaminophen, ASA, codeine and meperidine are considered safe for breastfeeding infants when ingested by the mother (Faut-Callahan & Paice, 1990; Riordan, 1983). In light of this, it would seem crucial to inform breastfeeding mothers that the analgesics offered to them present very little danger to their infants, especially when taken immediately after breastfeeding.

Other forms of pain management may also improve the effectiveness of analgesics. For example, the advantages of patient-controlled analgesia and epidural morphine administration over PRN analgesic administration for the

relief of postcesarean incisional pain have been well documented. Patient-controlled analgesia (PCA) prevents wide swings in narcotic plasma concentration, causes less sedation, provides more immediate pain relief, eliminates the need for painful injections, and is associated with higher patient satisfaction (Eisenach, Grice, & Dewan, 1988; Greene, Zeichner, Roberts, Callahan, & Granados, 1989; MacDonald, 1990).

Epidural morphine analgesia has the same advantages as PCA (Eisenach et al., 1988) and can provide relief that will last for up to 24 hours (Faut-Callahan & Paice, 1990). Mothers having a cesarean section under epidural anesthesia can easily benefit from this route of administration as it has already been established for anesthesia (MacDonald, 1990). Furthermore, this route will be more effective in relieving movement associated incisional pain as epidural narcotics bind to opiate receptors in the spinal cord and block pain messages from reaching it.

Following the day of surgery, oral analgesics are preferred to intramuscular injections because their absorption is gradual thus eliminating peaks and valleys in blood concentrations as well as the need for injections (Faut-Callahan & Paice, 1990). Adequate oral analgesia should be started as early as possible in the postpartum period to reduce the frequency and duration of pain related to intramuscular injections.

When patients cannot take oral medication because of nausea, vomiting, or decreased peristalsis, the rectal route should be considered. Both narcotics and nonsteroidal antiinflammatory drugs are available in suppository form (McCaffery & Beebe, 1989).

Nonsteroidal antiinflammatory drugs (NSAIDs) have been shown to effectively relieve mild to moderate postoperative incisional pain associated with the inflammatory process (Donovan, 1990; Faut-Callahan & Paice, 1990; Slavic-Svircev, Kaiko, Heidrich, & Rusy, 1984). NSAIDs interfere with the production of prostaglandins, thus reducing the associated inflammatory process and related pain. NSAIDs and narcotics provide analgesia through two different physiological mechanisms. Therefore, a combination of these two drug types may relieve pain more effectively.

Local application of cold also interferes with the production of prostaglandins and thus may relieve constant incisional pain (Donovan, 1990).

Transcutaneous electrical nerve stimulation, and local application of pressure (splinting and supporting the incision during movements for example), cold, or heat are forms of hyperstimulation analgesia which temporarily block transmission of the pain signal to the dorsal horns through stimulation of large A-beta fibres in the skin. There is

evidence that these interventions may relieve both constant and movement-associated incisional pain (Donovan, 1990; Melsack, 1988; Smith et al., 1986).

While the quality of movement-associated incisional pain was described by over 65% of mothers as tender, aching, tiring, sharp, and stabbing, constant incisional pain was most frequently described as a tender, aching, and tiring sensation. Therefore, the words tender, aching, and tiring were common to both pain types. Only the sharp and stabbing sensation distinguished them. Overall, movement-associated and constant incisional pain cannot be clearly differentiated from each other or from other pain types on the basis of their quality. Therefore, identification of a pain type should rely on the assessment of other parameters such as time of onset, location, intensity, and duration of pain.

In Taenzer's (1983) study, the words tender, tiring, sharp and stabbing were also reported by postcholecystectomy patients to describe the quality of postoperative incisional pain. However, Taenzer made no distinction between movement-associated and constant incisional pain in his study.

Together, these findings highlight the need for more research in the area of postoperative incisional pain and its assessment and management, especially movement-associated incisional pain. This pain type probably most affects patients' recovery because it interferes with postoperative activity and yet appears to be the most poorly managed.

Gas pain.

In this study, gas pain was at its highest frequency and intensity on the second and third postoperative days. This is consistent with the findings of previous studies (Smith-Hanarahan, 1988; Thomas, Ptak, Giddings, Moore, and Oppermann, 1990).

Factors known to contribute to gas pain are: general anesthesia, narcotics, manipulation of the bowel during surgery, and reluctance of the mother to contract painful abdominal muscles. These can lead to decreased bowel motility and gradual accumulation of gas which exerts pressure on the viscera and results in pain (McCaffery & Beebe, 1989; Thomas et al., 1990). This mechanism explains the delayed onset of gas pain.

