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Study of Labour Epidural Analgesia for the Parturient with Heart Disease

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Abstract:- Management of pregnant women with heart disease remains challenging due to the advancement of innovations in cardiac surgery and correction of complex cardiac anomalies, and more recently, with the successful performance of heart transplants, cardiac diseases are not only likely to coexist with pregnancy, but will also increase in frequency over the years to come. In developing countries with a higher prevalence of rheumatic fever, cardiac disease may complicate as many as 5.9% of pregnancies with a high incidence of maternal death. A prospective clinical study was conducted in Department of Anaesthesia, at a tertiary care hospital and medical college for period of September 2019 to October 2021. 50 pregnant women who received epidural analgesia were enrolled in the study. In our study we used low dose 0.0625% of bupivacaine (10 ml) with 2mcg/ml of Fentanyl as bolus and top up (5 ml of same concentration) is effective with haemodynamic stability and without any side effects.

Keywords:- *Parturient, Heart Disease, Labour Epidural Analgesia.*

I. INTRODUCTION

The delivery of the infant into the arms of a conscious and pain free mother is one of the most exciting and rewarding moments in medicine"

Labour is defined as events that occur serially in female genital tract in order to expel the products of conception out of the womb into outer world through the vagina.[1] Pain relief in parturient has always been surrounded by myths and conflicts. Hence, achieving an excellent and safe analgesia during labour remains a most challenging issue.

In 1950, Neuraxial techniques were introduced for labour pain relief and during the past two decades many more recent advances lead to comprehensive and evidence-based management of labour pain.[2]

Labour is a very painful process. It represents the most common acute severe pain in adult life. In McGill pain questionnaire, labour pain ranks in between cancer pain and Amputation of digits. Progression of labour, maternal and foetal wellbeing may be affected by physiological response to labour pain.[3]

Maternal stress response to pain leads to increase in corticotrophin, cortisol, nor epinephrine and epinephrine levels. Increased nor epinephrine levels will reduce uterine blood flow by 35- 70%. Epinephrine has relaxation effect on uterus which may prolong the labour. Catecholamine's increases maternal cardiac output, increased systemic vascular resistance and oxygen consumption.[3]

Hyperventilation during contraction increases the work of breathing, oxygen consumption and resulting in hypoxia which reduces the utero placental blood flow by up to 25%. Respiratory alkalosis shift oxyhemoglobin dissociation curve to left and fetal Pa02 may fall up to 23%. Compensatory metabolic acidosis appears to be transferred to the fetus. There is delayed gastric and urinary emptying. Effective pain relief attenuates all these detrimental of stress response to labour pain. A goal of maternal labour analgesia is effective pain relief without compromising progression of labour, maternal and fetal safety.[4]

Epidural analgesia remains the most commonly used technique. Time for onset of action takes up to 20 minutes.[5] But the rapid and reliable onset of prolonged analgesia resulting from intrathecal injection with greater flexibility

and longer duration of epidural technique makes combined spinal epidural analgesia superior and ideal technique of choice for labour pain.

Combined spinal epidural technique is frequently used nowadays because of rapid onset of analgesia and better maternal satisfaction. It is associated with shortened labour and increased rate of cervical dilatation.[6] Numerous intrathecal interventions are available by using combined Local anaesthetic agent and opioid or opioid alone or null CSE; dura puncture created without injecting any drugs.[7] In this study, we used 0.0625% Bupivacaine with Fentanyl 2µg/ml of bupivacaine epidurally.

➢ *Aims and Objectives*
- To study Pain relief of labour
- To study hemodynamic parameters (PR, BP, SPO2) before and after epidural analgesia
- To study labour outcome
- To study fetal outcome
- To study complications if any

II. MATERIALS AND METHODS

A prospective clinical study was conducted in Department of Anaesthesia, at a tertiary care hospital and medical college for period of September 2019 to October 2021. Patient with term pregnancy with heart disease scheduled for normal vaginal delivery, when patient is in active labour (cervical dilatation > 3cm) were included, 50 pregnant women who received epidural analgesia were enrolled in the study. 10 ml of 0.0625% of Bupivacaine with inj Fentanyl 2mcg/ml of bupivacaine as initial dose drug was used.

