



Case report

Postoperative chest liver herniation after cardiophrenic lymph node resection by a transdiaphragmatic approach following primary cytoreductive surgery for advanced endometrioid ovarian cancer: A case report

Hélène Leray^a, Laurent Brouchet^b, Yann Tanguy Le Gac^a, Sihem Bouharaoua^c, Philippe Otal^d, Gwenaél Ferron^{a,e}, Erwan Gabiache^f, Martina Aida Angeles^a, Carlos Martínez-Gómez^{a,g}, Alejandra Martínez^{a,g,*}

^a Department of Surgical Oncology, Institut Claudius Regaud, Institut Universitaire du Cancer de Toulouse (IUCT) – Oncopole, Toulouse, France

^b Department of Thoracic Surgery, Hospital Larrey, Toulouse University Hospital, Toulouse, France

^c Intensive Care Unit, Toulouse University Hospital, Institut Universitaire du Cancer de Toulouse (IUCT) – Oncopole, Toulouse, France

^d Radiology Department, Hospital Rangueil, Toulouse University Hospital, Toulouse, France

^e INSERM CRCT Team 19, ONCOSARC – Oncogenesis of sarcomas, Toulouse, France

^f Department of Nuclear Medicine, Institut Claudius Regaud, Institut Universitaire du Cancer de Toulouse (IUCT) – Oncopole, Toulouse, France

^g INSERM CRCT Team 1, Tumor Immunology and Immunotherapy, Toulouse, France

ARTICLE INFO

Keywords:

Lymph node excision
Diaphragmatic hernia
Chylothorax
Cytoreductive surgical procedures
Postoperative complications

ABSTRACT

Resection of enlarged cardiophrenic lymph nodes (CPLN) is a procedure required to obtain complete cytoreduction in selected patients affected by advanced ovarian cancer. Their resection by transdiaphragmatic approach has been demonstrated to be feasible with low rates of morbidity. The main complications associated with this procedure are pleural effusion, pneumothorax, and rarely, chylothorax.

This case describes a postoperative chylothorax and chest liver herniation in a patient who underwent a cytoreductive surgery for advanced endometrioid ovarian cancer, which included a right transdiaphragmatic CPLN resection. Surgical management by thoracotomy was required to repair the right diaphragmatic defect combined with conservative management of the chylothorax. The diaphragmatic closure was achieved employing interrupted stitches with a non-absorbable suture. No prosthetic material was required.

1. Background

Debulking surgery with no residual disease is the most important prognostic factor in advanced ovarian cancer (Bristow et al., 2002). Cardiophrenic lymph nodes (CPLN) involvement is considered as a FIGO stage IVB but should not preclude complete cytoreduction (Cowan et al., 2017; Mert et al., 2018; Prader et al., 2019). It is widely accepted that CPLN should be removed if they measure more than 10 mm, since 90% will be found to contain metastases at final pathology (Prader et al., 2016). Video-assisted thoracic surgery (Lim et al., 2009) and transdiaphragmatic approach (Yoo et al., 2013) are two possible surgical approaches with acceptable morbidity and low complication rates,

including pleural effusion, pneumothorax, chylothorax, and pulmonary embolism (Cowan et al., 2017).

We present the case of a postoperative chylothorax and chest liver herniation after CPLN resection by a transdiaphragmatic approach following cytoreductive surgery, the first to our knowledge reported in the literature.

2. Case

We present the case of a 54-year-old woman without any comorbidities and with a body mass index of 20. She was referred to our institution for peritoneal carcinomatosis with a heterogeneous and

* Corresponding author at: Department of Surgical Oncology, Institut Claudius Regaud, Institut Universitaire du Cancer de Toulouse – Oncopole, 1 Avenue Irène Joliot-Curie 31059 Toulouse Cedex 9, Toulouse, France.

E-mail address: martinez.alejandra@iuct-oncopole.fr (A. Martinez).

<https://doi.org/10.1016/j.gore.2021.100727>

Received 18 December 2020; Received in revised form 4 February 2021; Accepted 7 February 2021

Available online 13 February 2021

2352-5789/© 2021 The Authors.

Published by Elsevier Inc.