To alleviate gas pain, pressure on the viscera must be relieved by expelling the gas. Thomas et al. (1990) studied the effect of various therapeutic regimens on the prevention and relief of postcesarean gas pain. Providing mothers with a rocking chair and encouraging them to rock 60 minutes or more every day decreased gas pain. The physical activity of rocking, the lowering of the body in the chair, and the pressure exerted by the baby on the abdomen when held in the mothers arms, all stimulate peristalsis and encourage expulsion of gas. The effectiveness of rocking is enhanced by a diet of low gas-producing foods, oral simethicone after each meal, and one bisacodyl suppository twice daily or as

requested by the mother. However, movement-associated incisional pain needs to be adequately relieved in order to optimize the mother's ability to carry out these activities.

In this study, gas pain was described by a majority of mothers as a tender, aching, tiring and cramping experience. This does not clearly distinguish it from the other pain types. Therefore, assessment parameters such as time of onset, signs of abdominal distention, absent or decreased bowel sounds, and decreased flatulence are probably better indicators of the accumulation of gas in the bowel.

Uterine contraction pain.

In this study, the frequency and intensity of postcesarean uterine contraction pain peaked on the first postoperative morning. Forty-eight hours postdelivery, uterine contraction pain had decreased considerably and remained low for the rest of the study period.

When uterine contraction pain was reported most frequently and at its highest intensity, 69% of mothers were receiving an intravenous infusion of oxytocin. Exogenous oxytocin produces phasic uterine contractions and is administered to prevent postpartum hemorrhage and promote uterine involution (Govoni & Hayes, 1982). A recent review of the literature revealed no scientific studies documenting the ideal duration of oxytocin administration in postcesarean mothers, although one obstetrical textbook recommended 4 hours or until excessive uterine bleeding has stopped (Read &

Wellby, 1985). In this study, the range for oxytocin infusion was 9 to 46 hours (mean=24,32 hrs ± 8,31). If the duration of oxytocin administration could be shortened without jeopardizing the postcesarean mother's safety, the intensity and duration of uterine contraction pain would probably be significantly decreased.

The significant decrease in the mean intensity of uterine contraction pain that was observed 48 hours postdelivery coincided with the discontinuation of intravenous oxytocin in all mothers. In the absence of exogenous oxytocin administration, intrapartum and postpartum uterine contractions are believed to be stimulated by the release of two substances: the posterior pituitary releases endogenous oxytocin and the uterus releases prostaglandins. Together, these substances cause the uterus to contract which results in vasoconstriction, ischemia, and pain (Vander, Sherman, & Luciano, 1977). Bloomfield, Cissell, Mitchell, and Barden (1983), Bloomfield, Mitchell, Cissell, and Barden (1986), and Bloomfield, Mitchell, Cissell, Barden, and Yee (1986), have shown that NSAIDs are effective in the relief of postpartum uterine contraction pain. They have hypothesized that uterine contractions and the accompanying pain are mediated by a second messenger-prostaglandin system that may be inhibited by NSAIDS. However, uterine contractions are necessary to the postpartum involution of the uterus and NSAIDS may interfere with this normal process if indeed they reduce uterine

contractions.

The majority of mothers in this study (88%) were multiparous. Some reports suggest that uterine contraction pain is more frequent and intense in this group compared to primiparas (Wynn, 1988). This could not be determined in this study due to the small number of primiparas.

Breastfeeding is also known to cause the uterus to contract and may increase the intensity of uterine contraction pain (Riordan, 1983). Our data could neither support or refute this idea as pain was not specifically measured during infant feeding.

Uterine contraction pain was described by the majority of mothers as tender, aching, tiring, cramping, sharp and stabbing. As such, its quality does not differentiate it clearly from other pain types. In terms of assessment, time of onset and duration associated with other events such as intravenous oxytocin administration and breastfeeding, may be better indicators of the presence of this pain type.

Other sources of pain.

Postcesarean mothers also reported several other sources of discomfort including intramuscular injections, intravenous and urinary catheter sites (also reported by Affonso & Stichler, 1978), back pain, engorged breasts, interscapular pain, and throat pain.

Throat pain was reported by general anesthesia mothers only (47%) and was probably caused by tracheal intubation

(Webster, 1986). On the other hand, interscapular pain was reported by epidural anesthesia mothers only (30%). According to Rajanna (1989), interscapular pain occurs when air is introduced into the epidural space while the loss of resistance test is performed. This air migrates up to the thoracic and cervical region, exerts pressure on the sensory fibres innervating the spinal cord, and produces pain.

These data provide additional support for the idea that postcesarean pain is a multidimensional experience composed of several distinct pain types. Therefore, when assessing postcesarean pain for clinical or research purposes, it is critical to determine which pain type the patient/subject is describing.