➢ *Inclusion Criteria*
- Parturient with cardiac disease in active labour

➢ *Exclusion Criteria*
- Patient refusal
- Coagulopathy
- Local infections
- Allergic to local anaesthetia

➢ *Preparation of the Parturient:*
- She was prepared as per the routine preparation done for delivery, in addition to preparation of back to perform epidural block. The onset of active labour, degree of cervical dilatation and the adequacy of pelvis for vaginal delivery were assessed by attending obstetrician, before performing the block.
- Monitors (NIBP, pulse oximeter, ECG and CTG) connected and base line vitals were recorded.
- An IV line was started on the nondominant hand with an 18 G cannula.
- The parturient was preloaded with 300- 500 mL 0f Ringer lactate solution depending on the underlying heart disease.
- Antiaspiration prophylaxis (Inj. Ranitidine 50mg and Ondansetron 4mg IV) was given.
- All equipments needed for airway management and resuscitation of the mother and baby was kept ready before performing the block.

Block was performed after shifting patient to operation theatre.
- In sitting/right lateral position with monitors attached.
- under strict aseptic precautions.
- Ideal space chosen L3-L4/L4-L5
- Local infiltration with 1 cc of 2% Lignocaine was given in the L3- L4/L4- L5 for both the epidural needle placements.
- With bevel directed upwards, a midline approach with Tuohy needle was done and epidural space was identified by loss of resistance technique.
- Epidural placement was done in absence of uterine contraction. With patient in supine position, left uterine displacement was done by placing a wedge under the right buttock.
- As an initial dose 10 mL of 0.0625 % bupivacaine with 2 µg/mL fentanyl was given and patient was shifted back to labour room
- Left uterine displacement was maintained throughout the labour.
- Intermittent bladder catheterisation was done.
- Frequent vaginal examination was not encouraged throughout the labour.
- Oxytocin infusion was stopped before shifting patient to OT and during catheter insertion. It was then restarted after catheter insertion. Patient was educated that she would feel the uterine contractions as tightness without pain. Except pain, she can feel all other sensation. At the time of onset of second stage of labour, she may feel pain over perineum, inner thigh, anus or vagina.
- Full dose of 10 mL of (bupivacaine 0.0625%) was repeated at second stage, relieves the pain without affecting course of labour and this avoids further analgesia for episiotomy also.
- Obstetric management was decided by obstetricians.
- Continuous maternal and fetal monitoring was done and epidural catheter was removed six hours after delivery.

➢ *Monitoring*
- Time of onset of analgesia.
- Assessment of sensory blockade.
- Assessment of motor blockade.
- Duration of analgesia.
- Assessment of cardiovascular and respiratory system status.
- Complications or side-effects if any.
- Fetus monitoring by fetoscope, cardiotocograph.

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III. OBSERVATION AND RESULTS

This study includes 50 participants with heart disease who received epidural analgesia for labour.

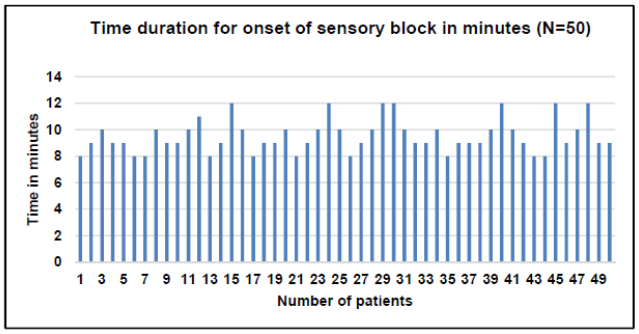

Fig 1 The mean time for onset of analgesia is 9.52±1.23 min Maximum upper level sensory block was confined to T6-T10 in 100% of patients.