This is an open access article under the CC BY-NC-ND license

(<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

irregular endometrial thickening. Diagnostic laparoscopy evidenced a peritoneal carcinomatosis with a peritoneal cancer index estimated at 14/39 (Tentes et al., 2003). Peritoneal biopsies confirmed a grade 1 endometrioid adenocarcinoma. The endometrial sampling revealed a possible synchronic well-differentiated endometrioid adenocarcinoma (grade 1). Magnetic resonance imaging showed a myometrial invasion below 50%. Contrast-enhanced computed tomography (CT) did not find extra-abdominal disease except for enlarged CPLN (13 mm). According to the tumor board recommendation, primary debulking surgery was performed.

The patient underwent a complete cytoreduction procedure including en-bloc pelvic resection according to Hudson procedure (Angeles et al., 2019), pelvic and para-aortic lymphadenectomy, infra-gastric omentectomy, right upper quadrant peritonectomy, and trans-diaphragmatic CPLN resection (Fig. 1A). The operative time was 276 min, and the estimated blood loss was 500 ml. No major intraoperative complications were observed. The right diaphragmatic opening was closed employing an absorbable running suture (Fig. 1B), and a right chest tube was placed to drain the pneumothorax and reduce the risk of postoperative pleural effusion.

The postoperative course was uneventful up to the 4th day when the chest tube drained a milky-colored fluid up to 2500 ml per day. The diagnosis of chylothorax was clinically established and was confirmed after the analysis of protein, lactate dehydrogenase, and triglyceride levels in the pleural fluid. A full-body CT-scan was performed due to persistent fever and tachycardia looking for an abdominal collection, pulmonary atelectasis or embolia. The imaging found normal post-operative changes, not justifying the symptoms. Chylothorax was managed conservatively, including pleural effusion drainage and fat-free parenteral nutrition. The clinical course was favourable. The volume of the pleural effusion decreased progressively and the pleural fluid became progressively serous. On the 17th postoperative day, the patient complained of dyspnea, breathlessness, and the arterial oxygen saturation revealed abnormal values, below 90%. A second CT-scan showed the atelectasis of the inferior and the middle lobe of the right lung due to extrinsic compression of the right hepatic lobe, which was partially herniated into the chest (Fig. 2). A right lateral and caudal intercostal thoracotomy was performed, which confirmed the herniation of the liver in the right diaphragmatic dome. The diaphragmatic breach was closed without tension employing interrupted stitches of a non-absorbable suture every 10 mm allowing liver reintegration into the abdominal cavity (Fig. 3). The chest tube was removed on the 12th postoperative day after confirming by a chest X-ray the full right lung expansion.

The postoperative recovery was uneventful, and the patient was discharged on the 26th postoperative day under fat-free enteral nutrition for a total duration of 6 weeks. One month after the thoracotomy,

chest X-ray did not show any pleural effusion and the patient did not present clinical signs of diaphragmatic dysfunction.

The anatomopathological analysis confirmed the initial diagnosis of a well-differentiated endometrioid adenocarcinoma of both ovaries with extension to the pelvic and the diaphragmatic peritoneum and two macrometastatic CPLN (2N+/8), considering the disease as a stage IVB according to the FIGO 2018 classification. In addition, a low-risk endometrial adenocarcinoma (grade 1) was found confined to the uterine corpus (FIGO IA). The patient could initiate her chemotherapy within six weeks after the cytoreductive surgical procedure and she underwent six cycles of adjuvant platinum-based chemotherapy. Currently, she is in clinical remission ten months after the end of the treatment.

3. Discussion

Diaphragmatic hernia in adults is a rare but severe complication mainly observed after traumatic thoracoabdominal injury or after major supramesocolic gastrointestinal procedures, including hepatic resection, liver transplantation, esophagectomy. To our knowledge, this is the first description of chest liver herniation through a diaphragmatic defect of iatrogenic origin associated with CPLN resection during cytoreductive surgery. The low serologic level of albumin of this patient (20 g/l for a normal standardized value of 30 g/l) may be considered as a factor contributing to this complication.

