Adequate graft perfusion is essential for successful liver transplantations. Intraoperative transit time flow measurement – TTFM, provides essential information about anastomosis quality, liver perfusion and guidance during flow modulation procedures.
TTFM is a well-established, easy to use, and rapid quality control method in liver transplantation. The real-time flow volume and pressure information obtained with the Medistim VeriQ™ system accurately guides the surgeon on the hepatic regional hemodynamic status and response during inflow modulation, yielding a reliable overview of the transplanted liver function before patient closure.

The Hepatic Artery Buffer Response (HABR) compensates for changes in Portal Vein Flow. However, extreme Portal Vein Flow (PVF) impairs Hepatic Artery Flow (HAF). The Medistim VeriQ™ system allows for a simultaneous measurement of both Portal Vein and Hepatic Artery flows.

Exposing small or partial grafts to excessive Portal Vein Flow may lead to the Small-for-Size Syndrome (SFSS).

Simultaneous flow and pressure measurements with the Medistim VeriQ™ system provides effective guidance for potential flow modulation procedures and in optimizing the liver hemodynamics.

- HAF ≥ 100 ml/min to minimize risk of Hepatic Artery Thrombosis (HAT)
- PVF < 4x physiologic value to avoid hyper perfusion associated with poor outcomes
- Hepatic Vein Pressure Gradient (HVPG = PVP – CVP) < 15mmHg, reduces risk of post-operative perfusion damage irrespective of graft size

Hepatic Artery complications after liver transplantation are a major cause of post-transplant morbidity and mortality.

In spite of procedural improvements, the rates of HAT are reported between 1.6 – 9.2%.

TTFM allows for early detection and confirmation of successful intervention in case of HAT.

Detection of Hepatic Artery Thrombosis (HAT)

Hepatic Artery complications after liver transplantation are a major cause of post-transplant morbidity and mortality.

In spite of procedural improvements, the rates of HAT are reported between 1.6 – 9.2%.

TTFM allows for early detection and confirmation of successful intervention in case of HAT.
Identification of compromised anastomosis

Insufficient Hepatic Artery Flow, or too high Portal Vein Flow may lead to post-surgical complications which are a major cause of post-transplant morbidity and mortality.

Hepatic Artery and Portal Vein Flow problems can be easily detected and corrected. TTFM performed intra-operatively allows the surgeon to evaluate the hemodynamics of the liver and the quality of newly constructed grafts and shunts. Patients who still have significant open portosystemic shunts after reperfusion of the graft, may be identified.

Shown here are TTFM readings of the hepatic artery before (fig.6) and after (fig.7) anastomotic revision were obtained.

The high resistance (PI 18.7) and low flow (3 ml/min) identified an anastomotic issue which was promptly addressed by revising the anastomosis.

Inflow modulation

Primary graft dysfunction is a serious complication in the early postoperative period. Early intra-operative identification and appropriate management is crucial.

Graft hyper- and hypo-perfusion are risk factors for early dysfunction and graft rejection which can result in the need for re-transplantation. When performing flow modulation procedures, reliable flow measurements are essential in deciding the optimal flow modulation strategy and to ensure that the desired flow rates are achieved.

The normal physiologic ratio between portal vein flow and hepatic artery flow, is approximately 5:1. Post-transplant, the ratio often increases due to hyper-perfusion and hepatic artery buffer syndrome, however, it should not exceed 10:1.

An initially high PVF/HAF ratio of 20 (fig.7) with relatively low hepatic artery flow was addressed by means of a successful splenic artery ligation. The portal vein flow decreased from 1716 ml/min to 940 ml/min and the hepatic artery flow increased from 85 ml/min to 173 ml/min, yielding an optimal PVF/HAF ratio of 5 with desired liver hemodynamics (fig.8).
Medistim TTFM Probes

With Medistim’s Vascular and QuickFit™ TTFM Probes, volumetric blood flow can be accurately measured through exposed arteries, veins and conduits during surgical procedures.

Medistim TTFM Probes - PS, PQ & PV probe series - available with and without handle

<table>
<thead>
<tr>
<th>Probe name</th>
<th>Probe sizes</th>
<th>Part numbers</th>
<th>Sterilization methods</th>
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<td>STERRAD® Ethylene Oxide gas (EtO)</td>
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References


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