Cohort Study

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The impact of epidural analgesia for acute pancreatitis on maternal and fetal outcome: a cohort study

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Introduction: It is anticipated that between 1 in 10, 000 and 1 in 30, 000 pregnancies will be affected by acute pancreatitis (AP). The authors wanted to evaluate the impact of epidural analgesia on maternal and fetal outcomes and its effectiveness in the pain treatment of obstetric patients with AP.

Methodology: The period for this cohort research was from January 2022 to September 2022. Fifty pregnant women with AP symptoms were enrolled in the study. Conservative medical management was done using intravenous (i.v.) analgesics, including fentanyl and tramadol. Fentanyl was infused i.v. at a rate of 1 μg/kg every hour, while tramadol was bolused i.v. at 100 mg/kg every 8 h. Boluses of 10–15 ml of 0.1% ropivacaine were injected into the L1–L2 interspace at 2–3-h intervals to provide high lumbar epidural analgesia.

Results: In this study, 10 patients were given an i.v. infusion of fentanyl, and 20 patients were given tramadol boluses. Epidural analgesia showed the most promising results decreasing the visual analog scale score from 9 to 2 in half of the patients. Most fetal complications were noticed in the tramadol group, including prematurity, respiratory distress, and babies requiring noninvasive ventilation.

Conclusion: Patients with AP during pregnancy may benefit from a new technique for simultaneous analgesia during labor and cesarean section administered via a single catheter. When AP is detected and treated during pregnancy, the mother and child benefit from pain control and recovery.

Keywords: epidural analgesia, fentanyl, tramadol, maternal and child health care, visual analog scale

Introduction

Acute pancreatitis (AP) is expected to occur in 1–10 births per every one thousand[1,2]. It is a potentially catastrophic obstetric complication for mom and baby alike. Mortality rates from pancreatitis in mothers and their unborn children have declined in recent years because of improvements in diagnosis and treatment. Prior estimates placed the maternal death rate at 37% and the fetal death rate at 60%. The diagnosis of AP is more common among women who have already had several children[3]. Fourth, it is most common during the last few weeks of pregnancy or the first few weeks following giving birth[4,5]. Gallstones and heavy alcohol users are the two most common causes of AP. Despite its rarity, the cause of hypertriglyceridemia is understood[6]. About 70% of instances of AP in pregnant women are caused by gallstones. AP may cause everything from mild pancreatitis to severe pancreatitis with necrosis, as well as abscesses, pseudocysts, and syndromes of multiple organ failure multiple organ dysfunction syndrome. Pregnancy makes any sickness, including AP, more dangerous. Pain in the mid-epigastric and right upper quadrant, often spreading to the back or flank, is a common symptom of apnea[7]. Pregnancy-related health changes are commonly mistaken for these.

Guidelines for properly selecting, administering, and monitoring analgesics must be included. Opioids are more effective

HIGHLIGHTS

- This cohort study shows patients with acute pancreatitis benefited more from epidural than intravenous analgesia in terms of pain control and speed of recovery.
- Patients may benefit from a new technique that allows for simultaneous analgesia during labor and cesarean section to be administered via a single catheter

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than systemic local anesthetics in decreasing the need for rescue analgesia in people with AP, while NSAIDs are similarly effective. When managing pain during surgery, epidural analgesia is one of the most effective methods[8,9].

Epidural analgesia is preferred to other pain relief methods for AP because it improves pancreatic microcirculation by inhibiting sympathetic nerves and causing blood vessels to dilate. This, in turn decreases the risk of pancreatic necrosis. Reduced morbidity from AP is attributable to epidural analgesia since it prevents pancreatic necrosis and its other negative consequences[10]. Although preliminary research on its effectiveness in AP is encouraging, further information is needed.

Anim-Somuah *et al*.[11] found that epidural analgesia had no impact on maternal mortality or the immediate health of the newborn as evaluated by Appearance, Pulse, Grimace, Activity, and Respiration (APGAR) scores or admissions to the neonatal critical care unit.

