American College of Radiology
ACR Appropriateness Criteria®
Management of Chylothorax

Variant: 1 Adult. Chylothorax of any etiology. Initial therapy.

Procedure	Appropriateness Category
Medical therapy and dietary modification	Usually Appropriate
Thoracic duct embolization	May Be Appropriate
Surgery	May Be Appropriate
Pleurodesis	Usually Not Appropriate

Variant: 2 Adult. Chylothorax refractory to medical and dietary management. Next therapy.

Procedure	Appropriateness Category
Thoracic duct embolization	Usually Appropriate
Pleurodesis	Usually Appropriate
Surgery	May Be Appropriate

Variant: 3 Adult. Spontaneous chylothorax with concurrent central venous obstruction. Initial therapy.

Procedure	Appropriateness Category
Thoracic duct embolization	May Be Appropriate
Catheter directed mechanical thrombectomy thoracic central vein	May Be Appropriate
Intraabdominal lymphatic embolization	May Be Appropriate
Medical therapy and dietary modification	May Be Appropriate (Disagreement)
Thoracic central vein recanalization	May Be Appropriate
Pleurodesis	May Be Appropriate
Surgery	May Be Appropriate
Surgical thrombectomy thoracic central vein	May Be Appropriate

Variant: 4 Adult. Chylothorax with concurrent chylous ascites. Initial therapy.

Procedure	Appropriateness Category
Medical therapy and dietary modification	May Be Appropriate (Disagreement)
Portal vein recanalization	May Be Appropriate
TIPS	May Be Appropriate
Surgery	May Be Appropriate
Pleurodesis	Usually Not Appropriate
Thoracic duct embolization	Usually Not Appropriate

Panel Members

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Summary of Literature Review

Introduction/Background

The lymphatic network of the lower extremity and pelvis carrying interstitial fluid coalesces and ascends in the retroperitoneum, meets with protein-rich hepatic and triglyceride-rich enteric lymphatics, and subsequently ascends through the posterior mediastinum as the thoracic duct(s) before draining to the central venous vasculature through the venolymphatic junction(s) [1, 2]. The system accommodates 1 to 2 L of flow daily under normal circumstance and contributes an essential mechanism of fluid and nutritional balance [1, 2].

Extravasation (lymphorrhea) from the thoracic duct or its thoracic tributaries, or transdiaphragmatic flow of chylous ascites, may overwhelm the resorption capacity of the pleural space resulting in chylothorax. Progressive accumulation provokes respiratory decompensation, whereas chronic losses via drainage induce malnutrition.

Thoracic chyle leakages most commonly occur as a result of iatrogenic injury, specifically following pulmonary resection or mediastinal instrumentation such as esophagectomy [3-6]. Nontraumatic or spontaneous etiologies include malignant (particularly lymphomatous) obstruction, congenital lymphatic anomalies, venous outflow obstruction, and others [7]. Suspected chylothorax is confirmed via pleural aspirate demonstrating the presence of chylomicrons and elevated triglyceride levels (>110 mg/dL) [1, 7]. Confirmation, combined with suspected etiology, prompts medical and/or interventional management to avert significant patient morbidity and/or mortality.

Initial Therapy Definition

Initial therapy is defined as a first-line treatment option for the medical condition defined by the variant. More than one option can be considered usually appropriate as the initial therapy when:

- There are equivalent alternatives (ie, only one option will be planned to effectively manage the patient's care).

OR

- There are complementary therapies (ie, more than one treatment option is planned to be performed simultaneously or in sequence during the same setting, wherein the therapies provide synergistic or complementary benefits to effectively manage the patient's care).

Discussion of Procedures by Variant

Variant 1:Adult. Chylothorax of any etiology. Initial therapy.

The goal of therapy is to manage chylothorax occurring in patients of any etiology, and to resolve or alleviate morbidity associated with chylothorax.