Postcesarean pain and fatigue.

An unexpected finding in this study was that the word tiring was used by over 65% of mothers to describe movement-associated incisional pain as well as constant incisional pain, gas pain, and uterine contraction pain. This is consistent with Taenzer's (1983) study in which over 60% of postcholecystectomy patients used the word tiring to describe their pain. This clearly indicates that fatigue is an important dimension of postcesarean pain.

Both postpartum and postoperative experiences have been associated with fatigue in the literature. The majority of women report fatigue during pregnancy and the postpartum period up to three months postdelivery (Drake & Verhulst,

1988; Fawcett & York, 1986; Larsen, 1966). Postoperative patients are also at high risk for fatigue due to the metabolic response to the acute stress of surgery, general anesthesia, pain, analgesics, and sleep deprivation (Rhoten, 1982).

Postcesarean mothers experience metabolic changes associated with birth and with surgery as well, and are, therefore, at even greater risk of developing fatigue. Sleep and rest are necessary to recover from fatigue (Rhoten, 1982). However, the postcesarean mother's sleep may be altered by postcesarean pain or interrupted to care for the newborn. According to Rhoten (1982), pain interferes with sleep and potentiates fatigue, but as well, fatigue can decrease pain tolerance. In this study, mothers clearly indicated that postcesarean pain was a tiring experience.

The findings of this study highlight the need for providing mothers with adequate pain control and a quiet environment in order to maximise the quality of rest and sleep periods, and possibly decrease pain perception and maximize recovery. As patients are being discharged from hospitals sooner because of escalating health care costs, care must be taken to ensure that postcesarean mothers still rest adequately at home.

Summary.

The findings of this part of the study suggest that a woman about to undergo a cesarean delivery can expect to

experience several unique pain types following surgery. She will most likely experience incisional pain both constant and movement-associated, with the latter being the most intense and lasting at least 4 days postpartum. There is also a good chance that she will experience uterine contraction pain, especially while receiving intravenous oxytocin, and some gas pain starting around the second postpartum day. There is also a smaller chance that she may experience throat pain or interscapular pain depending on the type of surgical anesthesia used, back pain, and discomfort related to intramuscular injections, intravenous and urinary catheter sites, and engorged breasts. Finally, the data also suggest that such a patient will find the pain experience tiring. It is now important to determine the appropriate use and effectiveness of available analgesic interventions for each specific pain type and to examine further the relationship between pain and fatigue in this population.

Postcesarean Pain and Surgical Anesthesia

Wall (1988) hypothesized that when surgery is performed under general anesthesia, the spinal cord receives a massive afferent barrage, possibly mediated by unmyelinated C fibres. This barrage sets off a prolonged spinal cord hyperexcitability. Under epidural anesthesia, the spinal cord receives no afferent signals during surgery and so the effect is blocked. If this hypothesis is true, then in the present study one would expect mothers who received general anesthesia

during surgery to experience more incisional pain postoperatively, in response to such stimuli as movement or touch, compared to those who received epidural anesthesia. However, other pain types such as constant incisional pain or uterine contraction pain would not be affected.

From postoperative days 0 to 4, the mean intensity of movement-associated incisional pain was consistently higher for the general anesthesia group compared to the complete epidural anesthesia group. These findings provide some evidence to support Wall's (1988) hypothesis. However, between group differences were not large and statistical significance was not often obtained. This finding could be explained in at least two ways. First, the mean intensity reported for this pain type and others was in the moderate to severe range after the effects of the anesthesia wore off. This intense pain following surgery could have itself initiated prolonged spinal cord hyperexcitability even in those subjects who received complete epidural anesthesia during surgery. This would reduce the differences between the two groups. It is possible that a longer epidural block, 24 hours perhaps, could prevent this "secondary hyperexcitability" and further decrease movement-associated incisional pain during the second to fourth postoperative days, and perhaps later. This hypothesis awaits further testing. Second, it is also possible that the sample size was too small to detect these differences.

Mothers in the incomplete epidural anesthesia group reported experiencing pain during surgery. According to Pederson et al. (1989), when concentrations of local anesthetics decrease in the cerebrospinal fluid, C fibres may be activated, allowing them to transmit visceral pain. Therefore, in this study, the spinal cord of mothers in the incomplete epidural anesthesia group may have been excited via C fibre activity during surgery, perhaps resulting in prolonged spinal cord hyperexcitability in the postoperative period.