Our study's major objective is to learn how well epidural analgesia relieves pain in pregnant women with AP. Secondary objectives include analyzing the effect of epidural analgesia on maternal and fetal outcomes.

Methodology

Cohort study

Information for this cohort study was obtained from high-risk pregnant women at a tertiary care center for obstetrics and gynecology from January to September of 2022. Using the Rao soft sample size calculator, we found that 50 patients would provide a 95% CI and a 5% margin of error.

STROCSS criteria

Our work has been reported in line with the STROCSS criteria[12]. As a helpful addendum, we have included the whole STROCSS 2021 checklist. Our study's Unique Identifier (UIN) in Research Registry is researchregistry8388[13]. The Declaration of Helsinki is followed in our research.

Inclusion and exclusion criteria

Pregnant women with AP symptoms were included in the research. Participants with chronic pancreatitis or who were unwilling to provide informed permission were not included in our research.

Collection of information from patients

The patients' permission was required before we could utilize their information in any study. In order to make a diagnosis of AP using the updated Atlanta criteria, two of the three following must be true: serum amylase and serum lipase elevations reaching at least three times the upper limit of normal, and imaging findings consistent with AP are classic signs of AP. We used ultrasound to examine the gallbladder, pancreas, duct, peripancreatic collection, and canine ductal system for any indications of AP. The fetus's health was verified to be OK after a thorough clinical and radiological examination. Ranson's criteria[14] determined the AP prognosis and severity.

Medical treatment

Medical management based on minimizing risk was the cornerstone of treatment. Fentanyl and tramadol were among the intravenous (i.v.) pain relievers used. One microgram per kilogram per hour of fentanyl was given i.v., and 100 mg/kg/8 h was bloused i.v. of tramadol. Boluses of 10–15 ml of 0.1% ropivacaine were injected into the L1–L2 interspace at 2–3 h intervals to provide high lumbar epidural analgesia.

When administering analgesia during childbirth, the same catheter and dosage are used each time using epidural anesthesia. Every woman was monitored up until she was finally allowed to go home.

At the time of birth, doctors and nurses took note of the APGAR ratings and birth weights of the newborns under their care. It was recorded how the mother and kid were in their condition at the time of discharge.

Statistics analysis

The data was gathered and analyzed using SPSS 21. All of the demographic and obstetrical data for the patients was recorded quantitatively and as percentages.

Results

Participants

The study comprised 50 patients with a clinical and biochemical diagnosis of AP. The majority (44%) of patients were 20–25 years old. None were below 20 years, and 10 patients were elderly gravida, that is, over 35 years old. More than half of the patients were in their first trimester. Fifty were second-gravida, 28% were primigravida, and 7% (i.e. 3) were multigravida (parity more than three). Most patients (56%) had an obstetric history of only one abortion, while six patients had a poor obstetric history, including four previous abortions, as shown in Table 1.

The most common risk factor of AP in our study was hypertriglyceridemia (30%) and gallstones (22%). Twelve and seven of them had preeclampsia and eclampsia, respectively. Only 4% of cases had no identifiable etiology (Table 2).

Table 1

Patient demographics

Parameter	Range	*N* (%)
Age (years)	20–25	22 (44)
	26–30	16 (32)
	30–35	1 (4)
	> 35	10 (20)
Period of gestation	First (till 12 weeks)	28 (56)
	Second (13–28 weeks)	3 (6)
	Third (29–40 weeks)	19 (38)
Gravida	Primigravida	14 (28)
	Parity: 1–2	26 (52)
	Parity: 2–3	7 (14)
	Parity: > 3	3 (7)
Abortions	1	28 (56)
	2	13 (26)
	3	3 (6)
	4	6 (12)

Table 2
Risk factors

Risk factors	*N* (%)
Gallbladder stones	11 (22)
Hypertriglyceridemia	15 (30)
Preeclampsia	12 (24)
Eclampsia	7 (14)
Hypercalcemia	3 (6)
Idiopathic	2 (4)

Transabdominal ultrasonography was performed on all of the patients. Along with other baseline examinations, liver function tests, serum amylase, and serum lipase were performed, and the findings are shown. Out of 50 patients, almost half of them had serum amylase level between 300 and 600 U/l and serum lipase levels between 100 and 300 U/l. Only 8% had serum amylase level greater than 900 U/l and 14% had serum lipase level greater than 900 U/l. Total bilirubin, serum aspartate transaminase, and alanine transaminase were also deranged but not in most of them, as shown in Table 3.