CPLN resection is a feasible procedure with low morbidity and low rates of postoperative complications, being the pleural effusion the most frequent (Cowan et al., 2017). Chylothorax is an infrequent complication with a rate of mortality around 10%, mainly observed in medical disorders such as infectious diseases or thoracic duct obstruction due to mediastinal malignancies and also in patients undergoing thoracic surgery (Shah et al., 2012). Cowan et al. previously reported a patient who presented a chylothorax after the resection of CPLN through a trans-diaphragmatic approach in ovarian cancer also treated by conservative management (Cowan et al., 2017). Anatomical variations of the thoracic duct with the presence of tributary lymphatic vessels in the lowest part of the anterior mediastinum draining CPLN could explain the post-operative chylothorax observed in our patient. The objective of treating the chylothorax is to prevent local, immunological and nutritional complications. Initial treatment of chylothorax is based on conservative treatment, and approximately half of patients respond to non-surgical management, which includes the complete elimination of fat intake, chest tube insertion, total parenteral nutrition, and optionally, anti-secretory agents such as somatostatin (Nair et al., 2007). Many surgical options exist in case of failure of conservative management of chylothorax, including talc pleurodesis, bipedal lymphography, thoracic duct

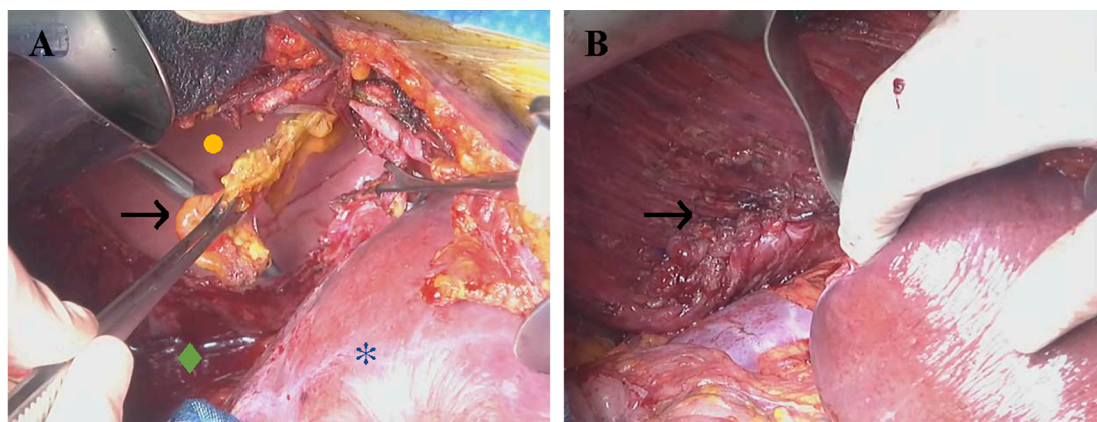


Fig. 1. Right transdiaphragmatic cardiophrenic lymph nodes resection during the primary cytoreductive surgery (♦ diaphragm; * liver; • lung). A. Abdominal view of the fat pad containing the enlarged cardiophrenic lymph nodes through the diaphragmatic opening (→). B. Final view after the right diaphragmatic closure with a running suture (→).