Variant 1:Adult. Chylothorax of any etiology. Initial therapy.
A. Medical therapy and dietary modification

In a typical fed state, the intestinal and hepatic lymphatic compartments combine to contribute the vast majority of the fluid volume handled by the lymphatic system. Institutional approaches vary widely, but medical and dietary measures generally aim to reduce enteric contributions to global

lymphatic transit, thereby promoting healing of the site(s) of extravasation.

Chylous flow rises dramatically following high-fat meals and can be mitigated by nonfat enteral nutrition with lessened deleterious nutritional effects compared to with a completely fasting state [8, 9]. Unlike long-chain triglycerides that transit directly via the enteric lymphatics to the thoracic duct, medium-chain triglycerides (MCTs) are absorbed by intestinal cells for subsequent portal venous transit, and diets containing MCTs as the only lipid content aim to achieve the same efficacy for chylothorax as completely nonfat enteric nutrition [10]. Although increased most dramatically by high-fat content meals, any enteric content potentially spurs lymphatic flow and total parenteral nutrition is advocated as a primary intervention or in a stepwise fashion for failure after initial modifications of enteric nutrition [10]. Following the triglyceride content of chest tube output in addition to volume of output may serve as a prognostic indicator of efficacy when employing fat controlled nutrition [8].

The somatostatin analog octreotide diminishes splanchnic perfusion and secondarily gastrointestinal secretions. Alpha-adrenergic agents work via similar mechanisms but with comparatively sparse evidence for chylothorax [10]. Rather than a standalone treatment, use of octreotide is typically complementary to aforementioned dietary modification strategies where in which it has been shown to more commonly improve outcomes relative to the primary medical/dietary strategy alone [10-15].

Greater success rates are generally observed when initial rates of extravasation are <1 L per day. Although often less definitive than direct interruption of lymphatic extravasation by surgical interruption or endolymphatic obstruction, medical and dietary interventions reduce the risk of additional morbidity from invasive interventions and are, therefore, typically used as a first-line treatment in the management of chylothorax. The reported success rates of various combinations of medical and dietary interventions in the treatment chylothorax from of all iatrogenic and traumatic causes range between 30% and 100% [8-23].

Variant 1:Adult. Chylothorax of any etiology. Initial therapy.
B. Pleurodesis

Chemical pleurodesis involves irritation of the pleural space by introducing chemical irritants into the thoracic cavity, either via chest tube or intraoperatively, to induce adhesions/symphysis and reduce or obliterate the potential space for the accumulation of fluid including chylothorax. Commonly used agents include talc, doxycycline, hypertonic glucose, and OK-342. Existing literature predominately surrounds treatment after failure of medical and dietary measures for iatrogenic/traumatic chylothorax, where in which high clinical success rates of pleurodesis have been reported [16, 18, 30]. The use of pleurodesis as a first-line treatment, prior to before any medical or dietary measures, is sparsely reported, and is typically employed secondarily due to comparative invasiveness and rare risks of serious complications such as acute respiratory distress syndrome from the inflammatory agents used. Mechanical pleurodesis alone has been reported to have high success rates between 80% and 100%, albeit with evidence limited to small series [10].

Variant 1:Adult. Chylothorax of any etiology. Initial therapy.
C. Surgery

Surgical management of thoracic chyle leaks broadly includes ligation of the thoracic duct or the leaking tributary, ligation and re-anastomosis of the injured segment, and reconstruction of the venolymphatic junction. Direct visualization of leaks is performed thorascopically or less commonly

via thoracotomy, and may be augmented by the administration of a fatty meal or subcutaneous or intranodal injection of lipophilic dyes, or indocyanine green. Aforementioned techniques may be supplemented by placement of fibrin sealants and/or tissue flaps over the site of ligation. Surgical methods may be combined with pleurodesis and are typically employed in combination with dietary and medical measures [10, 17, 18, 20, 23, 27-29].

