Opinion

Multiple disciplinary consensus on perioperative management of overwhelming inflammation for patients undergoing liver resection: an interpretation

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Submitted May 02, 2013. Accepted for publication Jun 01, 2013.
doi: 10.3978/j.issn.2304-3881.2013.06.02
Scan to your mobile device or view this article at: http://www.thehbsn.org/article/view/2206/3106

Liver resection is a conventional treatment for liver tumors, intrahepatic bile duct stones, hepatic trauma, hepatic abscesses, and some other liver diseases. Since the operation is performed on a vital organ, the liver surgeons must pay special attention to the perioperative management of inflammation, so as to effectively protect the organs (particularly the liver) and optimize the surgical effectiveness.

Excessive inflammatory response associated with liver resection may bring damage to liver tissues and further cause systemic multi-organ injuries. Factors including trauma of liver surgery, liver ischemia-reperfusion, blood transfusion, and postoperative pain may induce excessive inflammatory response, which can further trigger inflammation cascade, causing systemic inflammatory response syndrome. Patients may develop shock, postoperative liver failure (PLF), postoperative acute lung injury (ALI), acute respiratory distress syndrome (ARDS), acute kidney insufficiency (AKI), infections (e.g., sepsis and multiple organ failure due to severe sepsis), and postoperative cognitive dysfunction (POCD).

According to the expert consensus, proper perioperative management of inflammation will effectively control excessive inflammatory response and its poor outcomes and facilitate postoperative recovery.

It is recommended that the general function status and nutrition status should be assessed using Eastern Cooperative Oncology Group (ECOG) scoring system and Subjective Global Assessment, respectively, before the surgery. Patients with severe malnutrition should receive nutrition support before the initiation of surgery. The functions of all the vital organs including heart, lung, liver, and kidney should be carefully assessed. Liver function assessment is particularly important for liver resection. Also, psychological counseling should be provided. Patients should be guided to take heart and lung function exercises. Furthermore, disordered internal environment, anemia, hypoproteinemia, and some other underlying diseases must be appropriately managed.

Short-acting anesthetics, low-dose opioids, and continuous epidural block (T5-L2) is recommended for anesthesia. The technique of controllable low central venous pressure should be applied. The anesthesia procedures should be performed in a gentle manner to minimize the response to noxious stimuli and lower the incidences of postoperative complications.

Controlling the intra-operative blood loss is a key factor to ensure the safety of liver resection and control the excessive inflammatory response. According to the consensus, liver blood flow occlusion can be performed according to the Nomenclature of Liver Anatomy and Liver Resection Procedures, Methods of Liver Blood Flow Occlusion, and Principles for Surgery Selection.

Minimally invasive segmentation of the liver parenchyma is recommended to reduce the damage to the residual liver parenchyma and intrahepatic vascular structures. The selection of surgical procedures is based mainly on the operation experiences of the operator, the availability of equipment in the hospital, and the requirements for fine anatomy during the surgery. En-bloc suture or ligation of tissues should be avoided because they may cause the congestion or ischemic necrosis of liver parenchyma, which can be followed by bile leakage and infections.

Laparoscopic liver resection, as a minimal-access surgery, can reduce the stress response and inflammation induced by access trauma, incision pain, and activity limitations. According to the consensus, laparoscopic liver resection is the treatment of choice for tumors that are solitary, sized ≤5 cm, and/or located at the outer side of the liver (segments II-VI).

Drugs, fluid resuscitation, and analgesia are recommended for controlling post-operative inflammatory response.

Drugs that are useful for alleviating post-operative inflammatory response include glucocorticoids, urinary trypsin inhibitor, and liver-protecting drugs. Free radical scavenging agents, non-steroidal anti-inflammatory drugs (NSAIDs), and glutathione may also be useful.

For postoperative fluid resuscitation, Rivers' early goal-directed therapy (EGDT) protocol is recommended. A core target is to achieve the balance between oxygen delivery and peripheral tissue oxygen consumption (i.e., $ScvO_2$ ≥70%) by rapid volume expansion (and blood transfusion or use of positive inotropic drugs, if necessary); meanwhile, hypotension and hyperlactacidemia should also be properly managed.

Pain should be relieved using sedatives, or analgesics if it persists.

Cite this article as: Mao Y. Multiple disciplinary consensus on perioperative management of overwhelming inflammation for patients undergoing liver resection: an interpretation. Hepatobiliary Surg Nutr 2013;2(3):174-175. doi: 10.3978/j.issn.2304-3881.2013.06.02

Acknowledgements

Disclosure: The author declares no conflict of interest.

