

Round 1 - Management of Paraconduit Herniation (PCH) after Esophagectomy: An International Expert Delphi Survey

Question	Otions	Answer
Please state your current position	Head of department Senior consultant Consultant Attending surgeon Retired Other position or duration of retirement (please specify):	#
Please state your hospital's level of care	University Hospital Maximum Care Hospital Teaching Hospital General Hospital Private Hospital Other institution (please specify):	#
Please indicate the primary focus of your clinical work as a surgeon (maximum of two answers)	Upper GI surgery for benign disease Upper GI surgery for malignant disease Bariatric surgery General / visceral surgery Thoracic surgery Other (please specify)	#
Please indicate your experience as a surgeon (years since surgical board certificate)		#
Please indicate your place of work		#
Please indicate the approximate annual number of esophagectomies performed in your department		#
Please indicate the approximate annual number of esophagectomies performed by yourself		#
Please indicate the approximate annual number of surgeries for PCH performed in your department		#
Please indicate the approximate annual number of surgeries for PCH performed by yourself		#
Please estimate the percentage of surgeries for PCH that are performed in a non-elective setting (emergencies and urgent cases) in your department		#
Please estimate the percentage of surgeries that are performed for recurrent PCH in your department		#
Please rank your preferred surgical access route for the abdominal phase of elective esophagectomy	Laparoscopy Robotic-assisted laparoscopy Laparotomy	#
Please rank your preferred surgical access route for the thoracic phase of elective esophagectomy	Thoracoscopy Robotic-assisted thoracoscopy Thoracotomy	#
Which surgical maneuvers performed during index esophagectomy do you recommend to prevent PCH?	Hiatal sutures (crurorrhaphy) Hiatal mesh augmentation Colopexy to the hiatus Gastropexy to the hiatus Omentopexy to the hiatus Other (please specify)	Strongly recommended; recommended; Neither recommended nor discouraged; discouraged; strongly discouraged
In your opinion, what factors are relevant for the development of PCH?	Visceral obesity (increased thoraco-abdominal pressure gradient)	Highly relevant, Relevant; Neutral; Irrelevant; Highly irrelevant

	Low BMI History of other abdominal hernias COPD Neoadjuvant therapy Weak crural / diaphragmatic tissue Large hiatus hernia / hiatal surface area at index esophagectomy Large esophago-gastric junction tumor at index esophagectomy Extended resection of the crura during index esophagectomy Transhiatal approach during index esophagectomy Minimally invasive abdominal phase during index esophagectomy Minimally invasive thoracic phase during index esophagectomy Pyloric intervention during index esophagectomy Opening of the left pleural space during index esophagectomy Widening of the hiatus (i.e. transsection of the crura to avoid conduit kinking) during index esophagectomy Short ICU stay after index esophagectomy Significant weight loss after index esophagectomy Time elapsed since index esophagectomy Other (please specify)	
Given the increasing risk of PCH over time, how important is extended surveillance (e.g., beyond 5 years) in asymptomatic patients after esophagectomy?	Highly important Very important Moderately important Slightly important Not important	#
Please rank the following symptoms according to their typicality for chronic (non-emergency) PCH. A typical symptom may not be specific, but suggestive of the condition	Epigastric pain Retro-sternal or left-sided chest pain Early satiety, bloating Nausea, vomiting or retching Reflux (heartburn and regurgitation) Dysphagia Constipation, abdominal cramps Cough Reduced exercise tolerance Shortness of breath Weight loss Other (please specify):	Very typical; Rather typical; Moderately typical; Rather atypical; Not typical at all
Please rate the following symptoms according to their typicality for an emergency situation involving a PCH. A typical symptom may not be specific, but suggestive of the condition	Sudden severe chest pain Sudden severe abdominal pain Nausea and vomiting Tachycardia, fever Abdominal distension Respiratory distress	Very typical; Rather typical; Moderately typical; Rather atypical; Not typical at all

	Inability to pass gas and stool Other (please specify):	
Which of the following diagnostic procedures are recommended before elective PCH surgery?	Upper-GI endoscopy Contrast radiography CT scan PET-CT MRI Endosonography Other (please specify):	Strongly recommended; recommended; Neither recommended nor discouraged; discouraged; strongly discouraged
How do the clinical scenarios below influence your decision to perform or to avoid elective surgical repair for PCH in an asymptomatic patient?	Biologically older (>80years) or frail patient Biologically younger (<80years) or physiologically fit patient Proven tumor recurrence Tumor-free patient Recurrent PCH Primary (non-revisional) PCH Herniation of omentum only Complex PCH with herniation of multiple organs (e.g., small bowel, colon, or spleen) Previous major open abdominal surgery (i.e. laparotomy during index esophagectomy) Previous minimally-invasive abdominal surgery Radiographic evidence of enlarging PCH on surveillance imaging No radiographic evidence of enlarging PCH on surveillance imaging Radiographic evidence of a significantly widened hiatus No radiographic evidence of a significantly widened hiatus Other (please specify)	A great deal pro surgery; Considerably pro surgery; Neutral; Rather against surgery; A great deal against surgery
Please rate your recommendation of surgical approaches for elective surgery for PCH	Laparoscopy Robotic-assisted laparoscopy Laparotomy Thoracoscopy Robotic-assisted thoracoscopy Thoracotomy Combined thoraco-abdominal approach Other (please specify)	Strongly recommended; recommended; Neither recommended nor discouraged; discouraged; strongly discouraged
Please rate your recommendation regarding the following surgical-technical steps during elective surgery for PCH	Suture repair of hiatus Use of mesh to reinforce hiatal repair	Strongly recommended; recommended; Neither recommended nor discouraged; discouraged; strongly discouraged

