



INTERNATIONAL LIVER  
TRANSPLANTATION SOCIETY

## ILTS Video Author Guide

To: ILTS Education platform  
From: John Klinck, Special Project Executive  
Approval Date: Aug 20, 2020  
Subject: ILTS Video Author Guide

- Videos should be of similar standard to those submitted for presentation at the ILTS Annual Congress, i.e. submitted in MP4 format with authors and institution named, a title and a written summary.
- Maximum summary length is 500 words for body text, excluding title, authors and up to 4 references. The summary should be headed with the names and affiliations of the authors. It can be accompanied by other documents, e.g. pdfs, if these are the author's own or open access / copyright-free.
- Voice or embedded text commentary is desirable but not essential. Use of a soft, neutral instrumental music soundtrack is acceptable.
- Ten minutes should be the maximum length, although longer items can be presented as 10-minute segments, each with its own summary.
- Patient confidentiality and consent are required, and the content should be copyright compliant. The ILTS website disclaimer and policies on disclosure/conflict of interest apply.
- Submit to [ilts@ilts.org](mailto:ilts@ilts.org), with Subject entry: **Video submission for ilts.org**. WeTransfer may be used.

## ILTS Disclaimer

- This video platform is supported by the International Liver Transplantation Society to promote education and collaborative research among liver transplant professionals for the ultimate benefit of patients.
- Techniques and commentaries are posted in good faith with the intention of enhancing the knowledge and competence of all participants while preserving the privacy and dignity of transplant patients and their families. ILTS cannot accept liability for any breach of confidentiality.
- The procedures and opinions posted are the responsibility of the author(s) and are not necessarily endorsed by ILTS. These do not necessarily indicate a standard of care, nor can they replace local specialist consultation.
- ILTS is not liable for any statements made by participants on this platform, nor for any decisions or actions based on opinions or information posted.

## ILTS Videos: Model Summary

### Intraoperative Echocardiography – Pulmonary Thromboembolism and Intracardiac Thrombus

Authors: Sasha K. Shillcutt, MD, FASE  
Assistant Professor, Department of Anesthesiology  
University of Nebraska Medical Center  
Omaha, Nebraska, USA

Nicolas W. Markin, MD  
Chief Resident, Department of Anesthesiology  
University of Nebraska Medical Center  
Omaha, Nebraska, USA

Intraoperative cardiopulmonary thromboembolism has been a major contributor to mortality and morbidity during and following orthotopic liver transplantation (OLT).<sup>1,2</sup> Although a rare event, it is often a lethal complication during OLT. Frequent clinical symptoms include systemic hypotension and concomitant rising pulmonary artery pressure, which may lead to complete circulatory collapse.<sup>3</sup> The use of transesophageal echocardiography (TEE) in liver transplantation is often used to manage hemodynamics, measure pulmonary artery pressures, and guide therapeutic interventions. TEE can be used to identify proper filling, right ventricular distention, right ventricular function, tricuspid regurgitation and right-sided cardiac outputs before and after caval clamping. During OLT, TEE can be used to detect intraoperative thromboembolism, which can occur in all three phases of OLT.

Common echocardiography findings associated with pulmonary embolism are right ventricular dilation, right ventricular dysfunction, intraatrial septal bowing to the left, right to left shunting through a patent foramen ovale, worsening tricuspid regurgitation from baseline, and pulmonary hypertension. Although capturing thrombus in-transit is rare, signs of right-sided ventricular collapse with concomitant left ventricular hypovolemia support the diagnosis.

Organized thromboemboli, often described as “popcorn” emboli on echocardiography, can be seen to move through the right atrium, right ventricle and into the pulmonary artery and branches and may be associated with clinically significant massive pulmonary embolism (see Example 1, Videos 1A-1C). Pulmonary thromboemboli originating from the lower extremity vasculature from deep vein thrombosis may differ in their echogenicity from less organized thrombus, referred to as intracardiac thrombi (ICT). ICT can appear filamentous or strand-like and may develop in situ during OLT on intracardiac catheters and devices (see Example 2, Videos 2A-2F). ICT can result from severe disruption of the coagulation and fibrinolysis systems often associated with graft reperfusion.<sup>4</sup> ICT has been described in case reports to dissolve as rapidly as they formed.

Learning Objectives (OPTIONAL):

1. Massive pulmonary embolism can occur in the preanhepatic, anhepatic, or neohepatic stages of OLT and is associated with significant morbidity and mortality.
2. TEE findings associated with pulmonary thromboembolism are right ventricular dilation, right ventricular dysfunction, intraatrial septal bowing to the left, pulmonary hypertension, worsening tricuspid regurgitation, and right to left shunting through a patent foramen ovale. (Example 1, Videos 1A-1C)
3. ICT can occur from excessive activation of the coagulation system and have been described to form during low-flow states such as the anhepatic phase of OLT or after graft reperfusion. (Example 2, Videos 2A-2F)

References (OPTIONAL):

1. Lerner AB, Sundar E, Mahmood R, Sarge T, Hanto DW, Panzica PJ. Four cases of cardiopulmonary thromboembolism during liver transplantation without the use of antifibrinolytic drugs. *Anesth Analg* 2005;101:1608-12
2. Xia VW, Ho JK, Nourmand H, Wray C, Busuttill RW, Steadman RH. Incidental intracardiac thromboemboli during liver transplantation: incidence, risk factors, and management. *Liver Transpl* 2010;16:1421-27
3. O'Connor CJ, Roozeboom D, Brown R, Tuman KJ. Pulmonary thromboembolism during liver transplantation: possible association and antifibrinolytic drugs and novel treatment options. *Anesth Analg* 2000;91:296-9
4. Gologorsky E, De Wolf AM, Scott V, Aggarwal S, Dishart M, Kang Y. Intracardiac thrombus formation and pulmonary thromboembolism immediately after graft reperfusion in 7 patients undergoing liver transplantation. *Liver Transpl* 2001;7:783-89

---

J R Klinck, ILTS Special Projects Executive

August 2020