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Case Report

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Role of neuro-monitoring in acute liver failure patient with fixed dilated pupil for emergency liver transplant - a novel case report

Abstract

Where Liver transplantation is the option for Acute Liver Failure patients and when the clinical situation meets with fixed dilated pupil who is non reacting to light and in conditions where haemodynamic are fluctuating on double or triple inotrope support. We suggest considering for bedside non-invasive monitors where no time as left for invasive or shifting the patient for outside operating room procedure.

Keywords: Acute Liver Failure, Fixed Dilated Pupil, Near Infrared spectroscopy, Optic Nerve Sheath Diameter

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Glossary: FDP, fixed dilated pupil; ALF, Acute liver failure; ONSD, Optic nerve sheath diameter; NIRS, Near infrared spectroscopy; BIS, Bis spectral index

Introduction

Acute liver failure is a rare and deaden complication that may pose cerebral edema and brain death. Pupillary reaction to light is usually moniterd as a sign of brain death. ONSD and NIRS are Non-invasive neuromoniters to asses the optic nerve diameter and global cerebral oxygenation respectively. There are only few literature on ALF patients with fixed dilated pupil for liver transplant. But none of the literature was found on using ONSD and NIRS as a tool to proceed for liver transplant in a case of fixed dilated pupil. Here we present a novel case of ALF with fixed dilated pupil and non reacting to light reflex with successful liver transplantion based on ONSD and NIRS as a helping tool in a clinical dilemma scenario after obtaining a written informed consent from patients attenders.

Case report

A 42 old years female patient with no other co morbidities. Patient was apparently normal 20 days back then she developed fever which is acute in onset not associated with chills and rigor but associated with nausea and vomiting and jaundice which was insidious in onset , gradually progressive in nature and not associated with pruritis or clay coloured stool for which she was admiited in local hospital there she developed altered sensorium which is acute in onset, started as confusion and progressed to agitation followed by non responsive to verbal stimuli. In this situation patient was reffered to our institute. On examination patient was in hepatic encephalopathy grade 4 with bilateral equal mid dilated pupil sluggish reacting to light. A provisional diagnosis of ALF with unknown etiology was made. Other lab parameters were as follow haemoglobin 9 gm%; TLC: 10,400 mm3; platelet count 1.24 lacs mm3; bilirubin 42.2 mg%; AST: 453 IU/ml; ALT:719 IU/ml; INR:5.43; sodium: 134 meq/l; potassium: 3.52 meq/L; serum creatinine 0.9 mg%.

The patient was managed according to institute protocol for ALF. Trechea was electively intubated in view of encephalopathy with etomidate, fentanyl and rocuronium and mechanical ventilation instituted targrting an end tidal CO_2 of 30-35 mmhg. Invasive haemodynamic monitoring helped guided fluid management. Haemodynamics were maintained on high dose nor adrenaline and low dose vasopressin infusions. The patient was nursed in slight head up position with no physical stimulation. Core temperature was maintained at 35-36 0C. Arterial blood gases, blood sugar and electrolyte were monitored and managed. N –acetyl cysteine (NAC) and 3% NS were started as per protocol. Relatives were counseled to identify a donar for emergency liver transplant.

Around 48 h post admission, right –sided pupil developed sluggish reaction to light which was managed with intravenous mannitol (0.5g/kg). ONSD showed right pupil 6.8mm and left pupil 5.6mm in diameter. NIRS showed right cerebral oxygenation of 56% and left cerebral oxygenation of 64%. CT head was done to rule out any significant cerebral edema and brain herniation.

72 h post admission, the patient was shifted to theater for live donar liver transplant. Sevoflurane was added to air-oxygen mixture to depen the anaesthetic palne. BIS was maitaine around 50. Fentayl and atracurium infusion were continued. Just prior to incision, pupil were check and found to be fully dilated with no reaction to light. This created a dilemma for the transplant team of whether to proceed with transplant as the patient had evidently developed a brainstem herniation. Abandoning surgery would take away the only chance of transplant that the patient had. Meanwhile, Liver had been mobilised for hepatectomy in the donor. It seemed unwise to proceed with donar hepatectomy in the presence of FDP in the recipient.

