Episode 228: Liver Transplant Revisited with Nicole Rizkalla

On this episode: Dr. Jed Wolpaw With Dr. Nicole Rizkalla

In this 228th episode I welcome Dr. Nicole Rizkalla to the show to discuss the details of liver transplant anesthesiology. We discuss patient selection and preparation, intraop and postop management, the training pathway to be a transplant anesthesiologist and what the future may hold.

Questions & Notes

Click → jump to answers/notes.

Preoperative Assessment

- What information do you want from the patient?
  - What specific points to consider about their liver disease?
  - What specific points to consider about their extra-hepatic diseases?
- What do you expect from a surgical perspective?
- What could cause you to call the liver transplant surgery off?
- What labs/workup for the liver transplant patient?
- What lines do you put in for your liver transplant patient?
- Is it safe to place TEE in a patient with varices?
- When do you use venovenous bypass (VVB)?
- What are the risks of VVB?

Preanhepatic (Dissection) Stage

- What are you anticipating/thinking about in the preanhepatic/dissection stage?
- What are the surgical approaches to a liver transplant?

Anhepatic Stage

- What are you anticipating in the anhepatic stage?

Neohepatic Stage

- What are you anticipating in the reperfusion phase?
- Should you use bicarbonate during the reperfusion phase?
- What is the neohepatic phase? What is important about it?
- When should we extubate?

Postoperative Care

- What is liver ERAS?
- What are the initial goals in the ICU post-transplant?

What is the pathway to pursuing liver transplant anesthesiology?

What is the future of liver transplants?

References

Preoperative Assessment

What information do you want from the patient?

5:48

- What is the patient's liver disease?
- What are their extra-hepatic diseases?
- Are there any accompanying comorbidities?

What specific points to consider about their liver disease?

8:20

- **Acuity** and **chronicity** of the patient's liver disease.
    - E.g. is this acute with cirrhosis or acute without cirrhosis?

What specific points to consider about their extra-hepatic diseases?

9:20

- Think about what the patient's primary organ failures/dysfunctions are.
- How will these affect the anesthetic plan?
- How will these affect the anticipated operative course?
- E.g. accessing neurologic, pulmonary, cardiovascular, renal, hematologic, endocrinologic, and metabolic status
- What are the specific deficiencies?
    - What can be optimized?
    - What cannot be optimized but will need extra attention in the OR?

What do you expect from a surgical perspective?

10:31 (also 33:45 and 41:35)

- Is this a redo transplant? Will the dissection be difficult due to body habitus? Is the abdominal cavity very narrow? Is this a classic hepatectomy, or hepatectomy with caval preservation; how will this impact blood loss? etc.
- **Ask the surgical team** what they are anticipating.

What could cause you to call the liver transplant surgery off?

11:55

- You must think not only as an anesthesiologist, but also as **organ stewards**.
- A liver transplanted into a patient likely to expire post-op or have terrible quality of life after, may be better served in a candidate with a better chance of meaningful recovery.
- Some contraindications for liver transplant could include: acute/chronic RV failure, irreversible and severe pulmonary hypertension, severely depressed LV function, critical coronary disease, etc.
- Some physiologic variables to help determine **futility** could include the following (Petrowsky 2014):
    - Circulatory integrity, vasoactive support requirements, severity of lung disease (severely depressed P/F ratios), metabolic failure (rising lactate), severe frailty.

What labs/workup for the liver transplant patient?

18:24

- MELD labs
- Screening ECG and transthoracic echo
- Stress testing (depending on the institution)
- Overall, it can be really institution specific (e.g. some institutions require coronary angiography on all patients)
- CMP, coagulation profile, viscoelastic testing, infectious screening
- Vascular abdominal imaging

What lines do you put in for your liver transplant patient?

21:50

- This again can be very institution specific.
- Dr. Rizkalla herself usually places:
    - a peripheral arterial catheter after induction (patients requiring arterial catheter pre-induction would likely be precluded from the transplant)
    - central venous access (usually right jugular, with 2 catheters in the same vessel)
- Placement of PA catheter and TEE is usually under the discretion of the anesthesiologist and based on patient's underlying physiology/pathology (e.g. RV dysfunction, pulmonary htn).

Is it safe to place TEE in a patient with varices?

26:20

- Yes, place TEE when indicated. A review from Dalia et al (2018) found low incidence of complications from TEE placement in patients with grade 1 and 2 esophageal varices.

When do you use venovenous bypass (VVB)?

27:23

- VVB is an option to maintain preload and circulatory support when there is significant reduction of blood returning back to the right heart.
    - e.g. IVC and portal vein completely occluded during a total hepatectomy, in a patient with poor collateralization who is maximally contracted/augmented and maximally dilated requiring significant vasoactive support.
- Note, there are no consistent studies to show VVB improves patient outcomes.
- VVB may not be needed in a classic hepatectomy if the total duration of caval and portal vein isolation is relatively short (e.g. < 1 - 2 hours).

What are the risks of VVB?

31:00

- Placement of large bore lines, thromboembolism, air embolism, shearing.

Preanhepatic (Dissection) Stage

What are you anticipating/thinking about in the preanhepatic/dissection stage?

32:18

- Dr. Rizkalla considers the dissection stage to be **more important than the reperfusion** stage. For difficult cases, it is even more important to anticipate and **optimize patients during this stage** so they are in the best shape for reperfusion.
- She takes into account her initial assessment of the patient's debilitations/deficiencies and also any surgical considerations.
- E.g. optimizing volume status, diagnostics in place to recognize acute RV/LV failure, optimal metabolic and electrolyte profiles to enter reperfusion.

What are the surgical approaches to a liver transplant?

