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Anaesthetic Challenges in A Decompensated Liver Diasease Patient Posted for Bipolar Hemiarthroplasty with A Subarachanoid Blockade

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ABSTRACT:

Owing to the Increased Incidence of chronic liver disease, the risk of Mortality & Morbidity in Surgery and anesthesia are manifold. Chronic liver disease patients manifest either in compensated state or Decompensated state (Ascites, variceal bleed; Hepatic Encephalopathy, Spontaneous Bacterial Peritonitis, Hepatorenal & Hepatopulmonary Syndrome). Perioperative risk & post-operative outcome can be validated with child Pugh Turcotte scoring and Model for End stage Liver Disease score. (MELD) In this study we would like to share the perioperative Management which was involved in a case of chronic liver disease with elevated LFT; deranged coagulation profile. However with proper pre-operative Evaluation & Optimization, perioperative care the complications and mortality can be minimized.

INTRODUCTION:

Worldwide incidence of chronic liver disease is 1.8% of total adult population, out of which up to 10% of patients[1] undergo non- transplant surgeries in the last 2 years of their life in which the rate of mortality is 6%[2]. The major challenges faced by the anesthesiologist in handling these cases are altered pharmacokinetics of anesthetic drugs, fluctuations in blood pressure which alter the hepatic blood flow leading to ischemia and postoperative liver dysfunction. In addition to this, presence of hepatic coagulopathy might complicate the administration of central neuraxial blockade in these patients. Meticulous planning and execution of anesthesia is warranted to avoid complications like delayed recovery, hepaticencephalopathy [3] and hepatorenal syndrome. Administration of general anesthesia in these patients involves simultaneous usage of multiple drugs, fluctuation in blood pressure which might worsen the pre-existing condition. Though administration of central neuraxial blockade in these patients avoids polypharmacy, alterations in blood pressure and presence of coagulopathy makes this technique less desirable. Regional nerve blocks (combined lumbar and sacral plexus block) are difficult to perform in these patients as they are deep seated and are unsafe in the presence of coagulopathy. In this case report, we share our experience in administration of regional anesthesia in a patient with coagulation abnormalities.

CASE DESCRIPTION:

A 44-year-old male presented to pre - anesthetic clinic with right Intertrochanteric fracture, planned for right bipolar hemiarthroplasty[4]. Patient is a known case of alcohol induced decompensated liver disease (DCLD) awaiting liver transplantation since 2018. His MELD (Model for End Stage Liver Disease) score was 1 and Child-Turcotte Pugh score was class B. He was also a known case of seizure disorder, following head injury and was on antiepileptic therapy. He was a chronic alcoholic and cigarette smoker for more than 25 years. On examination, patient had grade II icterus, bilateral pitting pedal edema. Patient had no signs of asterixisor flapping tremors. His heart rate was 102 beats per minute, blood pressure was 100/70 mmHg and was maintaining a room air saturation of 98%. Investigations revealed a hemoglobin of 10.4gm%, a platelet count of 78,000 cells/cu.mm., INR of 1.90, APTT of 54 seconds. Liver function tests showed a total bilirubin of 5.7 mg/dl and a direct bilirubin of 3.4mg/dl. Glutamic-oxaloacetic transaminase (SGOT) and glutamic-pyruvic transaminase (SGPT) were found to be 53 units/litre and 62 units/litre respectively and an Alkaline phosphatase of 352units/litre.

Ultrasound abdomen revealed liver cirrhosis with portal

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hypertension, splenomegaly and moderate abdominopelvic ascites. Echocardiography revealed a dilated left atrium with an ejection fraction of 65%. Pre-operatively, the coagulation status of the patient was optimized with fresh frozen plasma administered at a dosage of 10 ml/kg[5], a day prior to surgery. In addition to FFP, injection vitamin K 10 mg was administered intravenously for 3 days prior to surgery. On the day of surgery, repeat INR was found to be 1.45 and we planned to proceed with regional anesthesia for hemiarthroplasty.

On the day of surgery, the patient was administered injection levetiracetam 500mg intravenously as a part of epileptic prophylaxis. His fasting blood sugar was 95 mg/dl and he was started on 0.5% DNS. He was then shifted to the operation theatre and minimal mandatory monitors were connected. Under ultrasound- guidance right radial artery was cannulated and invasive blood pressure was monitored. Under ultrasound- guidance right Fascia Iliaca plane block was administered with 10 ml of 0.75% ropivacaine, 10 ml of 2% lignocaine and 4 mg of dexamethasone.

After ensuring that there was no pain, the patient was positioned in the sitting position and a sub arachnoid block was administered with a 27-gauge Quincke needle using 2.5 ml of 0.5% heavy bupivacaine and 25 mcg of fentanyl as additive. A sensory level of T8 was achieved and the patient was positioned in the left lateral position and handed over to the surgeons. The procedure lasted for 90 minutes and in order to avert any fall in blood pressure, noradrenaline infusion was used at a rate of 0.05 – 0.1 mcg/kg/min. Additionally, active heating measures were followed to avoid hypothermia. Intraoperative blood loss was compensated with transfusion of 1 unit of packed red cells and 2 units of fresh frozen plasma. Vasopressors were kept ready for avoiding hypotension. The patient was shifted to the IntensiveCare Unit for post-operative observation.

The post-operative analgesia following the block lasted for 430 mins and rescue analgesia of injection paracetamol 1 g was administered[6][7]. Vigilant blood glucose monitoring was carried out to ensure euglycemic status in the post-operative status. INR was periodically monitored and fresh frozen plasma was administered until there was minimal collection in the drain tube. Injection nor adrenalin was gradually tapered and stopped 12 hours post operatively. Intermittent pneumatic compression was used in the perioperative period to avert the development of deep vein thrombosis. The patient was discharged on the 10th post-operative day and was advised for further follow up in the liver clinic.