When no leak is identified, empiric supradiaphragmatic ligation to interrupt the expected course of the caudal thoracic duct may be performed. Through a heterogenous in approach and in combination with other treatments, surgical intervention for iatrogenic chylothorax is effective in more than 90% of cases [10]. For cases of spontaneous chylothorax surgical planning, MR lymphangiogram may assist in the characterization of pathophysiology and thus direct surgical approaches. Due to interruption of flow, thoracic duct ligation may be complicated by lymphedema and/or ascites with many such occurrences resolving over months as the lymphatic system collateralizes around the obstruction.

Variant 1:Adult. Chylothorax of any etiology. Initial therapy.
D. Thoracic duct embolization

Access to the central lymphatics is achieved by transabdominal access of the cisterna chyli, percutaneous retrograde access of the thoracic duct arch in the neck, or transvascular retrograde cannulation through the venolymphatic junction. Following central lymphatic access, lymphangiography confirms or characterizes pathology. Embolization is typically performed with mechanical and/or liquid embolic agents. In cases of attempted but unsuccessful transabdominal access, disruption of the cisterna chyli and surrounding lymphatics may result in sufficient diversion away from the lymphatic extravasation to allow healing and resolution of chylothorax. Similarly, ethiodized oil used for planning stages of the procedure itself has enough of an embolic effect to resolve lymphatic extravasation alone in 30% to 70% of cases [10].

Individual experiences suggest technical success rates ranging between 48% and 90% and clinical success rates ranging between 60% and 90% [10, 17, 18, 20, 24-26], with the ability or inability to successfully access the cisterna chyli being a predictor of both technical and clinical success. A recent systematic review and meta-analysis demonstrated a pooled clinical success rates of combined lymphangiography and thoracic duct embolization of 94% [18].

Similar to surgical ligation, interruption of the central lymphatics may lead to development of ascites and/or lymphedema. Risks unique to thoracic duct embolization include those derived from the method of lymphatic access as well as nontarget embolization [25].

Variant 2:Adult. Chylothorax refractory to medical and dietary management. Next therapy.

The goal is to manage chylothorax that persists despite medical and dietary measures, and to resolve or alleviate morbidity associated with refractory chylothorax.

Variant 2:Adult. Chylothorax refractory to medical and dietary management. Next therapy.
A. Pleurodesis

Pleurodesis involves chemical irritation of the pleural space to induce adhesions/symphysis and reduce or obliterate the potential space for the accumulation of fluid including chylothorax. Commonly used agents include talc, doxycycline, hypertonic glucose, and OK-342. Existing literature predominately surrounds treatment after failure of medical and dietary measures for iatrogenic/traumatic chylothorax, where in which high clinical success rates of pleurodesis are

reported [16, 18, 30]. The use of pleurodesis as a first-line treatment, prior to before any medical or dietary measures, is sparsely reported, and is typically employed secondarily due to comparative invasiveness and rare risks of serious complications such as acute respiratory distress syndrome from the inflammatory agents used. Mechanical pleurodesis alone has been reported to have high success rates between 80% and 100%, albeit with evidence limited to small series [10]. With robust evidence regarding the efficacy of pleurodesis nontraumatic chylothorax, this method often applied as initial management [7, 10, 18, 31, 32].

Variant 2:Adult. Chylothorax refractory to medical and dietary management. Next therapy. B. Surgery

Surgical management of thoracic chyle leaks broadly includes ligation of the thoracic duct or the leaking tributary, ligation and re-anastomosis of the injured segment, and reconstruction of the venolymphatic junction. Direct visualization of leaks is performed thorascopically or less commonly via thoracotomy, and may be augmented by administration of a fatty meal or subcutaneous or intranodal injection of lipophilic dyes, or indocyanine green. Aforementioned techniques may be supplemented by placed with fibrin sealants and/or tissue flaps over the site of ligation. Surgical methods may be combined with pleurodesis and are typically employed in combination with dietary and medical measures [10, 17, 18, 20, 23, 27-29]. Through a heterogenous in approach and in combination with other treatments, surgical intervention for iatrogenic chylothorax is effective in more than 90% of cases [10]. When no leak is identified, empiric supradiaphragmatic ligation to interrupt the expected course of the caudal thoracic duct may be performed. For cases of spontaneous chylothorax planning, MR lymphangiogram may assist in the characterization of anatomy and thus direct surgical approaches.