On the basis of Wall's hypothesis, one could predict that the mothers in the incomplete epidural anesthesia group would experience greater levels of movement-associated incisional pain compared to those in the complete epidural anesthesia group. On postoperative days 0 and 1, movement-associated incisional pain intensity was similar in the two epidural groups. From postoperative days 2 to 4, mothers in the incomplete epidural anesthesia group reported more intense movement associated incisional pain, although differences did not attain statistical significance. Again, these findings provide some support to the hypothesis, although the evidence is not strong. However, the possible effect of a "secondary hyperexcitability" cannot be ruled out.

Recent evidence lends further support to Wall's (1988) hypothesis and suggests that preoperative administration of opiates results in less movement-associated incisional pain

following surgery under general anesthesia (Kiss & Kilian, 1992). The effect of preoperative administration of opiates on postoperative movement-associated incisional pain in Kiss and Kilian's (1992) study was similar to that of epidural anesthesia in the present study. Perhaps preoperative opiates can suppress spinal cord hyperexcitability during surgery and even postoperatively.

Wall's (1988) hypothesis is further supported in this study by the fact that no significant between group differences were found for the intensity of constant incisional pain. With the exception of the immediate postoperative period, the pain intensities reported in the three anesthesia groups were remarkably similar throughout the study. On the basis of this hypothesis, one would not expect constant incisional pain to be affected by the degree of spinal cord excitation and subsequent hypersensitivity because it is not generated by external stimuli such as movement or touch.

The intensity of gas pain and postcesarean uterine contraction pain also appeared not to be related to the type of surgical anesthesia. This was to be expected as these pain types are not related to spinal cord hypersensitivity to innocuous stimuli. However, Chi-square analysis and ANOVA revealed that gas pain was significantly more frequent ($X^2=8.88$; $p<0.02$) and intense ($F=6.69$; $p=0.003$) in the second week postpartum in the general anesthesia group than in either

of the epidural groups. This suggests a long-lasting effect of general anesthetics on gastrointestinal motility.

In summary then, the evidence suggests that a complete blockage of spinal cord excitation during surgery via epidural anesthesia decreased the intensity of movement-associated incisional pain experienced postoperatively. However, the decrease was not great and may have been due to a secondary spinal cord hyperexcitability arising from noxious stimuli postoperatively. It is now important to compare these results with a group of subjects receiving blockade of the "secondary hyperexcitability".

Implications for Practice

This study provides detailed information on the frequency, intensity, duration, and quality of the various components of the postcesarean pain experience. This information could be used to better prepare women for the different sensations they can expect after a cesarean section and should be discussed in the context of analgesic interventions available to relieve each pain type. The data generated in this study can also be used to develop a framework for assessing and managing postcesarean pain. Furthermore, it may assist clinicians in detecting possible postoperative complications reflected in unusual pain trajectories.

The mother's description of her pain experience is indispensable to its accurate assessment and effective

management. At the very least, mothers should be asked to locate their pain(s) and rate its/their intensity before and after treatment.

In the past, postcesarean pain has been viewed as a unidimensional experience and treated using only one modality, i.e. narcotic analgesics or combinations of narcotics and NSAIDs. We now know that several different pain types comprise the postcesarean experience. Therefore, to be effective, a pain management plan must emerge from a systematic and ongoing assessment of the mother's unique experience of each pain type and of her response to analgesic interventions. A combination of interventions tailored to the underlying physiological processes of each pain type is more likely to be effective in the relief of the postcesarean pain experience. Clearly, administration of one drug will not likely be the answer to the relief of a combination of unique pain types.

Directions for Future Research

The results of this study point to the need for future studies to examine appropriate interventions and to further examine the effect of surgery and surgical anesthesia on postoperative pain. More specifically, some suggestions for future research include studies to:

1) Evaluate the effectiveness of analgesic interventions, pharmacologic and non-pharmacologic, in isolation or in combination, in the treatment of each

component of the postcesarean pain experience.

2) Determine if a relationship exists between postcesarean pain and fatigue in the early postpartum period. If it does, nursing interventions designed specifically to reduce fatigue, may in turn reduce postcesarean pain, and optimize postoperative recovery. As well, analgesic interventions may decrease the fatigue experienced by postcesarean mothers and facilitate their new mothering role.

3) Examine the relationship between postoperative incisional pain and prolonged spinal cord hyperexcitability associated with different types of anesthesia in different surgical groups. These studies should use larger samples than in the present study and longer epidural blocks (24hrs). Epidural anesthesia may prove to be an effective way to prevent or minimize postoperative incisional pain and its associated complications.

Conclusions

This study has contributed to the existing body of knowledge on postcesarean pain. The findings support the original hypothesis that the postcesarean pain experience is composed of several pain types with distinct characteristics. These characteristics have been examined in detail. The data also support Wall's (1988) hypothesis that surgery can produce prolonged spinal cord hyperexcitability. This work has

contributed to the advancement of the science of nursing and will hopefully improve the quality of patient care.

