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Indications, techniques, and clinical outcomes of thoracic duct interventions in patients: a forgotten literature?

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ABSTRACT

Background: The evolution of the "gut-lymph concept" has promoted thoracic duct (TD) lymph drainage as a possible treatment to reduce systemic inflammation and end-organ dysfunction in acute illness. The aim was to review the published experience of thoracic duct interventions (TDIs) aimed at improving clinical outcomes.

Methods: A search of three databases (MEDLINE, EMBASE, and EMBASE CLASSIC) over the last 60 y. The indications for intervention, the technique, and clinical outcomes were reviewed.

Results: There were a wide range of indications for TDI. These included reducing rejection after transplantation, treating inflammatory diseases, and reducing chronic failure of the liver, kidney, and heart. The techniques included TD cannulation and lymphovenuous fistula. The outcomes were variable and often equivocal, and this appears to reflect poor design quality. There is clinical equipoise regarding a therapeutic role of (TD lymph drainage in acute pancreatitis, and probably other acute diseases.

Conclusions: Until well-designed clinical trials are undertaken, the clinical benefits of TDIs will remain promising, but uncertain.

Introduction

There has been renewed interest in the role of thoracic duct (TD) lymph in the pathophysiology of acute and critical illnesses. It is known that about 70% of TD lymph is derived from the intestine and its mesenteries and other viscera.[1,2] The "gut-lymph concept"[3–6] states that with acute and critical illness, there are gut-derived factors in TD lymph that promote systemic inflammation and end-organ dysfunction (Fig. 1).[5] These systemic effects are remarkably similar across

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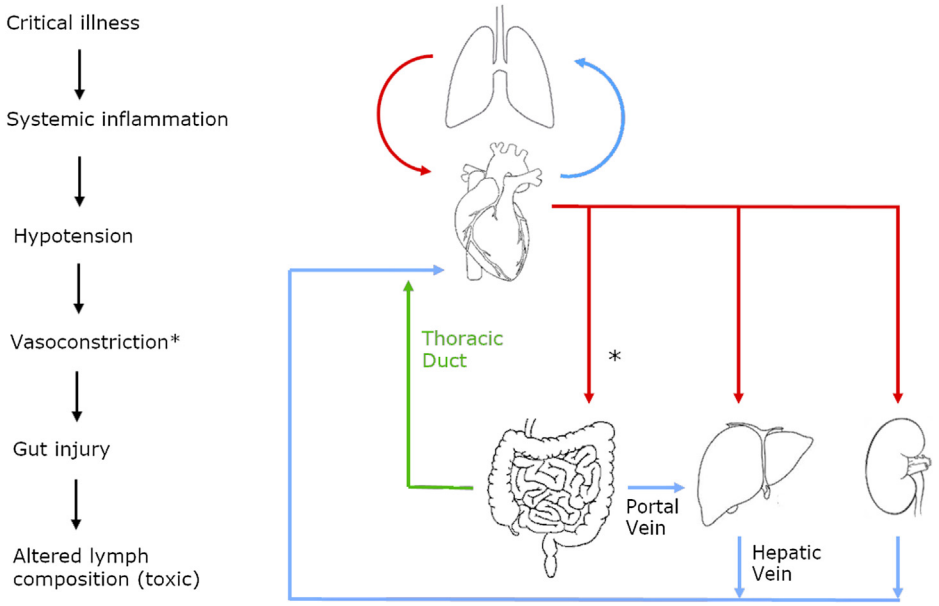

Fig. 1 – The "gut-lymph concept". In critical illness, systemic inflammation leads to hypotension. To preserve the perfusion of vital organs (heart, brain, lungs, and kidney), there is profound splanchnic vasoconstriction*, which results in gut injury and altered mesenteric lymph. This toxic lymph returns to the systemic circulation via the thoracic duct to further mediate systemic inflammation and distant end-organ dysfunction. (Color version of figure is available online.)

different acute diseases (including sepsis, trauma, hemorrhage, and pancreatitis), which suggests the presence of common mechanism.[7,8] The carriage of toxic mediators in TD lymph may drive this systemic inflammation and organ dysfunction.[3,5]

Mesenteric or gut-lymph drains from the intestine into the cisterna chyli and forms the TD, which then ascends through the mediastinum to terminate in the region of the left internal jugular or subclavian veins in the left neck.[9] In health, TD lymph transports dietary fat, lymphocytes, interstitial fluid, protein, lipids, hormones, and macromolecules from the viscera, mesentery, and peritoneum to the systemic circulation.[10] There is evidence that the composition of TD lymph undergoes significant changes in the presence of acute and critical illness.[3–5,11–13] The study of the "gut-lymph concept" has been hampered by the difficulty in sampling gut-lymph in humans because of the relative anatomical inaccessibility of the intestinal lymph ducts, cisternae chyli and the TD itself. The most accessible portion of this lymphatic system is the termination of the TD in the root of the left neck.[5]

Treatment by externally draining TD lymph is not a new idea as there is a body of older literature, now largely forgotten, which evaluates a number of interventions directed at TD lymph to improve the clinical outcome in a range of acute illnesses. The advent of the gut-lymph concept and the extensive animal data supporting it in recent years[14–22] has renewed interest in these older studies as to whether they provide evidence to support the use of TD lymph drainage as a treatment of acute illness. The aim of this study was to review the literature regarding thoracic duct interventions (TDIs) in patients, with particular reference to the indications, techniques, and clinical outcomes.

Methods

A search of the MEDLINE, EMBASE, and EMBASE CLASSIC databases was performed for all studies related to TDI published between January 1, 1950 and January 1, 2015. The search terms used were the combined results of "Thoracic duct" or "Thoracic lymph" or "Cisterna Chyli" and the combined results of "Cannulation/Cannulate" or "Catheterization/catheterisation" or "drainage/draining" or "Ligation/ligate" or "decompress/decompression surgery" or " dialysis/dialysing" or "collect/collection" or "Intervention". Not included were studies that investigated TD lymph for physiological, compositional, and diagnostic purposes.[6,22–30] All nonhuman and non-English studies were excluded from the search. There was no age restriction. In addition to electronic databases, the reference lists of all eligible studies were screened to identify additional studies.

Inclusion and exclusion criteria

A study was included if it described any technique that altered TD lymph flow or content with therapeutic intent to manage a disease or improve a clinical outcome. All study designs were included. If a given patient cohort was published in an overlapping study, the report with the most substantial results was included. Furthermore, any study that primarily described a technique for TDI and was subsequently referenced in another study to manage a disease or improve a clinical outcome was also included. Studies were excluded if the intention of the TDI was to manage a chyle leak (congenital, postoperative, or traumatic). Studies were excluded if no mention was made of clinical outcomes (with