Variant 2:Adult. Chylothorax refractory to medical and dietary management. Next therapy. C. Thoracic duct embolization

Access to the central lymphatics is achieved by transabdominal access of the cisterna chyli, percutaneous retrograde access of the thoracic duct arch in the neck, or transvascular retrograde cannulation through the venolymphatic junction. Following central lymphatic access, lymphangiography confirms or characterizes pathology. Embolization is typically performed with mechanical and/or liquid embolic agents. In cases of attempted but unsuccessful transabdominal access, disruption of the cisterna chyli and surrounding lymphatics may result in sufficient diversion away from the lymphatic extravasation to allow healing and resolution of chylothorax. Similarly, ethiodized oil used for planning stages of the procedure itself has enough of an embolic effect to resolve lymphatic extravasation alone in 30% to 70% of cases [10].

Individual experiences suggest technical success rates ranging between 48% and 90% and clinical success rates ranging between 60% and 90% [10, 17, 18, 20, 24-26], with the ability or inability to successfully access the cisterna chyli being a predictor of both technical and clinical success. A recent systematic review and meta-analysis demonstrated a pooled clinical success rates of combined lymphangiography and thoracic duct embolization of 94% [18].

Similar to surgical ligation, interruption of the central lymphatics may lead to development of ascites and/or lymphedema. Risks unique to thoracic duct embolization include those derived from the method of lymphatic access as well as nontarget embolization [25].

Variant 3:Adult. Spontaneous chylothorax with concurrent central venous obstruction. Initial therapy.

The goal of therapy is to manage chylothorax occurring in patients occurring with concurrent central venous obstruction.

Variant 3:Adult. Spontaneous chylothorax with concurrent central venous obstruction. Initial therapy.
A. Catheter directed mechanical thrombectomy thoracic central vein

Central venous obstruction due to thrombosis or malignancy may compromise lymphatic outflow through venolymphatic junction and result in various sequela of lymphatic congestion, including chylothorax. Restoring central venous patency and thus normal venolymphatic outflow may be performed with the aim of resolving chylothorax without instrumentation of the lymphatic system. Literature surrounding this approach; however, is limited.

Variant 3:Adult. Spontaneous chylothorax with concurrent central venous obstruction. Initial therapy.
B. Intraabdominal lymphatic embolization

Ascending passage of liquid embolics from an abdominal lymphatic access site may be performed to address sites of lymphatic extravasation in the upper abdomen and chest that are otherwise difficult to address by standard thoracic duct embolization techniques. Evidence for this approach is limited to case reports.

Variant 3:Adult. Spontaneous chylothorax with concurrent central venous obstruction. Initial therapy.
C. Medical therapy and dietary modification

In a typical fed state, the intestinal and hepatic lymphatic compartments combine to contribute the vast majority of the fluid volume handled by the lymphatic system. Institutional approaches vary widely, but medical and dietary measures generally aim to reduce enteric contributions to global lymphatic transit, thereby promoting healing of the site(s) of extravasation.

Chylous flow rises dramatically following high-fat meals and can be mitigated by nonfat enteral nutrition with lessened deleterious nutritional effects compared to with a completely fasting state [8, 9]. Unlike long-chain triglycerides that transit directly via the enteric lymphatics to the thoracic duct, MCTs are absorbed by intestinal cells for subsequent portal venous transit, and diets containing MCTs as the only lipid content aim to achieve the same efficacy for chylothorax as completely nonfat enteric nutrition [10]. Although increased most dramatically by high-fat content meals, any enteric content potentially spurs lymphatic flow and total parenteral nutrition is advocated as a primary intervention or in a stepwise fashion for failure after initial modifications of enteric nutrition [10]. Following the triglyceride content of chest tube output in addition to volume of output may serve as a prognostic indicator of efficacy when employing fat controlled nutrition [8].

