

## **Plasma Exchange (PLEX) in Acute Liver Failure**

**Do not initiate PLEX until a decision regarding suitability for liver transplantation has been made by the transplant team. Discuss initiation of PLEX with on call transplant anaesthetist and hepatologist.**

Please note the terms Acute Liver Failure (ALF) and Fulminant liver failure are used interchangeably.

Patients with Acute Liver Failure (ALF) who receive PLEX will fall into 2 categories:

- 1. Patients deemed unsuitable for transplant due to underlying comorbidities or psychological reasons.**
  - One RCT demonstrates these patients may have reduced mortality if treated with PLEX.
- 2. Patients listed for transplantation who have significant haemodynamic instability.**
  - Evidence suggests PLEX may stabilise these patients allowing transplantation to proceed, in addition there is a reduction in morbidity due to lower vasopressor requirements and therefore reduced digital ischaemia.

### **Indications for PLEX in ALF**

- Acute liver failure (ALF) in patients in the above 2 categories with the additional following criteria:
  - Ventilated
  - Noradrenaline > 20mls/hour single strength (this however is not an absolute number and trajectory is also important)
  - Hyperacute cause of ALF i.e. paracetamol overdose.
    - Other hyperacute aetiologies can be considered such as acute hepatitis.
  - Check contraindications below before commencing.

### **Contraindications to PLEX**

#### **Absolute:**

Hepatic artery thrombosis, liver resections with liver failure, Budd-Chiari, Primary non function of transplanted liver or graft dysfunction, malignancy

#### **Relative:**

Sepsis, hypoxic hepatitis, Futility

### **Referral for PLEX**

Following agreement between the transplant and intensive care team the patient should be referred for PLEX.

PLEX will be provided 7 days/week by the clinical apheresis unit based at RIE.

Unstable patients with high vasopressor requirement should receive PLEX as soon as possible – **inform the apheresis team of the clinical urgency when making the referral.** These patients can deteriorate very quickly.

Referrals for PLEX to the apheresis team should be made as soon as possible by the following process:

- 1<sup>st</sup> line, contact the BTS registrar bleep 2215 or via switch board.
- 2<sup>nd</sup> line, contact the BTS consultant on-call via switchboard.

**Critical Care Guidelines  
FOR CRITICAL CARE USE ONLY**

**Prior to initiation of PLEX – please check the following**

- **IV Medication**
  - Any IV medication due to be given shortly before or during a PLEX session (**especially antibiotics**) should be delayed until the completion of the PLEX session to prevent loss of the medication during the session.
- **IV Access for PLEX**
  - It is anticipated that most patients will require a **second vascath** to allow PLEX to be delivered.
  - If the patient has a RIJ central line and RIJ vascath insitu, the second vascath for PLEX should be **inserted into a femoral vein**. Thereby leaving one side of the neck free for further lines for transplantation if required.
- **Renal replacement therapy (CVVHD)**
  - CVVHD is a recognised treatment in ALF therefore it should **not be discontinued** to facilitate PLEX.
  - As mentioned above – a second femoral vascath is required to facilitate PLEX.
- **Calcium replacement during PLEX**
  - Calcium replacement during PLEX will be **managed by the ICU nurse** and not the apheresis nurse.
  - High dose calcium replacement is required due to the livers inability to metabolise citrate
- **FFP/ Octaplas administration during PLEX**
  - PLEX will most likely be carried out using Octaplas (detergent treated FFP) due to its reduced immune profile.
  - The apheresis nurse will be responsible for ordering FFP or Octaplas from BTS.

**The PLEX Procedure**

- Each PLEX session will consist of **1.5 x plasma volume** and will take up to 4 hours.
- PLEX should be carried out on **three** consecutive days. Response to each PLEX session should be assessed.
- However, If the patient undergoes liver transplantation, no further PLEX is required.
- **Inform the apheresis nurse performing PLEX that the patient has acute liver failure and therefore they should run citrate at the lowest level on the apheresis machine.**

**\*\*\*Calcium replacement during PLEX – PERFORMED BY ICU BEDSIDE NURSE\*\*\***

- **Step 1 – ICU BEDSIDE NURSE**
  - Checks ionised calcium on ABG before commencing PLEX.
  - If less than 1mmol/L give bolus of 20mls of 10% calcium gluconate over 20mins.
- **Step 2**
  - Always start a continuous infusion of high dose calcium gluconate (even if a bolus dose was not required). The calcium is required during plasma exchange to counteract the effect of citrate anticoagulation.
  - The calcium infusion is undiluted 10% calcium gluconate (not chloride) at **20mls/hour** for the duration of PLEX.

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- **Step 3**

- Check ionised calcium on an **ABG every hour during PLEX** and following completion of PLEX.
- If at any point during PLEX:
  - The ionised calcium is **less than 1mmol/L** the infusion rate of calcium gluconate should be **increased to 30mls/hour**.
  - The ionised calcium is **more than 1.2mmol/L** the infusion rate of calcium gluconate should be **decreased to 10mls/hour**.

**Patient assessment following each PLEX session**

- The half-life of FFP is 4-6 hours.
- Therefore, assessment of patient coagulation as a marker of improving liver function should only be undertaken **> 12 hours after the completion of the PLEX session**.
- Clinical decisions regarding delisting, listing and patient assessment should be made on bloods taken **>12 hours** after completion of a PLEX session.
- If after 3 days of PLEX the patient remains critical unwell and there has been a perceived benefit. PLEX can be continued for longer than 3 days following agreement between the hepatologist, intensivist, transplant anaesthetist and BTS consultant.
- **Expected clinical/biochemical changes following PLEX:**
  - Reduction in vasopressor requirements
  - Improved MAP
  - Reduction in Bilirubin, ALT and Ammonia
  - Marked reduction in INR and PT
  - There is no evidence PLEX improves or worsens intracranial pressure
  - PLEX is a volume neutral procedure and therefore should not worsen fluid overload

If a patient is referred for PLEX please email Oliver Robinson ICU consultant

**oliver.robinson@nhslothian.scot.nhs.uk** so that appropriate audit and data collection can occur.

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