	Autogenous options (ligamentum teres, left liver, omentum or other) to reinforce hiatus repair Use of relaxing diaphragmatic incisions Gastropexy Colopexy Postoperative wound drain (abdominal/mediastinal) Postoperative chest drain Other (please specify):	
Please rate your recommendation regarding suture repair of the hiatus during elective surgery for PCH	Use of pledgets to reinforce suture repair Single stitches Single form-8- or Z-stitches Running sutures Tension-free repair with mesh only (no sutures) Other (please specify)	Strongly recommended; recommended; Neither recommended nor discouraged; discouraged; strongly discouraged
Please state the name and size of sutures used for hiatal closure in your department		#
Please indicate your recommendation regarding mesh use for hiatal reinforcement during elective surgery for PCH	In all patients In selected patients I never use meshes Other (please specify):	#
How do the clinical scenarios below influence your decision to use meshes or to avoid them when performing elective surgery for PCH? You may skip this question in case you never use mesh reinforcement in this situation!	Biologically older (>80years) or frail patient Biologically younger (<80years) or physiologically fit patient Proven tumor recurrence Tumor-free patient Recurrent (revisional) PCH Primary (non-revisional) PCH Complex / large PCH with herniation of multiple organs (e.g., small bowel, colon, or spleen) Herniation of omentum only Wide hiatus / large hiatal surface area Normal hiatal surface area Weak crural / diaphragmatic musculature Normal crural / diaphragmatic musculature Herniation to the right and left pleural space Herniation to the right pleural space only Visceral obesity (high abdomino-thoracic pressure gradient) Low BMI Relevant weight loss after index esophagectomy COPD History of other abdominal hernias Other (please specify)	A great deal pro mesh; Considerably pro mesh; Neutral; Rather against mesh; A great deal against mesh

Which mesh types do you recommend for hiatal reinforcement during elective surgery for PCH? You may skip this question in case you never use mesh reinforcement in this situation!	Synthetic absorbable mesh Synthetic non- or partially absorbable mesh Biological mesh Other (please specify):	Strongly recommended; recommended; Neither recommended nor discouraged; discouraged; strongly discouraged
Which mesh shape and placement do you recommend during surgery for PCH? You may skip this question in case you never use mesh reinforcement in this situation!	Anterior / left crural reverse-C-shaped mesh Anterior reverse-U-shape mesh Anterior rectangle mesh Completely encircling the hiatus (keyhole mesh) Posterior crural mesh (any shape) "Tension-free" mesh (any shape) without crurorrhaphy On relaxing diaphragmatic incision (any shape) Other (please specify):	Strongly recommended; recommended; Neither recommended nor discouraged; discouraged; strongly discouraged
Which mesh fixation technique do you recommend during elective surgery for PCH? You may skip this question in case you never use mesh reinforcement in this situation!	Mesh fixation with sutures Mesh fixation with tacks Mesh fixation with fibrin or cyanoacrylate glue "Incorporated" mesh fixation (sewing-in of mesh during hiatal closure) Other (please specify):	Strongly recommended; recommended; Neither recommended nor discouraged; discouraged; strongly discouraged
Did you encounter any of the intra- and/or post-operative complications of PCH repair listed below?	Conduit necrosis Transmural conduit lesion requiring repair Intestinal perforation Perioperative hemorrhage Pericardial tamponade Pneumothorax Seroma formation Delayed conduit emptying (hiatal stenosis) Mesh erosion into conduit Mesh erosion to other organs (aorta, lung) Mesh migration Mesh infection Chronic pain None of the above complications Other (please specify):	#
Which diagnostic tests are recommended for routine follow-up of patients after surgery for PCH?	Clinically (symptoms) follow-up Upper-GI endoscopy Contrast radiography CT scan	Strongly recommended; recommended; Neither recommended nor discouraged; discouraged; strongly discouraged

PET-CT
MRI
Endosonography
Other (please specify):

multiple choice or free answer