The somatostatin analog octreotide diminishes splanchnic perfusion and secondarily gastrointestinal secretions. Alpha-adrenergic agents work via similar mechanisms but with comparatively sparse evidence for chylothorax [10]. Rather than a standalone treatment, use is octreotide is typically complementary to aforementioned dietary modification strategies whereby it has been shown to more commonly improve outcomes relative to the primary medical/dietary strategy alone [10-15].

Greater success rates are generally observed when initial rates of extravasation are <1 L per day.

Although often less definitive than direct interruption of lymphatic extravasation by surgical interruption or endolymphatic obstruction, medical and dietary interventions reduce the risk of additional morbidity from invasive interventions and are, therefore, typically used as a first line-line treatment in the management of chylothorax. The reported success rates of various combinations of medical and dietary interventions in the treatment chylothorax from of all iatrogenic and traumatic causes range between 30% and 100% [8-23].

Variant 3:Adult. Spontaneous chylothorax with concurrent central venous obstruction. Initial therapy.

D. Pleurodesis

Pleurodesis involves chemical irritation of the pleural space to induce adhesions/symphysis and reduce or obliterate the potential space for the accumulation of fluid including chylothorax. Commonly used agents include talc, doxycycline, hypertonic glucose, and OK-342. Existing literature predominately surrounds treatment after failure of medical and dietary measures for iatrogenic/traumatic chylothorax, where in which high clinical success rates of pleurodesis have reported [16, 18, 30]. The use of pleurodesis as a first-line treatment, prior tobefore any medical or dietary measures, is sparsely reported, and is typically employed secondarily due to comparative invasiveness and rare risks of serious complications such as acute respiratory distress syndrome from the inflammatory agents used. Mechanical pleurodesis alone has been reported to have high success rates between 80% and 100%, albeit with evidence limited to small series [10]. Literature surrounding its use in central venous obstruction is limited.

Variant 3:Adult. Spontaneous chylothorax with concurrent central venous obstruction. Initial therapy.

E. Surgery

Surgical management of thoracic chyle leaks broadly includes ligation of the thoracic duct or the leaking tributary, ligation and re-anastomosis of the injured segment, and reconstruction of the venolymphatic junction. Direct visualization of leaks is performed thorascopically or less commonly via thoracotomy, and may be augmented by administration of a fatty meal or subcutaneous or intranodal injection of lipophilic dyes. Aforementioned techniques may be supplemented by placed with fibrin sealants and/or tissue flaps over the site of ligation.

Surgical methods may be combined with pleurodesis and are typically employed in combination with dietary and medical measures [10, 17, 18, 20, 23, 27-29]. Through a heterogenous in approach and in combination with other treatments, surgical intervention for iatrogenic chylothorax is effective in more than 90% of cases [10].

When no leak is identified, empiric supradiaphragmatic ligation to interrupt the expected course of the caudal thoracic duct may be performed. For cases of spontaneous chylothorax planning, MR lymphangiogram may assist in the characterization of anatomy and thus direct surgical approaches.

Variant 3:Adult. Spontaneous chylothorax with concurrent central venous obstruction. Initial therapy.

F. Surgical thrombectomy thoracic central vein

Central venous obstruction due to thrombosis or malignancy may compromise lymphatic outflow through venolymphatic junction and result in various sequela of lymphatic congestion, including chylothorax. Surgical thrombectomy aimed at restoration of venous patency and thus normal

venolymphatic outflow may be performed with the aim of resolving chylothorax without instrumentation of the lymphatic system. Literature surrounding this approach; however, is limited.

Variant 3:Adult. Spontaneous chylothorax with concurrent central venous obstruction. Initial therapy.