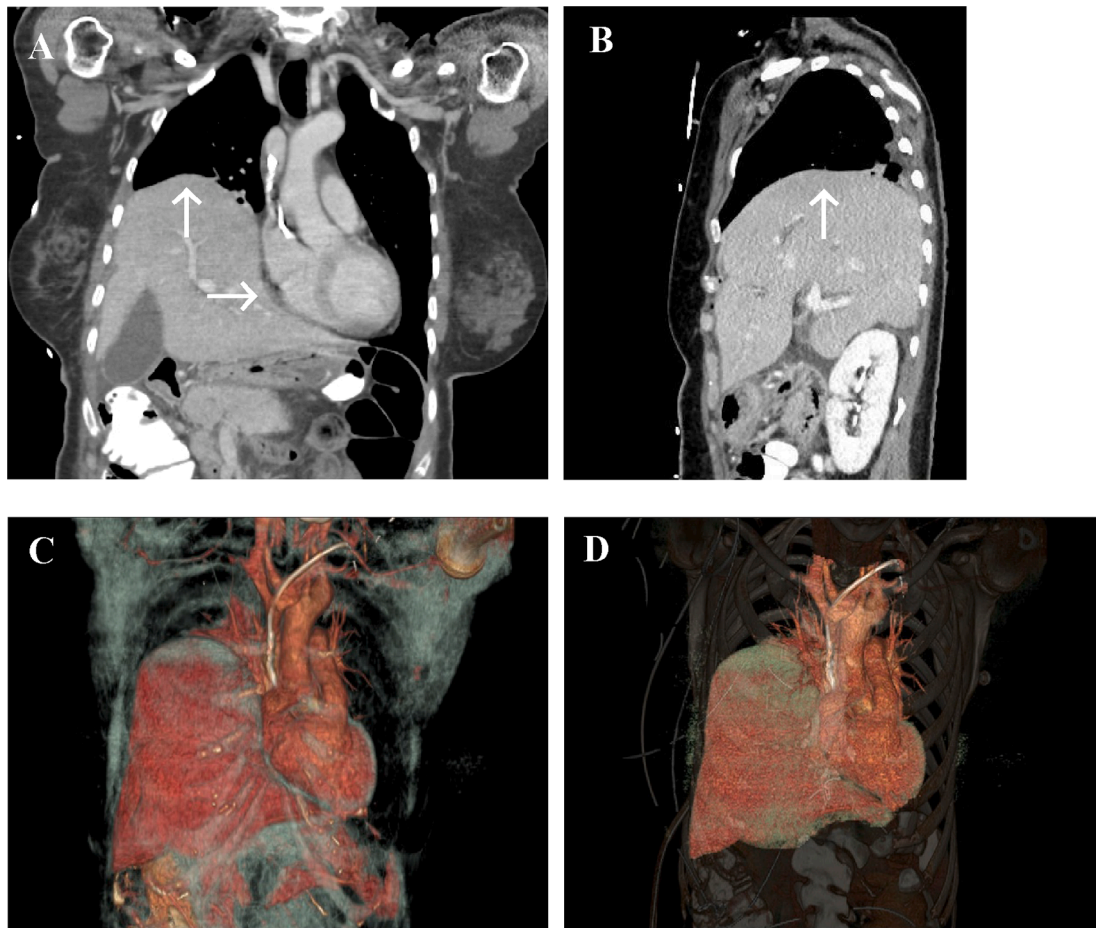


Fig. 2. Computed tomography showing chest liver herniation. A. Coronal section showing the liver compression into the right lung (↑) with the mediastinal deviation (→). B. Sagittal section with elevated hemidiaphragm leading to right lung compression. C. Coronal 3D reconstruction, Volume Rendering – soft tissue windowing. D. Coronal 3D reconstruction, Volume Rendering double transparency fusion.

percutaneous embolization, and surgical ligation of the thoracic duct as a last resort (Martucci et al., 2015). In this case, we did not perform lymphography due to the lack of imaging device. The surgical ligation of the thoracic duct during the thoracotomy was not feasible since the origin of the lymphatic leakage was not identified.

The diaphragmatic repair may be done by thoracotomy or laparotomy based on the etiology of the diaphragmatic hernia (Hanna et al., 2008). In our patient, due to the normal bowel recovery and the absence of intestinal loops in the chest, we decided to perform the diaphragm repair by thoracotomy instead of by midline laparotomy to avoid the postoperative adhesions of the previous surgery. In some cases, a combined approach with the reconstruction by a prosthetic mesh may be required in case of a large diaphragmatic defect (Bosanquet et al., 2009).

We explain this complication by several factors: the impaired diaphragmatic healing due to the chyle leak and the inadequate nutrition of the patient, the length of the diaphragmatic opening, and the accelerated resorption of the running suture promoted by local inflammation due to the chyle. Hence, to avoid this complication, during CPLN resection, special attention should be paid to lymphostasis by the ligation of lymphatic channels, the diaphragmatic closure with interrupted stitches and, finally, using non-absorbable sutures.

4. Conclusion

Transdiaphragmatic CPLN resection is usually associated with low morbidity. Here, we report for the first time a chest liver herniation due to postoperative chylothorax after transdiaphragmatic CPLN resection. The management required a surgical approach to reconstruct the

diaphragm combined with the medical treatment of chylothorax. In the case of diaphragmatic opening during cytoreductive surgery, the closure employing non-absorbable sutures and interrupted stitches should be employed.

5. Patient consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

CRedit authorship contribution statement

Hélène Leray: Conceptualization, Data curation, Methodology, Writing - original draft. **Laurent Brouchet:** Conceptualization, Data curation, Methodology. **Yann Tanguy Le Gac:** Conceptualization, Data curation, Methodology. **Sihem Bouharaoua:** Conceptualization, Data curation, Methodology. **Philippe Otal:** Conceptualization, Data curation, Methodology. **Gwenaél Ferron:** Conceptualization, Data curation, Methodology. **Erwan Gabiache:** Conceptualization, Data curation, Methodology. **Martina Aida Angeles:** Conceptualization, Data curation, Methodology. **Carlos Martínez-Gómez:** Conceptualization, Data curation, Methodology, Writing - original draft, Writing - review & editing. **Alejandra Martinez:** Conceptualization, Project administration, Methodology, Writing - review & editing.