DISCUSSION:

The goals of anesthetic management in these patients include preoperative optimization of coagulation cascade, maintenance of hepatic blood flow, avoidance of usage of hepatotoxic/nephrotoxic drugs, maintenance of perioperative euglycemic status and avoidance of thrombotic events.

DCLD is associated with coagulopathy which is mainly due to reduction in the synthesis of clotting factors as well as thrombocytopenia due to splenic sequestration. All the clotting factors with the exception of Von Willebrand factor, factor VIII and calcium are synthesized by the liver. Deficiency of clotting factors is reflected in the prolongation of INR, which when elevated more than 1.8 leads to severe coagulopathy [8]. In the presence of coagulopathy lumbar puncture is an intermediate risk procedure and major orthopedic surgeries are

included under high risk procedures. Hence correction of hepatic coagulopathy is a pre- requisite prior to the procedure. Transfusion of 10- 20ml/kg of FFP would elevate the coagulation factors by 20% which would normalize the clotting cascade. Hence in our patients we transfused 10ml/kg of FFP which reduced the INR from 1.9 to

1.45. Platelet count in our patient was 1,02.000cells/cu.mm even in the presence of splenomegaly, which did not warrant any correction.

Liver receives dual blood flow from both portal vein(75%) and hepatic artery(25%). Autoregulation of hepatic blood flow in response to changes in blood pressure is present only in the hepatic artery and absent in the portal system. Hence any sudden and sustained fall in blood pressure would result in reduced hepatic blood flow which may worsen the pre-existing liver failure. In order to avoid precipitous fall in blood pressure we used an adjuvant in addition to the local anesthetic as it reduces the incidence of hypotension and at the same time it preserves the analgesia of sub-

arachnoid block. Monitoring of invasive blood

pressure enabled us to identify any fall in blood pressure at the earliest and enabled us correct the hypotension in time. Our target systolic pressure of 110mmHg was aimed which was achieved by the transfusion of packed red cell thereby preventing the use of vasopressors. Administration of fascia iliaca block not only obtunded positioning pain for sub-arachnoid block but also enabled us to lower the

dose of local anesthetic in the sub-arachnoid space thereby reducing the incidence of hypotension. Fascia iliaca block provided an additional margin of safety for closure of skin and subcutaneous tissue in the event of spinal anesthesia level recession.

Most of the drugs used during general anesthesia are mostly metabolized in the liver and excreted by the kidneys. Hence in the presence of liver failure the duration of action of these drugs may be prolonged and can result in delayed recovery from anesthesia. Hypo-albuminemia in DCLD would result

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in elevated free fraction of the drug bound to it. Hence dose adjustment has to be followed to avoid exaggerated drug response. The effect of individual anesthetic drugs in patients with liver failure is highlighted in table I.

S. No	ANESTHETIC AGENTS	INDIVIDUAL DRUGS	MECHANISM OF ACTION IN LIVER DISORDERS
1	I.V. Anesthetic agents	Thiopental	Dose should be reduced due to reduction in plasma proteins leading to increased unbound fraction, half-life may be prolonged.
		Propofol	Dose should be reduced as sensitivity to the sedative and cardiorespiratory depressant effects are increased
		Etomidate	Dose need not be altered as it has minimal effects on hepatic blood flow.
2	Skeletal muscle relaxants	Succinylcholine	Delayed action as there may be reduced pseudocholinesterase concentrations, altered protein binding.

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		Vecuronium & rocuronium	Steroid based blockers causes prolonged elimination phase in severe liver disease.
		Atracurium & cis-atracurium	No effect on hepatic metabolism.
3	Opioids	Morphine	Elimination is delayed in cirrhotic patients
		Fentanyl	On repeated or larger doses active metabolite may accumulate.
		Alfentanil	Elimination is reduced and volume of distribution is increased and reduced protein binding by alpha1-glycoprotein.
		Remifentanil	No changes in hepatic blood flow.
4	Volatile anesthetics	Desflurane	Ideal volatile agent as it is being metabolized least
		Isoflurane	reduces hepatic blood flow
		Sevoflurane	reduction in hepatic blood flow

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We preferred subarachnoid block in this patient as it avoids the use of multiple drugs. Fascia iliaca block provided post-operative analgesia which reduced the requirement of parenteral analgesics. Though opioids like fentanyl are safe in providing good post-operative analgesia, they are associated with increased incidence of vomiting, constipation,

Conclusion :

Henceforth we conclude to say that regional anesthesia would warrant better perioperative and postoperative outcome compared to general anesthesia. Since hepatotoxicity would be one of the most common complication behind general anesthesia, choice of regional anesthesia would be better. Regional anesthesia would be an option of anesthesia only if coagulation abnormalities are corrected.

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As liver is responsible for glycogenesis, glycogenolysis, and gluconeogenesis, liver failure is often associated with severe hypoglycemic episodes. Hence, periodic blood glucose monitoring and prompt correction of any hypoglycemic events were followed in our patient.

Though liver failure is associated with coagulopathy, it is also associated with thrombotic events which might be fatal in the peri-operative period. This is also compounded by the presence of immobilization in patients with lower limb fractures. In order to overcome this challenge, we used intermittent pneumatic compression pump to prevent the development of deep vein thrombosis.liver disease for non-hepatic surgery:A systematic review. Ann Med Surg (Lond).

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