Ten patients received a 1 μg/kg/h fentanyl i.v. infusion, 20 received tramadol boluses i.v., and 20 received epidural analgesia through an epidural catheter placed in the lumbar interspace L1–L2. The most promising was epidural analgesia, which reduced pain levels from 9 to 2 on the visual analog scale (VAS) for half the patients and 9 to 1 for the other half. Patients who received i.v. fentanyl infusions saw their VAS scores drop to 3, while those who received i.v. tramadol boluses saw their scores drop to 5–3. The results indicate that epidural analgesia provides excellent pain relief (Fig. 1).

Table 3
Frequency of biochemical parameters

Biochemical parameters	Number of patients	Percentage
S-amylase (U/l)		
100–300	13	26
300–600	24	48
600–900	9	18
900	4	8
S-lipase (U/l)		
100–300	26	52
300–600	14	28
600–900	3	6
900	7	14
Total bilirubin (mg/dl)		
0.2–1.3	29	58
1.3–2.0	14	28
> 2.0	7	14
Serum AST (U/l)		
10–40	39	78
40–70	8	16
> 70	3	6
Serum ALT ((U/l)		
10–40	13	26
40–70	26	52
> 70	11	22

ALT, alanine transaminase; AST, aspartate transaminase.

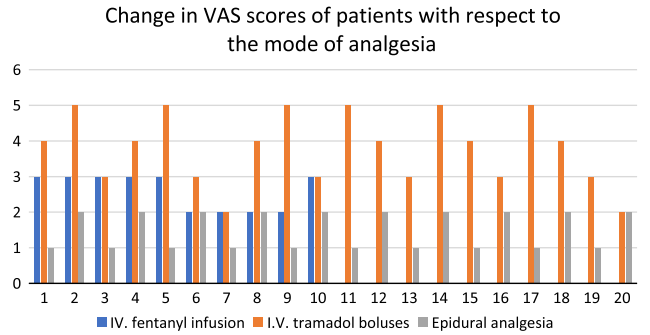

Figure 1. Visual analog scale score.

Nine out of 20 women who received epidural analgesia had a preterm delivery; five had lower segment cesarean section, while four had a vaginal delivery. Babies in the tramadol group were more likely to be premature, underweight for their gestational age, have respiratory distress, and need non-invasive ventilation. Table 4 shows that among the infants delivered to mothers who had epidural analgesia, six were preterm and three had neonatal jaundice.

APGAR was recorded in neonates delivered in different periods of the gestation period, as shown in Table 5.

Discussion

Pregnancy-related cases of AP are very rare. Most cases are mild, with about 20% classified as moderate to severe. Hypertriglyceridemia and gallstone disease are common causes of this condition[15]. In our analysis, hypertriglyceridemia fared better than gallstones, which are the most prevalent cause of AP in pregnancy. Some women have a genetic propensity to develop hypertriglyceridemia, and increased estrogen levels during pregnancy are known risk factor. Cholesterol and hepatic bile output rose, leading to supersaturated bile and, in turn, gallstone formation throughout the second and third trimesters of pregnancy, while bile and phospholipids remained relatively constant. Moreover, gallbladder volumes are increased both premeal and postmeal because of the slow emptying. Cholesterol crystals and gallstones develop because of the large quantity of excess, supersaturated bile left in the gallbladder[16].

Table 4
Maternal and fetal complications

Intravenous fentanyl	Intravenous tramadol	Epidural analgesia
Maternal complications		
Preterm C-sec (3)	Preterm vaginal delivery (4)	Preterm VD (4)
	Preterm C-section (3)	Preterm CS (5)
Fetal complications		
Prematurity (2)	Prematurity (3)	Prematurity (6)
	Small for gestational age (2)	Neonatal jaundice (3)
	Respiratory distress (2)	
	NIV for 2 d (3)	

CS, cesarean section; VD, vaginal delivery.