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Appendix A

Verbal Instructions Given to Subjects Before Completion of the Numerical Rating Scale

If 0 represents no pain and 10 represents the worst possible pain, how much would you rate your pain on a scale of 0 to 10?

Appendix B

The Short-Form McGill Pain Questionnaire

	NONE	MILD	MODERATE	SEVERE
Throbbing	0)_____	1)_____	2)_____	3)_____
Shooting	0)_____	1)_____	2)_____	3)_____
Stabbing	0)_____	1)_____	2)_____	3)_____
Sharp	0)_____	1)_____	2)_____	3)_____
Cramping	0)_____	1)_____	2)_____	3)_____
Gnawing	0)_____	1)_____	2)_____	3)_____
Hot-burning	0)_____	1)_____	2)_____	3)_____
Aching	0)_____	1)_____	2)_____	3)_____
Heavy	0)_____	1)_____	2)_____	3)_____
Tender	0)_____	1)_____	2)_____	3)_____
Splitting	0)_____	1)_____	2)_____	3)_____
Tiring-exhausting	0)_____	1)_____	2)_____	3)_____
Sickening	0)_____	1)_____	2)_____	3)_____
Fearful	0)_____	1)_____	2)_____	3)_____
Punishing-cruel	0)_____	1)_____	2)_____	3)_____

S_____ A_____ T_____

VAS

NO PAIN ⊢——————————————————————⊣ WORST POSSIBLE PAIN

PPI

0	No pain	_____
1	Mild	_____
2	Discomforting	_____
3	Distressing	_____
4	Horrible	_____
5	Excruciating	_____

(Melzack, 1987, p.193)

The Short-Form McGill Pain Questionnaire (French version)

	AUCUNE	FAIBLE	MODEREE	FORTE
Qui bat	0)_____	1)_____	2)_____	3)_____
Fulgurante	0)_____	1)_____	2)_____	3)_____
Qui poignarde	0)_____	1)_____	2)_____	3)_____
Vive	0)_____	1)_____	2)_____	3)_____
Qui crampe	0)_____	1)_____	2)_____	3)_____
Qui ronge	0)_____	1)_____	2)_____	3)_____
Chaude-brûlante	0)_____	1)_____	2)_____	3)_____
Pénible	0)_____	1)_____	2)_____	3)_____
Poignante	0)_____	1)_____	2)_____	3)_____
Sensible	0)_____	1)_____	2)_____	3)_____
Qui fend	0)_____	1)_____	2)_____	3)_____
Fatigante-épuisante	0)_____	1)_____	2)_____	3)_____
Ecoeurante	0)_____	1)_____	2)_____	3)_____
Epeurante	0)_____	1)_____	2)_____	3)_____
Violente-cruelle	0)_____	1)_____	2)_____	3)_____

S_____ A_____ T_____

VAS

AUCUNE DOULEUR ⊢——————————————————⊣ LA PIRE DOULEUR POSSIBLE

PPI

0 Pas de douleur _____
1 Faible _____
2 Inconfortable _____
3 Forte _____
4 Sévère _____
5 Insupportable _____

(Melzack, 1987, p.192)

Appendix C

Demographics and Data Regarding Obstetrical History, Anesthesia, Surgery and the Newborn

1. Age (years)
2. Height (cm)
3. Weight before pregnancy (kg)
4. Weight at end of pregnancy (kg)
5. Gravidity
6. Parity
7. Number of abortions (therapeutic or natural before 28 weeks)
8. Number of previous cesarean sections and dates
9. Smoking status (last 3 years)
   1. Non-smoker
   2. Half - 1 pack / day
   3. 1-2 packs / day
   4. 2 + packs / day
10. Medications used regularly
11. Existing medical problems
12. Admitted to hospital within last 5 years (dates and reasons)
13. Marital status
    1. Single
    2. Married / common law
    3. Divorced / separated
    4. Widowed
    5. Other
14. First language spoken
    1. English
    2. French
    3. Italian
    4. Hebrew
    5. Spanish
    6. Greek
    7. Other