43:40

- Classic hepatectomy with bicaval approach to anastomosis of new graft
    - Involves suprahepatic and infrahepatic venous clamping, with removal of retrohepatic cava
- Hepatectomy with caval preservation (with a piggyback technique)
    - Involves removal of liver with preservation of caval continuity
    - Although the vena cava is preserved, this is a more meticulous and longer procedure
    - Certain conditions can preclude patients from this technique
        - E.g. Budd-Chiari syndrome

Anhepatic Stage

What are you anticipating in the anhepatic stage?

48:14

- Metabolic and hematologic disarray
    - e.g. more likely to be coagulopathic, hypothermic, acidemic, hyperkalemic

Neohepatic Stage

What are you anticipating in the reperfusion phase?

49:20

- While the portal vein has been clamped, there is a buildup of unwanted substances (e.g. endotoxin, vasoactive mediators, bacteria, lactate, nitrogenous waste, acid) that can be worse if a patient has a diseased gut and if there has been an extended time while clamped.
- Watch out for RV dysfunction/failure
    - Sudden increased workload
    - Potential hyperkalemia, acidemia, hypothermia

Should you use bicarbonate during the reperfusion phase?

54:30

- Dr. Rizkalla tends **not** to pre-emptively use bicarbonate during reperfusion, unless the patient is **already acidotic** prior to reperfusion.

What is the neohepatic phase? What is important about it?

55:27

- The phase following reperfusion, which begins with hepatic arterial anastomosis, and ends with biliary anastomosis and closure.
- Assessment of the function of the new liver begins here.
    - Based on the characteristics of the graft and the recipient, you can anticipate whether the patient will potentially get better or worse at this time.

When should we extubate?

59:29

- At Dr. Rizkalla's institution, they have an extubation rate in the OR of about 85%.
- Extubation in the OR should be the default unless there are any specific issues (e.g. graft is not working well).

Postoperative Care

What is liver ERAS?

1:03:27

- Enhanced Recovery After Surgery Protocol (ERAS)
- Early extubation, early mobilization, early removal of gastric tubes and drains, early enteral intake, early participation in physical therapy and mobilization.
- ERAS can reduce length of ICU and hospital stay with improved patient outcomes (Rodrıguez-Laiz 2021).

What are the initial goals in the ICU post-transplant?

1:04:45

- Support graft integrity, graft recovery, patient recovery.
- Judicious volume administration, maintenance of hemodynamics, surveillance of ongoing graft function/dysfunction, surveillance of ongoing bleeding, monitoring of any other organ dysfunction.

What is the pathway to pursuing liver transplant anesthesiology?

1:06:55

- Liver transplant anesthesiology fellowships
    - Mostly hybrid programs
- Look for a **high volume center** (120-150 liver transplants a year)
    - With you performing in at least **50 liver transplants a year**

What is the future of liver transplants?

1:10:20

- There is an expanding recipient and donor pool, due to being more aggressive on who can give and receive transplants.
    - This equates to potentially more sick patients with lower-quality grafts.
- Early extubation, fast-track, bypassing ICU, facilitating rapid recovery.
- Combining certain complex procedures together (e.g. combined heart-liver transplants).

References

1. Adelmann et al, Anesthesia for Liver Transplant, Anesthesiology Clin, 2017, 35:491–508
2. Barjaktarevic et al, Perioperative Considerations in Liver Transplantation, Semin Respir Crit Care Med 2018, 39:609–624
3. Petrowsky et al, Liver Transplantation in Highest Acuity Recipients Identifying Factors to Avoid Futility, Annals of Surgery, 2014, 259:6
4. Molinari et al, Preoperative Stratification of Liver Transplant Recipients: Validation of the LTRS, Transplantation. 2020, 104(12): e332–e341
5. Varughese et al, Cumulative Deficits Frailty Index Predicts Outcomes for Solid Organ Transplant Candidates, Transplantation Direct, 2021;6: e677
6. A. De Gasperi et al, Preoperative cardiac assessment in liver transplant candidates Best Practice & Research Clinical Anaesthesiology, 2020, 34: 51e68
7. Dalia et al, A Comprehensive Review of Transesophageal Echocardiography During Orthotopic Liver Transplantation, Journal of Cardiothoracic and Vascular Anesthesia, 2018, 32:1815–1824
8. Fayad A et al, Comparative effectiveness and harms of intraoperative transesophageal echocardiography in noncardiac surgery: a systematic review. Semin Cardiothorac Vasc Anesth 2018;22:122-136
9. De Marchi et al, Safety and Benefit of Transesophageal Echocardiography in Liver Transplant Surgery: A Position Paper From the Society for th e Advancement of Transplant Anesthesia (SATA) Liver Transplantation, AASLD, 2020, 26:1019–1029
10. R. van Rijn et al, Hypothermic Machine Perfusion in Liver Transplantation — A Randomized Trial, N Engl J Med 2021, 384:1391-1401
11. M. Zeillemaker-Hoekstra et al, Anesthesia for combined liver-thoracic transplantation. Best Practice & Research Clinical Anaesthesiology, 2020, 34:101e108102
12. Lin et al, Prehabilitation-Driven Changes in Frailty Metrics Predict Mortality in Patients With Advanced Liver Disease, Am J Gastroenterol, 2021, 116(10):2105-2117
13. Rodrıguez-Laiz, et al, Fast-Track Liver Transplantation: Six-year Prospective Cohort Study with an Enhanced Recovery After Surgery (ERAS) Protocol, World J Surg, 2021, 45:1262–1271
14. Chadha et al, Society for the Advancement of Transplant Anesthesia: Liver Transplant Anesthesia Fellowship—White Paper Advocating Measurable Proficiency in Transplant Specialties Training Seminars in Cardiothoracic and Vascular Anesthesia 2017, 21(4) 352–356