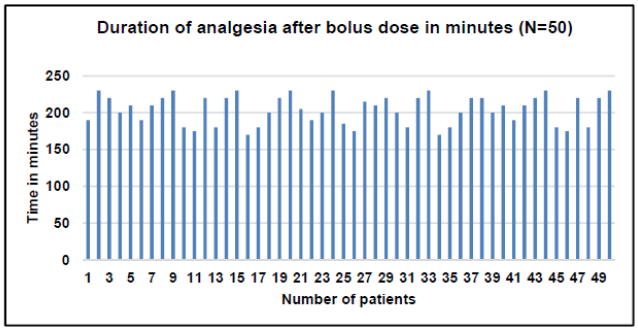

Fig 2 Mean duration of analgesia after initial bolus dose was 204.4 ± 19.6 min. No detectable motor block occurred in 80% of patients where as 20% of patients had Grade 1 motor block.

The patients needed one to two top up doses**.** 78% needed only 1 topup ;16% needed 2 top-ups and only 6% needed 3 top-ups.

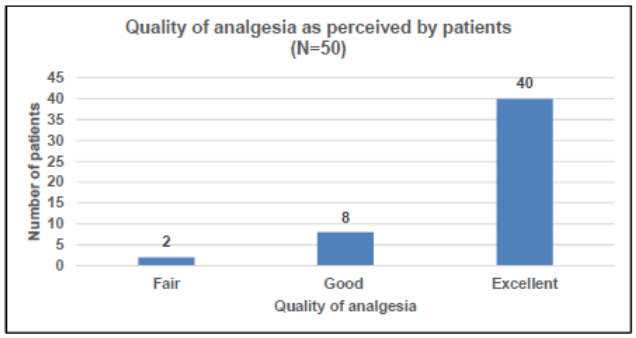

Fig 3 In present Study, 80% of patients had excellent pain relief and 16% had good pain relief and only 4% of participants had fair analgesia. Hemodynamic stability was significantly better throughout the analgesia. The mean VAS score 1.6 after 10 min of epidural block and the patients had good to excellent pain relief and 90% of participants expressed willingness for epidural analgesia in next pregnancy.

The mean APGAR score at 1min and 5min is 9.2 and 9.8 respectively.

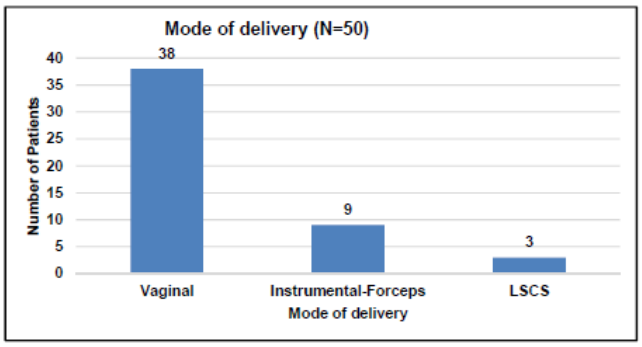

Fig 4 Most of patients (76%) had normal delivery with 18% needing instrument (forcep) for vaginal delivery and 6% had undergone LSCS.

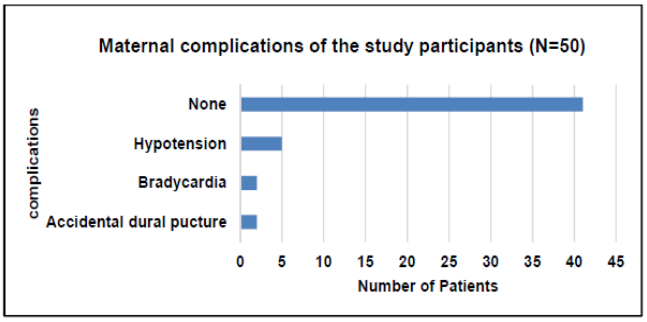

Fig 5 Regarding complications 10% had hypotension, 4% had bradycardia, 4% had accidental dural puncture but about 82 % had no complication which is significantly important.