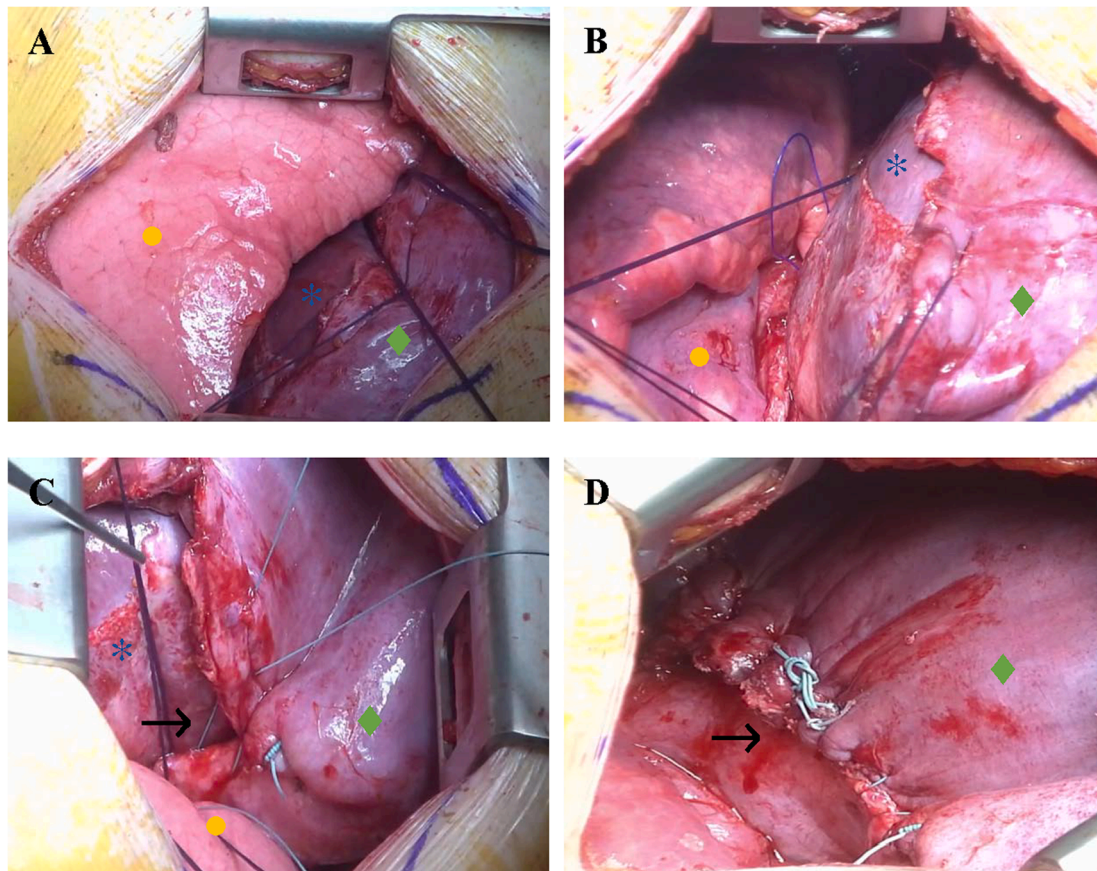


Fig. 3. Right diaphragmatic thoracotomy through the 6th intercostal space (♦ diaphragm; * liver; • lung). A and B. Initial diaphragmatic closure by placing untied sutures in the extremities and in the middle of the defect to avoid length discrepancy. C and D. Starting at each outer end, interrupted stitches of non-absorbable suture are placed (→).