G. Thoracic central vein recanalization

Central venous obstruction due to thrombosis or malignancy may compromise lymphatic outflow through venolymphatic junction and result in various sequela of lymphatic congestion, including chylothorax.

Percutaneous recanalization and/or thrombolysis of occluded central vein(s) and thus normal venolymphatic outflow may be performed with the aim of resolving chylothorax without instrumentation of the lymphatic system. Literature surrounding this approach; however, is limited.

Variant 3:Adult. Spontaneous chylothorax with concurrent central venous obstruction. Initial therapy.

H. Thoracic duct embolization

Access to the central lymphatics is achieved by transabdominal access of the cisterna chyli, percutaneous retrograde access of the thoracic duct arch in the neck, or transvascular retrograde cannulation through the venolymphatic junction. Following central lymphatic access, lymphangiography confirms or characterizes pathology. Embolization is typically performed with mechanical and/or liquid embolic agents. In cases of attempted but unsuccessful transabdominal access, disruption of the cisterna chyli and surrounding lymphatics may result in sufficient diversion away from the lymphatic extravasation to allow healing and resolution of chylothorax. Similarly, ethiodized oil used for planning stages of the procedure itself has enough of an embolic effect to resolve lymphatic extravasation alone in 30% to 70% of cases [10].

Individual experiences suggest technical success rates ranging between 48% and 90% and clinical success rates ranging between 60% and 90% [10, 17, 18, 20, 24-26], with the ability or inability to successfully access the cisterna chyli being a predictor of both technical and clinical success. A recent systematic review and meta-analysis demonstrated a pooled clinical success rates of combined lymphangiography and thoracic duct embolization of 94% [18]. Outcomes specific to nontraumatic/noniatrogenic origins of chylothorax are lacking.

Similar to surgical ligation, interruption of the central lymphatics may lead to development of ascites and/or lymphedema. Risks unique to thoracic duct embolization include those derived from the method of lymphatic access as well as nontarget embolization [25].

Variant 4:Adult. Chylothorax with concurrent chylous ascites. Initial therapy.

The goal of therapy is to manage chylothorax accompanying chylous ascites and to resolve or alleviate morbidity associated with chylothorax and chylous ascites.

Variant 4:Adult. Chylothorax with concurrent chylous ascites. Initial therapy.

A. Medical therapy and dietary modification

In a typical fed state, the intestinal and hepatic lymphatic compartments combine to contribute the vast majority of the fluid volume handled by the lymphatic system. Institutional approaches vary widely, but medical and dietary measures generally aim to reduce enteric contributions to global lymphatic transit, thereby promoting healing of the site(s) of extravasation.

Chylous flow rises dramatically following high-fat meals and can be mitigated by nonfat enteral nutrition with lessened deleterious nutritional effects compared to a completely fasting state [8, 9]. Unlike long-chain triglycerides that transit directly via the enteric lymphatics to the thoracic duct, MCTs are absorbed by intestinal cells for subsequent portal venous transit, and diets containing MCTs as the only lipid content aim to achieve the same efficacy for chylothorax as completely nonfat enteric nutrition [10]. Although increased most dramatically by high-fat content meals, any enteric content potentially spurs lymphatic flow and total parenteral nutrition is advocated as a primary intervention or in a stepwise fashion for failure after initial modifications of enteric nutrition [10]. Following the triglyceride content of chest tube output in addition to volume of output may serve as a prognostic indicator of efficacy when employing fat controlled nutrition [8].

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Greater success rates are generally observed when initial rates of extravasation are <1 L per day. Although often less definitive than direct interruption of lymphatic extravasation by surgical interruption or endolymphatic obstruction, medical and dietary interventions reduce the risk of additional morbidity from invasive interventions and are, therefore, typically used as a first-line treatment in the management of chylothorax. The reported success rates of various combinations of medical and dietary interventions in the treatment chylothorax from of all iatrogenic and traumatic causes range between 30% and 100% [8-23]. Literature regarding the use of dietary modification and medical treatments in the setting of lymphorrhea and central venous obstruction is limited.