The patients who had hypotension and bradycardia were managed by giving them left lateral position, 100% oxygen administration, IV fluids, and ephedrine 6 mg was given after every two minutes till blood pressure was corrected. Accidental dural puncture was seen in 5 patients in the study which was managed by administering iv fluids, iv analgesic and bed rest was advised after the labour and counselled the mother.

IV. DISCUSSION

Experiencing labour pains and giving birth is a normal physiological process. Although it is a natural phenomenon, it produces severe pain which requires analgesia to relieve pain during labour. The goal of labour analgesia is to provide adequate pain relief without causing any maternal and fetal jeopardy. Epidural analgesia is a gold standard technique for pain relief during labour. The study was conducted in our territory unit on 50 participants to study Labour epidural analgesia for parturient with heart disease. In our study 10 ml inj Bupivacaine 0.0625% with inj Fentanyl 2mcg/ml of bupivacaine was used as initial dose.

In the present study mean age of parturient patients was 25.2 ± 4.6 years. 54% of patients were primi gravida followed by gravida 2 (32%). The mean gestational age was 38.22 ± 1.14 during epidural block.

Most workers have commenced epidural analgesia when cervical dilation was 3 cm or more. In the present study, epidural analgesia was given with cervical dilation being between 3cm-5 cm. Most of patient needed only 1 top up 78% (n= 39) of Participants; 8 Participants needed 2 top-ups and 3 Participants needed 3 top ups. Mean duration of analgesia after initial bolus dose was 204.4 ± 19.6 min.

Cohen et al, 1987,[8] found that onset of analgesia was 7 ±1 min in patients receiving 0.25% Bupivacaine as initial dose with addition of 5mcg/ml fentanyl (higher concentration hastened the onset. The average onset time of 8 minutes noticed by Mc Morland et al.,[9] who assessed from the time of epidural block to loss pain with sensory level achieved at T8-T10 level. In his study about 85% had mean onset of analgesia was 8 minutes, Similar results are observed in present study.

Jaime Fernandez – Guisasola et al.,[10] shows upper level of sensory block in most of participants at T8 among the study patients undergoing labour epidural analgesia. Bellini et al.,[11] reported that 81% of participants who received epidural block with 0.125% Bupivacaine demonstrated a block T6-T10. Owen et al.,[12] in his study 80% of patient's sensory level was between T7-T10 which is adequate for labour. Similar results are observed in present study.

Karnawat et al.,[13] using 10 mL 0.125% bupivacaine obtained that the analgesia duration of intermittent bolus administration an average was 230 min and gave lower NRS score (NRS 1-3). Brockway et al.,[14] where the mean duration of analgesia was 213 min, Similar results are observed in present study.

Chestnut et al in their study where they used an infusion of 0.0625% bupivacaine with 0.0002% fentanyl who noticed that all the study Participants had mild motor blockade (grade 0 to 1) according to modified bromage scale.[15] Russel and Reynolds et al in their study Participants who recieved an infusion of 0.0625% Bupivacaine with 0.0002% fentanyl 20% of Participants were unable to raise leg (grade 1) and 80% had no motor blocked which is similar to my study.[16] My study findings are comparable with this studies.

Most workers have used visual analogue score to assess the quality of pain relief. In the present study VAS score has been used to assess the quality of pain relief. The VAS score decreased from 9 to 0 from the baseline to 6 hours after labour analgesia with slight elevation seen at 3 hours.

Similarly, K.S James et al[17] observed that 69% of Participants experienced pain free contractions by using 0.1% bupivacaine with fentanyl 5 mcg/ml. the study used VAS score who had more pain with VAS score of 8-9 during labour was relieved after epidural block and VAS score was drastically reduced to 2-3 which is significant. The study of Eddleston et al[18] who used 0.25% bupivacaine and found satisfactory analgesia with VAS score of 1-2 after labour epidural analgesia where mothers had good pain relief in 95.4% of Participants. My study findings are similar with these studies.