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

- Angeles, M.A., Martínez-Gómez, C., Martínez, A., Ferron, G., 2019. En bloc pelvic resection for ovarian carcinomatosis: Hudson procedure in 10 steps. *Gynecol. Oncol.* 153, 209–210. <https://doi.org/10.1016/j.ygyno.2018.12.006>.
- Bosanquet, D., Farboud, A., Luckraz, H., 2009. A review diaphragmatic injury. *Respir. Med. CME* 2, 1–6. <https://doi.org/10.1016/j.rmedc.2009.01.002>.
- Bristow, R.E., Tomacruz, R.S., Armstrong, D.K., Trimble, E.L., Montz, F.J., 2002. Survival effect of maximal cytoreductive surgery for advanced ovarian carcinoma during the platinum era: A meta-analysis. *J. Clin. Oncol.* 20, 1248–1259. <https://doi.org/10.1200/JCO.20.5.1248>.
- Cowan, R.A., Tseng, J., Murthy, V., Srivastava, R., Long Roche, K.C., Zivanovic, O., Gardner, G.J., Chi, D.S., Park, B.J., Sonoda, Y., 2017. Feasibility, safety and clinical outcomes of cardiophrenic lymph node resection in advanced ovarian cancer. *Gynecol. Oncol.* 147, 262–266. <https://doi.org/10.1016/j.ygyno.2017.09.001>.
- Hanna, W.C., Ferri, L.E., Fata, P., Razek, T., Mulder, D.S., 2008. The Current Status of Traumatic Diaphragmatic Injury: Lessons Learned From 105 Patients Over 13 Years. *Ann. Thorac. Surg.* 85, 1044–1048. <https://doi.org/10.1016/j.athoracsur.2007.10.084>.
- Lim, M.C., Lee, H.S., Jung, D.C., Choi, J.Y., Seo, S.S., Park, S.Y., 2009. Pathological diagnosis and cytoreduction of cardiophrenic lymph node and pleural metastasis in ovarian cancer patients using video-assisted thoracic surgery. *Ann. Surg. Oncol.* 16, 1990–1996. <https://doi.org/10.1245/s10434-009-0486-5>.
- Martucci, N., Tracey, M., Rocco, G., 2015. Postoperative Chylothorax. *Thorac. Surg. Clin.* 25, 523–528. <https://doi.org/10.1016/j.thorsurg.2015.07.014>.
- Mert, I., Kumar, A., Sheedy, S.P., Weaver, A.L., McGree, M.E., Kim, B., Cliby, W.A., 2018. Clinical significance of enlarged cardiophrenic lymph nodes in advanced ovarian cancer: Implications for survival. *Gynecol. Oncol.* 148, 68–73. <https://doi.org/10.1016/j.ygyno.2017.10.024>.
- Nair, S.K., Petko, M., Hayward, M.P., 2007. Aetiology and management of chylothorax in adults. *Eur. J. Cardio-thoracic Surg.* 32, 362–369. <https://doi.org/10.1016/j.ejcts.2007.04.024>.
- Prader, S., Harter, P., Grimm, C., Traut, A., Waltering, K.U., Alesina, P.F., Heikaus, S., Ataseven, B., Heitz, F., Schneider, S., Du Bois, A., 2016. Surgical management of cardiophrenic lymph nodes in patients with advanced ovarian cancer. *Gynecol. Oncol.* 141, 271–275. <https://doi.org/10.1016/j.ygyno.2016.03.012>.
- Prader, S., Vollmar, N., du Bois, A., Heitz, F., Schneider, S., Ataseven, B., Bommert, M., Waltering, K.U., Heikaus, S., Koch, J.A., Alesina, P.F., Traut, A., Harter, P., 2019. Pattern and impact of metastatic cardiophrenic lymph nodes in advanced epithelial ovarian cancer. *Gynecol. Oncol.* 152, 76–81. <https://doi.org/10.1016/j.ygyno.2018.11.001>.
- Shah, R.D., Luketich, J.D., Schuchert, M.J., Christie, N.A., Pennathur, A., Landreneau, R. J., Nason, K.S., 2012. Postesophagectomy chylothorax: Incidence, risk factors, and outcomes. *Ann. Thorac. Surg.* 93, 897–904. <https://doi.org/10.1016/j.athoracsur.2011.10.060>.
- Tentes, A.A.K., Tripsiannis, G., Markakidis, S.K., Karanikiotis, C.N., Tzegas, G., Georgiadis, G., Avgidou, K., 2003. Peritoneal cancer index: A prognostic indicator of survival in advanced ovarian cancer. *Eur. J. Surg. Oncol.* 29, 69–73. <https://doi.org/10.1053/ejso.2002.1380>.
- Yoo, H.J., Lim, M.C., Song, Y.J., Jung, Y.S., Kim, S.H., Yoo, C.W., Park, S.Y., 2013. Transabdominal cardiophrenic lymph node dissection (CPLND) via incised diaphragm replace conventional video-assisted thoracic surgery for cytoreductive surgery in advanced ovarian cancer. *Gynecol. Oncol.* 129, 341–345. <https://doi.org/10.1016/j.ygyno.2012.12.023>.