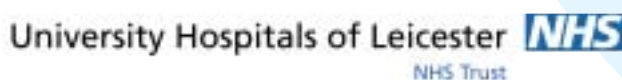


# MARS helps to save liver failure patients... ...in Leicester

## Leicester and the Liver

The Glenfield Hospital, as one of England's newer teaching hospitals, is a 500 bedded centre of medical excellence for clinical services, teaching and research, located in Leicester, and part of the University Hospitals of Leicester NHS Trust.



Many of the Trust's Medical Specialities are now recognised as Centres of Excellence and Glenfield can boast the following:

- Britain's leading centre for Pulmonary Rehabilitation.
- One of the largest and most technically advanced Cardiothoracic Units in the country currently performing around 1500 open heart cases per year on adults and children.
- One of the best equipped radiological departments in the country incorporating cardiac catheter rooms, gamma camera facilities, CT and MRI scanners.
- Recognition as the leading centre in the country performing neo-natal ECMO (extra-corporeal membrane oxygenation) which has led to the designation as a supra Regional Centre, while three other hospitals practise NNECMO in the UK there is no other provider of paediatric and adult ECMO. This therapy supports patients who may have multi-system organ failure (MSOF).

Glenfield currently has 6 professorial posts in Cardiology, Medicine for the Elderly, Respiratory Medicine and Cardiac Surgery. Clinical research is undertaken by all the major medical specialities.

Mr Giles Peek is a Consultant Cardiothoracic Surgeon who is pioneering the MARS® liver support system at Leicester.

## What is ECMO?

Extracorporeal Membrane Oxygenation (ECMO) uses cardiopulmonary bypass in order to support patients with a severe, but potentially reversible respiratory

or cardio respiratory failure for prolonged periods in the intensive care unit (ICU). ECMO is an evidence-based therapy in neonatal patients, but its use in older children and adults is less well established.

At Glenfield Hospital, under the care of the ECMO Team, ECMO is used for modified heart/ lung machines to treat patients with severe but potentially reversible respiratory or cardio respiratory failure who are continuing to deteriorate despite maximal intensive care.

These patients would have a risk of death between 80-100%.

ECMO can be used to reverse this process in patients of all ages. Survivals range from around 99% in babies with meconium aspiration syndrome through around 70% for adults with respiratory failure to around 50% for children needing support of the circulation following open heart surgery.



Large proportions of patients supported with ECMO have multi-system organ failure and as the MSOF progresses the liver failure becomes an important, and indeed, defining component of their disease. The Molecular Adsorbents Recirculation System (MARS) uses an albumin dialysis technique to remove albumin bound toxins thereby taking over the detoxification function of the liver.



Tel: 01480 444000

Fax: 01480 434084

Web: [www.gambro.co.uk](http://www.gambro.co.uk)



*"We feel that MARS will become widely disseminated throughout intensive care units and its major use will be treatment in multi system organ failure patients rather than patients with single system liver failure in liver units. It is essential that Gambro sponsor research to explore the efficacy of MARS in this setting."*

## What is MARS?

Mr Peek said "The MARS was introduced into our hospital in January 2000; initially only one circuit was available; this was used in order to treat the first patient whose serum bilirubin was 847  $\mu\text{mol/l}$ . The MARS was considered for patients who developed progressive hyperbilirubinaemia  $>300 \mu\text{mol/l}$ . Patients were screened for treatable causes such as biliary obstruction, haemolysis and hepatotoxic medication. All patients under the care of the ECMO team at Glenfield Hospital who fulfilled the above criteria were treated with MARS".

MARS is a cell-free extra corporeal liver support device, used in blood detoxification.

- MARS therapy mimics the detoxification function of the liver, stabilising the patient until the liver regenerates, or until an appropriate graft is available for transplant.
- The basis of MARS therapy is the elimination of water-soluble and albumin bound substances which accumulate in liver failure. This enhances the regeneration of liver cells and reduces the toxicity of plasma.
- The MARS machine operates by causing these substances to pass through the MARS Flux filter and bind to a recirculating albumin solution. This solution is then dialysed before being passed through selective absorbers and recirculated to the MARS Flux filter.

This system has been used for numerous indications such as decompensated chronic liver disease, acute liver failure, secondary liver failure possibly due to ischaemic injury of the liver, multi organ failure, sepsis and removal of protein bound drugs post overdose. Some 13% of the general ITU population has liver insufficiency that could potentially be treated.

MARS provides a well tolerated and safe patient treatment through high biocompatibility. It manages patient's fluid, electrolyte, acid/base balance and lactate levels.



## Patients of all ages

At the Glenfield Hospital, Mr Peek continues "We use MARS in patients of all ages who have developed liver failure as part of their multi system disease. Before we had MARS almost all patients whose bilirubin exceeded  $300 \mu\text{mol/l}$  in the context of multi

organ failure died. Since we have been using MARS in these cases we are saving around half of these patients. We have also noticed that during MARS therapy, the

patient's inotrope requirements are dramatically decreased. We know from basic science research that a large number of cytokines are albumin bound and we hypothesised that the MARS unit is removing these cytokines, and thereby ameliorating the sepsis syndrome. We have also used MARS specifically in this setting on a number of occasions for patients with severe sepsis who do not have liver failure and have seen dramatic clinical improvement. We hope to investigate this further in a cohort study of children with severe sepsis and we are currently applying for ethical committee approval.



## A positive future

To support the increasing use of MARS in association with MSOF, Gambro has produced a comprehensive folder on the MARS system and its use in continuous Renal Replacement Therapy (CRRT) as well as liver failure. The folder also includes a number of case studies and published clinical papers, including an earlier one from the Glenfield Team, under Mr Peek, together with colleagues at other Leicester hospitals, entitled 'Modular extracorporeal life support for multi organ failure patients'.

Reflecting on the very positive contribution MARS has made in his practice of treating critically ill patients, Mr Peek concludes "We feel that MARS will become widely disseminated throughout intensive care units and its major use will be treatment in multi system organ failure patients rather than patients with single system liver failure in liver units. It is essential that Gambro sponsor research to explore the use of MARS." Gambro is pursuing this course on a global front.

*Gambro Hospital - leading the way in selective blood purification.*