The increased pulse rate and blood pressure was due to the sympathetic activity, provoked by pain, anxiety and apprehension. Epidural analgesia during labour produce complete block of nociceptive pathways obviates the pain induced sympathetic activity and this eliminates alteration in cardiac output and blood pressure. This is an advantage in patients with heart disease Participants. Among the Heart disease in Participants in the present study, Rheumatic heart disease was the most common 68%, followed by Ventral septal defect (10%) and Peripartum cardiomyopathy (10%). The common symptoms among these parturient were dyspnea (62%) and fatigue (46%).

Suntharalingam et al[19] used low dose technique with a 0.1% bupivacaine and fentanyl combination in their 5-case series. They concluded that epidural analgesia may be used for delivery in heart disease patients with close invasive monitoring. According to Gomar and Errando[20] with the exception of pulmonary hypertension, idiopathic hypertrophic subaortic stenosis, neuraxial techniques with low segmental blockade of dermatomes offer an alternative to general anaesthesia in parturient during caesarean section.

In the present study the mode of delivery, about 76% of the parturient (38 patients) was delivered spontaneously, 18% of Participants (9 patients) underwent instrumental delivery by outlet forceps and 6% (3 patients) needed cesarean section. This is similar to the observation of David H Chestnut[15] who observed spontaneous delivery 59%, instrumental delivery 29% cesarean section 10% in his study.

In present study the APGAR score measured at 1 min and 5 min after the delivery of the baby for studying the overall condition which include five parameters for assessing. Beilin and Halpern[21] in 2010 did focused review with various studies that compared bupivacaine and ropivacaine and concluded that there was no evidence that neonatal outcome is adversely affected when bupivacaine is used for labour analgesia.

In present study among the complications, 41 Participants (82%) had no complications. 10% (5 patients) had hypotension in the present study. Jaime Fernandez – Guisaola et al[10] observed the incidence of hypotension to be 4% by using continous 0.0625% bupivacaine with 0.0002% Fentanyl Cohen et al[8] found hypotension in 5-11% of patients receiving fentanyl along with bupivacaine. Bleyaert et al[22] observed the incidence to be 10%. Owen et al found hypotension in 25% of Participants receiving bupivacaine, which responded well to the treatment. The patients who had hypotension were managed by giving them left lateral position, 100% oxygen administration, IV fluids, and ephedrine 6 mg was given after every two minutes till blood pressure was corrected to restore uterine artery perfusion promptly.[13] My study findings are comparable with these studies.

Incidence of bradycardia in the present study is 4%. The mean pulse rate is 83 ± 3 beats per min during the analgesia which is 79 ± 12 to 98 ± 13 beats per min as observed by Finegold et al.[23]

The patients with bradycardia were observed throughout the analgesia and managed by giving left lateral position, preloading the fluid according to the underlying pathology and by taking sensory level more than T6. In the present study 4% of Participants had dural puncture. David H C. Chestnut et al[15] shows incidence of pruritis 22%, nausea 27% and emesis 7%. In the present study no parturient had pruritis, nausea, vomiting, nerve injury or epidural haematoma.

V. CONCLUSION

Painless labour with central neuraxial segmental block with epidural catheter is well known. Parturient having heart disease land up in cardiac problem because of severe labour pain during delivery.

In our study we used low dose 0.0625% of bupivacaine (10 ml) with 2mcg/ml of Fentanyl as bolus and top up (5 ml of same concentration) is effective with haemodynamic stability and without any side effects. So, we recommend for every cardiac participant's low dose central neuraxial segment block with epidural catheter should be given which will be helpful for painless labour and in emergency LSCS this can be combined with General anaesthesia for intraoperative and postoperative advantages.

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