Table 5

APGAR scores in different periods of gestation period

Period of gestation (weeks)	Mode of delivery	Birthweight (g)	APGAR score
26 + 2	LSCS	> 750	0/3/5
32 + 1	LSCS	> 1900	7/8/9
36 + 2	LSCS	> 3040	8/8/9
40 + 3	LSCS	≤ 4200	8/9/9

APGAR, appearance, pulse, grimace, activity, and respiration; LSCS, lower segment cesarean section.

Since the symptoms of AP in pregnancy are similar to those of hyperemesis gravidarum, they may be easily missed in the first trimester of pregnancy. Most of our patients ($n = 7$) reported epigastric pain, loss of appetite, nausea, and vomiting throughout their first trimester of pregnancy. Pregnant women who appear with severe nausea and vomiting should thus have their serum amylase and lipase levels checked frequently.

Treatment for AP during pregnancy is the same as for those who are not pregnant. In order to reduce exocrine pancreatic function, the patient is treated with fluid replacement, oxygen supplements, analgesics, and the cessation of oral eating[17]. Patient care in our research was conservative, consisting of administering prophylactic antibiotics, i.v. fluids, oxygen, and analgesics.

One of the top therapeutic priorities in the early management of AP is the relief of abdominal discomfort experienced by almost all patients with AP[18]. Adequate i.v. analgesia, often including opioids and nonopioids, is always indicated for patients with severe AP. Multicenter retrospective research has connected thoracic epidural analgesia (TEA) to higher survival; therefore, it may be considered if i.v. analgesia does not provide enough pain relief or makes intestinal paralysis worse[19]. Nonetheless, epidural analgesia is seldom used for people with AP. Out of 44 146 Japanese patients with AP evaluated by Sadowski *et al.*[20] between 2010 and 2013, only 0.7% got epidural analgesia for pain relief.

Epidural anesthesia is increasingly recognized for its advantages beyond pain relief, with research revealing increases in mucosal capillary perfusion, gastrointestinal barrier function, renal perfusion, and decreased severity. Sadowski and colleagues demonstrated TEA, better pain management with TEA, and increased pancreatic microcirculation using a randomized controlled trial design. Epidural analgesia, fentanyl infusion, and tramadol boluses were compared for their effectiveness in relieving pain in our patients. As a result of receiving large doses of lumbar epidural analgesia, patients' VAS ratings dropped dramatically, from 9 to 2. The findings of a research by Bernhardt and colleagues were similar. Of the 121 patients he administered epidurals to, 72% reported feeling 'very good' or 'excellent' pain relief[21].

In their study of maternal and fetal outcomes in pancreatitis, Mahapatra *et al.*[22] found no evidence of an increased risk for either. None of the 50 individuals experienced maternal or fetal death. There were 11 preterm births across the three groups: two in the fentanyl group, three in the tramadol group, and six in the epidural group. Fetal complications occurred at a lower rate in the epidural group compared to the tramadol group.

The study's retrospective design and small sample size are flaws. Its strength, however, lies in its narrow focus on patients for whom analgesia is the first line of defense.

Conclusion

When AP is detected and treated during pregnancy, the mother and her child benefit. Regarding pain relief and recovery time, patients with AP benefitted more from epidural than i.v. analgesics. In certain cases, patients with severe pancreatitis during pregnancy might benefit from a novel approach that allows for the administration of analgesics during both labor and cesarean section using a single catheter.

Ethical approval

Approved by LNUH dated, 1 January 2022 (Ref no ERC/LNUH/421/22)

Consent

The informed consent from the patients was obtained considering Helsinki's Declaration.

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No funding was received.

Contribution statement

H.M., S.K.: concept and design. H.R.: manuscript writing. Z.A. and A.N.: editing and review. A.K.N. and A.R.: data analysis.

All authors have equally contributed to the manuscript and have approved the final manuscript to be published in Helsinki's Declaration.

Conflicts of interest disclosure

None to declare.

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