In the anaesthetised patient, brain death assessment by clinical test was not possible. It was necessary to do a confirmatory test, but could not proceed for CT head angiogram to confirm the status of cerebral blood flow because at this situation haemodynamics were fluctuating and on high nor adreanaline and vasopressin infusion but ONSD performed on bedside showed right pupil 6.5mm and left pupil 6.8mm measured 3mm away from the globe. NIRS showed right cerebral oxygenation on 60% and left cerebral oxygenation of 58%. BIS value of 60. Based on ONSD, NIRS, BIS parameter we proceded with the transplant. The 12 h long surgery was uneventful. However, pupil remained fixed and dilated throughout and the patient was shifted to ICU on mechanical ventilation post procedure for further management as per protocol.

Immunosuppression, broad spectrum antibiotics, antifungal agents and N acetyl cysteine were continued post operatively. Inotropes were

gradually tapered and stopped. Around 9 h post surgery, sluggish pupillary reaction to light was first observed. Over the next few days, the patient showed gradual improvement. On POD2, pupils were sluggishly reacting to light. Graft function was satisfactory as assessed by laboratory parameters. Nasogastric feeds were started and increased as per tolerance. Breathing efforts were observed in the next few hours. The patient regained muscle power over the next week. On POD6, eye opening to command was present. Ventilatory support was continued and trachea was finally extubated on POD12.

Furthur on POD 26 patient developed rectal perforation for which she has to undergoe exploratory laparotomy. On POD 46 Patient expired due to sepsis, allograft failure and multiorgan dysfunction.

Discussion

Role of non- invasive neuromonitoring is increasing used in day by day practice as it is easy to perform , results can be obtained easily where in situations of clinical dilemma unlike invasive monitoring which is time taking. ONSD and BIS together with NIRS helped the clinical scenario for successful Liver transplant. The ONSD correlates with invasively measured ICP, with a range of cutoffs indicating elevated ICP from 5 to 6 mm. The ONSD dynamically responds to changes in ICP, in response to both mannitol infusion and intrathecal infusion of Ringer's solution.[1] The appropriate cutoff for ONSD is unknown in patients with ALF, and likely the trend is more important as baseline ONSD can vary between patients.[2,3]

Living Donor Liver Transplantation for Acute Liver Failure With Fixed Pupils: Are We Fixed? A case report by Shwetha A Singh et al.[4] performed liver transplantation in patient with fixed dilated pupil based on CT angiogram findings which is time taking procedure and should not be performed in the state of haemodymaic fluctuations with high nor adrenaline and vasopressin infusion.

So, here we come with easily performable bedside non-invasive and highly reliable parameters with NIRS and ONSD although interobserver variable may be seen with ONSD. It is not always easy to perform CT angiogram for cerebral blood flow so, should be aware of alternative possibilites.

Several cases have been reported in literature highlighting the unpredictability of FDP and brain death.[5,6] Pupils could dilate and become non-reactive following administration of high doses of sympathomimetics such as dopamine,7 noradrenaline or parasympatholytic drugs.

FDP can be associated with other miscellaneous causes of anoxia like cardiac arrest, hypothermia, excessively deep anaesthesia, various poisonings like cyanide, methanol, propranolol as well as barbiturate overdose. Hypothermia induced in our patient was as per ALF protocol and depth of anaesthesia was monitored with Bi-Spectral Index monitoring. In non-ALF patients, induced hypothermia does not significantly impact papillary signs.

Conclusion

This case highlights the dilemma created in a case with FDP since a major decision regarding donor hepatectomy and transplanting patients with ALF had to be taken. Although the reason for FDPs still remains an enigma in this case, NIRS, ONSD and BIS helped in resolving the issue in favour of going a head with transplantation.

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