15. Second language spoken (as above)
16. What ethnicity do you belong to?
17. Occupation
18. Obstetrician
19. Are you planning to have an epidural or a general anesthesia?
20. Preoperative medications
21. Duration of anesthesia (min)
22. Anesthetic agent
23. Anesthetist
24. Duration of surgery (min)
25. Surgeon
26. Type of incision
27. Sutures
28. Surgical complications
29. Estimated blood loss
30. Baby's APGAR
31. Baby's sex
32. Baby's weight (grams)
33. Baby's length (cm)
34. Infant complications
35. Analgesics given (agent, dose, route and time)
36. Number of doses of narcotics given on each postoperative day
37. Other medications administered
38. Postoperative time at which IV syntocinon was

discontinued

39. Postoperative time at which urinary catheter was discontinued

40. Postoperative time at which mother first voided

41. Postoperative time at which mother first expelled flatus

42. Postoperative time at which mother first had bowel movement

43. Postoperative time at which mother first fed infant

44. Symptoms experienced and time

45. Postoperative complications and time

46. Method of infant feeding

47. If breastfeeding: Does the fact that you breastfeed have any influence on your consumption of pain medication?

    1. Yes Comments:_____
    2. No _____
    3. N/A _____

Appendix D

Recruitment Form

To All Mothers Who Will Deliver a Baby by Cesarean

My name is Ninon Yale. I am a nurse and Master's student at McGill University's School of Nursing. I am seeking your participation in a study on mothers who will deliver their baby by cesarean. This study is being conducted in cooperation with St. Mary's Hospital and McGill University's School of Nursing.

I would like to meet you briefly to further explain the study and answer any questions you may have. If you are interested, please sign this form and return it to the unit secretary who handed it to you. This in no way commits you to participate in the study. Following our meeting together, you will be free to decide whether you wish to participate.

Your cooperation would be greatly appreciated!

Yours thankfully,

Ninon Yale, N., B.Sc.

_____ _____

Please sign here Date

Formulaire de Recrutement

A Toutes Les Mères Qui Donneront Naissance

A Un Enfant Par Césarienne

Je m'appelle Ninon Yale. Je suis infirmière et j'étudie au niveau de la Maîtrise à l'Université McGill. J'effectue présentement une recherche sur les femmes qui comme vous, donneront naissance à un enfant par césarienne. Pour ce faire, je recherche votre participation. Ce projet a lieu en coopération avec l'Hôpital St. Mary's et l'Ecole des Sciences Infirmières de l'Université McGill.

J'aimerais vous rencontrer afin de mieux vous renseigner et répondre à toutes les questions qui vous viendraient à l'esprit. Si vous êtes intéressée, veuillez signer ce formulaire et le remettre à la secrétaire médicale qui vous l'a donné. Ceci ne vous engage à rien. Vous pourrez décider librement de participer ou non à cette étude après notre rencontre.

Votre collaboration serait grandement appréciée!

Sincèrement votre,

Ninon Yale, inf., B.Sc.

_____ _____

Veuillez signer ici Date

Appendix E

Information Handout on the Research Project: Postcesarean pain: Characteristics and Relationship with Surgical Anesthesia

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About the researcher:

My name is Ninon Yale. I am a nurse and a Master's student at McGill University, School of Nursing. I am conducting a study on mothers like yourself, who will give birth to a baby by cesarean at St. Mary's Hospital.

The following are answers to some common questions asked about the study.

1. What is the purpose of this research study?

The purpose of this research study is to examine what types of discomfort are experienced by mothers after a cesarean birth and to determine the frequency, intensity, duration, and quality of each type of discomfort. We also plan to determine the influence of anesthesia on cesarean discomfort.

2. What is required of me if I participate in the study?

As a participant in this study, you will be asked, on the day of your admission to the hospital, to complete a short questionnaire on anxiety. In the recovery room, you will be asked to complete a very short portion of a questionnaire concerning your discomfort following the cesarean birth. You will be expected to complete the full length of the

questionnaire twice a day for the first three days after your delivery, and only once on the fourth day. Two and six weeks after the birth of your baby, I will call you at home so that you can complete the discomfort questionnaire over the phone. The purpose is to determine how much discomfort women experience after a cesarean delivery, what type of discomfort it is, and how long it lasts.

3. What will be done with the information I give?

Your name and personal information will not be disclosed. In order to ensure confidentiality and anonymity, you will be issued a code number upon entering as a participant. All information will be recorded under your code number. Only the researcher and her advisor will have any knowledge of the individuals involved in the study.

The results of the study will be written into a report and may be published in a professional journal. Again, the names of the participants will not be used and once the data analysis is complete, all personal data will be destroyed.

4. Will being a participant take much of my time?

Approximately fifteen minutes will be necessary to complete the questionnaires upon each of our meetings.

5. What will happen if I do not want to become a participant?

If you choose not to be involved in this study, this will not affect the care or the services you receive at St. Mary's Hospital.

6. **Why was I approached as a possible participant in this study?**

You were selected as a potential candidate in this study because of the nature of your hospitalization. All women admitted to St. Mary's Hospital for an elective cesarean delivery, aged 21 years or more, and English or French speaking will be approached and asked to participate.

