

Virtual ACS 2021 Surgeons and Engineers: A Dialogue on Surgical Simulation Meeting

Challenges in Surgical Education

Training Ultrasound Guided Needle Insertion for Percutaneous Transhepatic Biliary Drainage

Aleah M. DeSchmidt; Martin Palavecino, M.D.; Sophia L. Bidinger; Joaquin E. Batista; Agnes Y. Song; Alyssa L. Schul; Justin H. Ting; Jack E. Norfleet, PhD; and Robert M. Sweet, M.D.

University of Washington, Seattle, WA; California Polytechnic State University, San Luis Obispo, CA; U.S. Army Future Command CCDCSC STTC MSRB, Orlando, FL

Background: Percutaneous transhepatic biliary drainage (PTBD) is performed when there is an obstruction causing a buildup of bile in the common bile duct. This build up is often fatal if not addressed. PTBD is performed by using ultrasound (US) to guide the insertion of a Chiba needle percutaneously and into the bile duct. Using the Seldinger's technique, a guidewire is then inserted through the stenosis into the duodenum, when feasible; otherwise, is left proximal to the stricture. A catheter or stent is then placed to promote drainage.

Current Challenges: Consistently and accurately placing the Chiba needle in the bile duct is difficult. This is a skill that must be practiced repeatedly and currently the only way to practice is on patients. Existing liver models are either able to be punctured and not ultrasound-able or ultrasound-able, but lack in training needle insertion. Many also do not have internal structures imitating the bile duct and the portal vein making it difficult to properly practice performing the procedure.

Need of Innovation Introduction: The ideal model meets five needs. The model should be anatomically accurate, with high fidelity biliary system. The internal anatomy should be visible under ultrasound and the vessels should be identifiable under Doppler supporting the inclusion of fluids. The model should simulate a biliary stenosis. The model materials should exhibit similar mechanical properties as human tissue. Finally, the model should be economical, supporting multiple uses and/or inexpensive production.