Variant 4:Adult. Chylothorax with concurrent chylous ascites. Initial therapy.
B. Pleurodesis

Pleurodesis involves chemical irritation of the pleural space to induce adhesions/symphysis and reduce or obliterate the potential space for the accumulation of fluid including chylothorax. Commonly used agents include talc, doxycycline, hypertonic glucose, and OK-342. Existing literature predominately surrounds treatment after failure of medical and dietary measures for iatrogenic/traumatic chylothorax, where in which high clinical success rates of pleurodesis are reported [16, 18, 30]. The use of pleurodesis as a first-line treatment, prior tobefore any medical or dietary measures, is sparsely reported, and is typically employed secondarily due to comparative invasiveness and rare risks of serious complications such as acute respiratory distress syndrome from the inflammatory agents used. Mechanical pleurodesis alone has been reported to have high success rates between 80% and 100%, albeit with evidence limited to small series [10]. With robust evidence regarding the efficacy of pleurodesis nontraumatic chylothorax, this method is often applied as initial management [7, 10, 18, 31, 32]. Literature surrounding its use in chylothorax following abdominal surgery is limited to a small case series [39].

Variant 4:Adult. Chylothorax with concurrent chylous ascites. Initial therapy.
C. Portal vein recanalization

Cirrhotic portal hypertension translates excess pressures to the lymphatic system occasionally

resulting in chylous ascites and/or chylous pleural effusion. Similar to central venous obstruction, portal venous obstruction may result the translation of high mesenteric venous pressures to the abdominal lymphatic compartment with ensuing lymphorrhea. Portal decompression by way of portal venous recanalization or bypass (Rex shunt) has been shown to alleviate or resolve chylous leaks. Literature; however, is sparse [33, 34].

Variant 4:Adult. Chylothorax with concurrent chylous ascites. Initial therapy.
D. Surgery

For suspected abdominal sources of lymphatic extravasation, ligation of the thoracic duct may be expected to exacerbate lymphorrhea. Oversewing suspected retroperitoneal sites of extravasation, however, may be effective. Literature surrounding this approach is limited. Diverting lymphatic accumulation in the abdomen to the vasculature by way of a peritoneovenous shunt may also be considered [36-38].

Variant 4:Adult. Chylothorax with concurrent chylous ascites. Initial therapy.
E. Thoracic duct embolization

In cases of chylothorax resulting from transdiaphragmatic flow of abdominal lymphorrhea, thoracic duct embolization may be expected to worsen chyle losses by compromising the normal lymphatic outflow.

Variant 4:Adult. Chylothorax with concurrent chylous ascites. Initial therapy.
F. TIPS

Cirrhotic portal hypertension translates excess pressures to the lymphatic system occasionally resulting in chylous ascites and/or chylous pleural effusion. Similar to central venous obstruction, portal venous obstruction may result in the translation of high mesenteric venous pressures to the abdominal lymphatic compartment with ensuing lymphorrhea. Portal decompression by way of bypass (transjugular intrahepatic portosystemic shunt) has been shown to alleviate or resolve chylous leaks. Literatures; however, is sparse [33-35].

Summary of Highlights

This is a summary of the key recommendations from the variant tables. Refer to the complete narrative document for more information.

- **Variant 1**: Chylothorax of any etiology may be first approached with conservative measures including nonfat enteral nutrition (or MCTs as the only lipid) and somatostatin analogs, which will promote resolution of chylorrhea in a large portion of patients without the morbidity of procedural intervention. In the situation of brisk chylous losses (eg, >1 L/d) and/or when a distinct location of chylous injury is known, the condition may be reasonably first approached with surgical or interventional approaches, because noninvasive measures are less likely to resolve large or otherwise rapid chylous leaks.