Feuillet d'Information sur le Projet de Recherche:

La Douleur Post-Césarienne: Charactéristiques et Relation avec le Degré de Stimulation de la Moelle Epinière durant la Chirurgie

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A propos de la chercheuse:

Mon nom est Ninon Yale. Je suis infirmière et étudiante à la Maîtrise à l'Ecole des Sciences Infirmières de l'Université McGill. J'entreprends une étude de recherche sur les mères qui donneront naissance à un enfant par césarienne à l'Hôpital St. Mary's.

Voici les réponses à certaines questions que vous pourriez avoir au sujet de cette étude de recherche.

1. **Quel est le but de cette recherche?**

Le but de cette recherche est d'examiner les différents types d'inconforts qui sont ressentis par les mères à la suite d'un accouchement par césarienne et d'en déterminer la fréquence, l'intensité, la durée, ainsi que la qualité. Nous examinerons également l'influence de l'anesthésie opératoire sur l'inconfort ressenti suite à la césarienne.

2. **Qu'est-ce qu'on exigera de moi si j'accepte de participer à cette recherche?**

En tant que participante, on vous demandera de répondre à un court questionnaire sur l'anxiété peu après votre admission à l'hôpital. A la salle de réveil, on vous demandera de compléter, en partie seulement, un questionnaire

concernant l'inconfort ressenti suite à votre césarienne. Puis, on vous demandera de répondre à la totalité de ce questionnaire deux fois par jour pour les trois premiers jours suivant votre accouchement, et une fois seulement le quatrième jour. Deux et six semaines après votre accouchement, je vous contacterai par téléphone afin de compléter le questionnaire sur la douleur. Ceci nous permettra d'identifier les differents types d'inconfort ressentis par les mères qui accouchent par césarienne, leur fréquence et leur intensité respective, ainsi que la durée de chacun d'eux.

3. <u>Que fera-t-on avec les informations que je donne?</u>

Votre nom et informations personnelles ne seront pas divulgués. Si vous acceptez de participer à cette étude, nous vous émetterons un numéro de code afin de respecter la confidentialité et l'anonymat. Toute information recueillie à votre sujet et nécessaire à cette recherche sera inscrite sous ce numéro de code. Seuls la chercheuse et son tuteur auront accès à l'identité des participantes ainsi qu'à l'information recueillie.

Les résultats de cette étude constitueront le contenu d'un rapport écrit (Thèse) et seront possiblement publiés dans une revue professionnelle. Cependant, le nom des participantes n'apparaîtra nulle part et une fois l'analyse des données complétée, toute information personnelle sera détruite.

4. Est-ce que cette étude prendra beaucoup de mon temps?

Environ quinze minutes seront nécessaires pour chacune de nos rencontres.

5. Qu'arrivera-t-il si je refuse de participer?

Si vous choisissez de ne pas participer à cette recherche, ceci n'affectera en aucune façon les soins et services dont vous bénéficierez à l'Hôpital St. Mary's.

6. Pourquoi m'a-t-on demander de participer à cette étude?

Toute femme admise pour une césarienne élective à l'Hôpital St. Mary's, âgée de 21 ans ou plus, et parlant le français ou l'anglais, peut si elle le désire participer à cette étude. On demandera à chacune d'elle si elle accepte de participer.

Appendix F

Written Consent Form

The research project has been explained to me. I understand that if I agree to participate, I will:

be expected, on the day of my admission to the hospital, to complete a short questionnaire on my level of anxiety. Shortly after my delivery, I will be asked to complete a short questionnaire concerning my discomfort. I will be expected to complete this same questionnaire twice a day during the first four days of my recovery, and once on the second and sixth weeks after my delivery for which I authorise Ninon Yale to contact me by telephone.

I further understand that:

1. All information is confidential and my identity will not be revealed.
2. My participation is voluntary.
3. My decision to participate will not affect the care/services I receive here.
4. I am free to withdraw my consent and to discontinue my participation in the project at any time without explanation.
5. Any questions I have about the project will be answered.
6. While I am encouraged to answer all questions, I am not obliged to do so.

7. And I give permission to Ninon Yale to have access to my chart so that she may obtain additional information regarding my recovery.
8. If I so wish, the results of this study will be communicated to me.

On the basis of the above statements I agree to participate in this project.

_____ _____

Participant's signature Date

_____ _____

Researcher's signature Date

Formulaire de Consentement Ecrit

Le projet de recherche m'a été expliqué. Si j'accepte d'y participer je consens à:

répondre, lors de mon admission à l'hôpital, à un court questionnaires concernant mon niveau d'anxiété. Peu de temps après mon accouchement par césarienne, je compléterai un court questionnaire concernant mon inconfort. Je compléterai ce même questionnaire deux fois par jour pendant les quatre premiers jours de ma récupération à l'hôpital et une fois lors des deuxième et sixième semaines suivant mon accouchement. A cet effet, j'autorise Ninon Yale à me contacter à la maison pour que je puisse répondre au questionnaire par téléphone.