- **Variant 2**: For patients who refractory to medical and dietary measures, management appropriately escalates to surgical ligation or lymphatic embolization of the thoracic duct. Pleurodesis may be considered as an alternative, particularly if patient factors limit candidacy for surgical or interventional approaches.

- **Variant 3**: Uncommonly, chylous effusions can occur as a result of downstream obstructions

at or central to the venolymphatic junction. Surgical, and interventional treatments on the lymphatic system can resolve the lymphatic extravasation and thus may be appropriate but do not address the inciting condition. In such situations, particularly if there are other clinical sequela of the venous obstruction, central venous recanalization via thrombolysis, thrombectomy, angioplasty or stent may be appropriate.

- **Variant 4**: Altered lymphatic dynamics stemming from elevations in portal pressures and resulting in chylous accumulation in the chest and/or abdomen may require unique management approaches. Medical/dietary therapies to slow lymphatic flow globally may be appropriate. Surgical or interventional disruptions of the thoracic duct when extravasations are occurring in abdominal or retroperitoneal sites of extravasation will likely worsen the condition, and thus these types of intervention should focus on interruption of lymphatic flow below and across sites of extravasation. Portal decompression via recanalization or diversion (eg, TIPS) may secondarily reduce lymphatic pressures and allow sites of chylous leakage to heal.

Supporting Documents

The evidence table, literature search, and appendix for this topic are available at https://acsearch.acr.org/list. The appendix includes the strength of evidence assessment and the final rating round tabulations for each recommendation.

For additional information on the Appropriateness Criteria methodology and other supporting documents, please go to the ACR website at https://www.acr.org/Clinical-Resources/Clinical-Tools-and-Reference/Appropriateness-Criteria.

Gender Equality and Inclusivity Clause

The ACR acknowledges the limitations in applying inclusive language when citing research studies that predates the use of the current understanding of language inclusive of diversity in sex, intersex, gender, and gender-diverse people. The data variables regarding sex and gender used in the cited literature will not be changed. However, this guideline will use the terminology and definitions as proposed by the National Institutes of Health.

Appropriateness Category Names and Definitions

Appropriateness Category Name	Appropriateness Rating	Appropriateness Category Definition
Usually Appropriate	7, 8, or 9	The imaging procedure or treatment is indicated in the specified clinical scenarios at a favorable risk-benefit ratio for patients.
May Be Appropriate	4, 5, or 6	The imaging procedure or treatment may be indicated in the specified clinical scenarios as an alternative to imaging procedures or treatments with a more favorable risk-benefit ratio, or the risk-benefit ratio for patients is equivocal.
May Be Appropriate (Disagreement)	5	The individual ratings are too dispersed from the panel median. The different label provides transparency regarding the panel's recommendation. "May be appropriate" is the rating category and a

		rating of 5 is assigned.
Usually Not Appropriate	1, 2, or 3	The imaging procedure or treatment is unlikely to be indicated in the specified clinical scenarios, or the risk-benefit ratio for patients is likely to be unfavorable.

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The ACR Committee on Appropriateness Criteria and its expert panels have developed criteria for determining appropriate imaging examinations for diagnosis and treatment of specified medical condition(s). These criteria are intended to guide radiologists, radiation oncologists and referring physicians in making decisions regarding radiologic imaging and treatment. Generally, the complexity and severity of a patient's clinical condition should dictate the selection of appropriate imaging procedures or treatments. Only those examinations generally used for evaluation of the patient's condition are ranked. Other imaging studies necessary to evaluate other co-existent diseases or other medical consequences of this condition are not considered in this document. The availability of equipment or personnel may influence the selection of appropriate imaging procedures or treatments. Imaging techniques classified as investigational by the FDA have not been considered in developing these criteria; however, study of new equipment and applications should be encouraged. The ultimate decision regarding the appropriateness of any specific radiologic examination or treatment must be made by the referring physician and radiologist in light of all the circumstances presented in an individual examination.

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