De plus il est entendu que:

1. Tous les renseignements sont confidentiels et mon identité ne sera pas divulguée.
2. Ma participation est libre.
3. Je suis entièrement libre de refuser ou de retirer ma participation à n'importe quel moment sans avoir à donner d'explication.
4. On répondra à toutes mes questions au sujet de ce projet.
5. Bien qu'on m'encourage à répondre à toutes les questions, je n'y suis pas obligée.

7. De plus, je permet à Ninon Yale l'accès à mon dossier afin qu'elle puisse obtenir des reiseignements supplémentaires concernant ma récupération.
8. Si je le desire, les résultats de cette étude me seront communiqués.

Dans les conditions mentionnées ci-dessus je m'engage à participer à ce projet.

_____ _____

Signature de la participante Date

_____ _____

Signature de la chercheuse Date

Appendix G

Follow-Up Interview

1. Interview was: 1-Completed
   2-Refused
   3-Not done, unable to contact person
   4-Not done, person unable to respond
   5-Other
2. Subject is now: 1-At home
   2-In other institution
   3-Still in hospital
   Reason:_____
3. Have you taken any pain medication in the last 24 hours?
   1. Yes 2. No
4. If yes, at what time? _____
5. What is the name of the medication? _____
6. Are you doing anything else to relieve your pain? _____
   1. Yes 2. No If yes, what? _____7.
Do you presently have constant incisional pain? _____
   1. Yes 2. No
   If yes administer SF-MPQ
8. If not, have you had constant incisional pain in the
   past 24 hrs? _____ 1. Yes 2. No
   If yes, how much did it rate on a scale of 0 to 10? ___
9. Do you presently have movement associated incisional
   pain?____ 1. Yes 2. No
   If yes administer SF-MPQ

10. If not, have you had movement-associated incisional pain in the last 24 hrs? _____

    1. Yes 2. No

    If yes, how much did it rate on a scale of 0 to 10? ___

11. Do you presently have uterine contraction pain? _____

    1. Yes 2.No

    If yes administer SF-MPQ

12. If not, have you had uterine contraction pain in the last 24 hrs? _____

    1. Yes 2. No

    If yes, how much did it rate on a scale of 0 to 10? ___

13. Do you presently have gas pain? _____

    1. Yes 2. No

    If yes administer SF-MPQ

14. If not, have you had gas pain in the last 24 hrs? _____

    1. Yes 2. No

    If yes, how much did it rate on a scale of 0 to 10? ___

15. Did you experience any other type of pain in the last 24 hrs? _____ 1. Yes 2. No

    If yes, what type(s) of pain?

    And how much did your pain rate on a scale of 0 to 10?

TYPE OF PAIN	INTENSITY 0 TO 10
_____	_____
_____	_____

16. For how much of the last 2 weeks have you had pain? ___

    1. Not at all 2. Less than one week 3. 1 to 2 weeks

Appendix H

Procedure Flow Sheet

Evening Prior to Day of Cesarean Delivery

1. Unit secretary: inform researcher of the names of patients satisfying the study's inclusion criteria and hand out recruitment form to potential participants as requested by researcher.

2. Researcher: meet individually with each patient who signs the recruitment form, give verbal and written information, answer all questions. If patient agrees to participate, informed consent is signed.

3. Collect demographic and obstetrical data from subject's hospital record.

5. Clarify SF-MPQ vocabulary as necessary and explain how NRS is used.

6. Ask subject to complete STAI.

Immediate Postoperative Period

1. Collect data regarding surgery and anesthesia from subject's hospital record.

2. Ask subject (when well oriented) to complete NRS for every type of pain reported.

Postoperative Days 1 through 4

1. Note type, dosage, route, and time of administration of all analgesics from hospital record, and any other interventions aimed at pain relief. (Interviews are done at least three hours after analgesic administration).

2. Collect postoperative data from subject's hospital record.

3. Once between 8.00 and 12.00 and once between 13.00 and 17.00, ask subject to complete SF-MPQ for movement-associated and constant incisional pain, uterine contraction pain, and gas pain. For any other type of pain, complete NRS only.

Postpartum Weeks 2 and 6: Telephone Interviews

Ask subject to complete SF-MPQ for movement-associated and constant incisional pain, uterine contraction pain, and gas pain. Complete NRS for any other type of pain reported. If subject experiences no pain at time of interview, complete NRS for any type of pain experienced in the last 24 hrs.