

# Flash Pulmonary Edema Secondary to Persistent Left Superior Vena Cava

Jack Demirjian MD MS, Rohan Divecha MD, Emmanuel Garrastegui-Mercado MD, Oscar Garcia MD



## Background

- **Persistent left superior vena cava (PLSVC)** is a common congenital anomaly of the thoracic venous system. It is usually asymptomatic and is detected when cardiovascular imaging is performed for unrelated reasons.
- We present a case that highlights the practical implications of PLSVC where a patient developed flash pulmonary edema after gastrointestinal procedures, in this case, *laparoscopic cholecystectomy, as well as Endoscopic retrograde cholangiopancreatography.*
- Management is discussed leading to the resolution of symptoms.
- We propose a pathophysiologic mechanism leading to the aforementioned complication that is not well understood in the medical literature.

## Case Presentation

- 86-year-old female presents to the hospital with stomach and back pain
- Imaging and laboratory findings revealed cholelithiasis and pancreatitis. Patient was started on IV fluids and pain control.
- Patient continued to complain of abdominal pain now located in the right upper quadrant; with worsening LFTs and Alkaline phosphatase. Patient was recommended a laparoscopic cholecystectomy.
- Echocardiogram revealed an EF of 50-55% as well as a **dilated coronary sinus with persistent left superior vena cava terminating in the left atrium, with atrial septal bowing from left to right consistent with increased left atrial pressure.**

## Management

- Patient underwent a laparoscopic cholecystectomy
- Soon the patient developed hypoxia, tachycardia and **she desaturated to the 70s**
- **She was placed on high-flow nasal cannula**
- **Chest X-ray revealed diffuse bilateral interstitial and airspace opacities with bilateral pleural effusions**
- **Patient was started on Furosemide which resolved her pulmonary edema.**
- Abdominal pain persisted, Patient received MRCP which revealed choledocholithiasis with 2 stones
- Patient had ERCP, soon after **she experienced hypoxia, patient was placed on BIPAP**
- **Chest X-ray revealed bilateral pleural effusions**
- **Patient was started on furosemide and her condition quickly improved.**

## Images

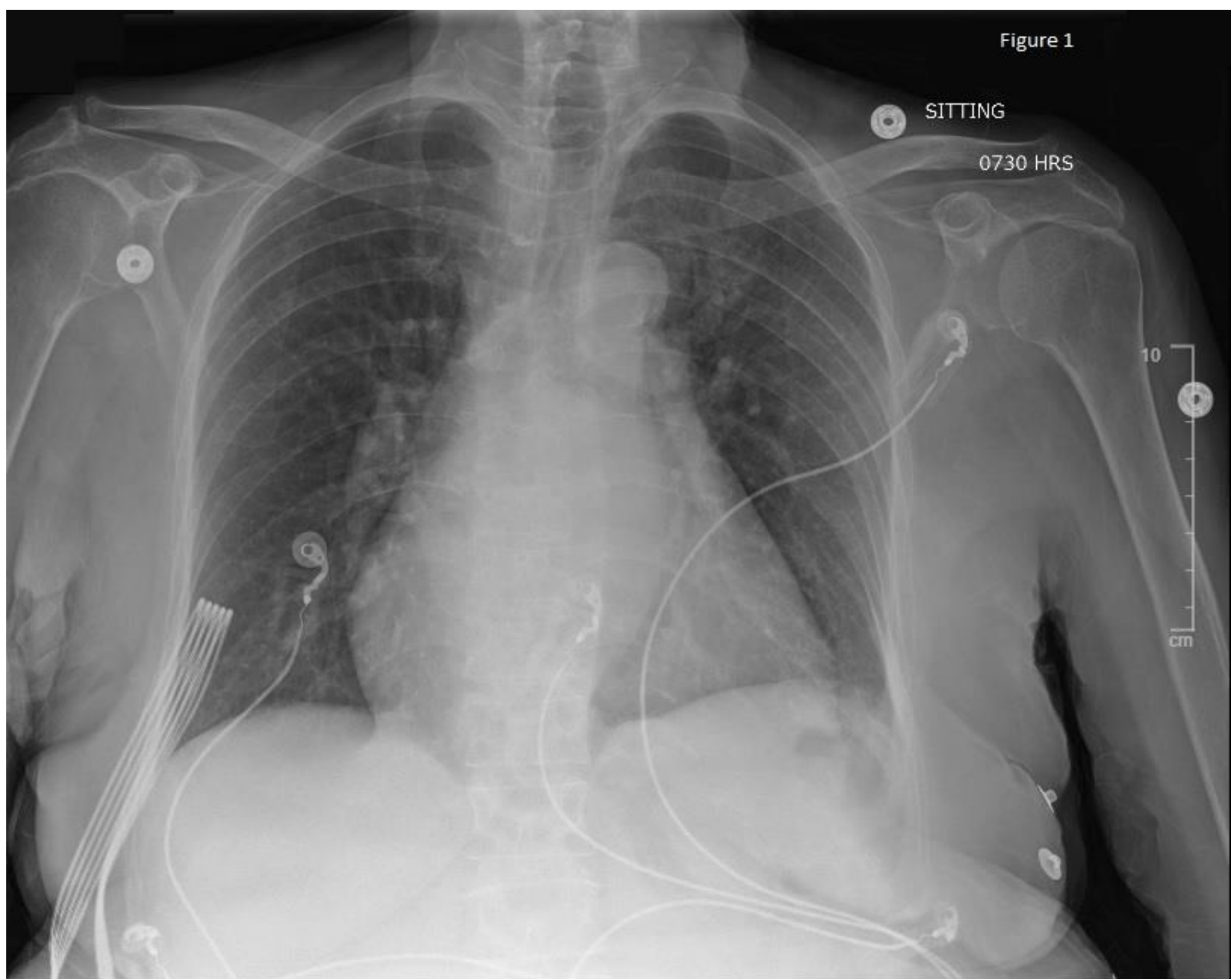


Figure 1: Chest X-ray of the patient on arrival



Figure 2: Chest X-ray post cholecystectomy depicting diffuse bilateral interstitial with bilateral pleural effusions

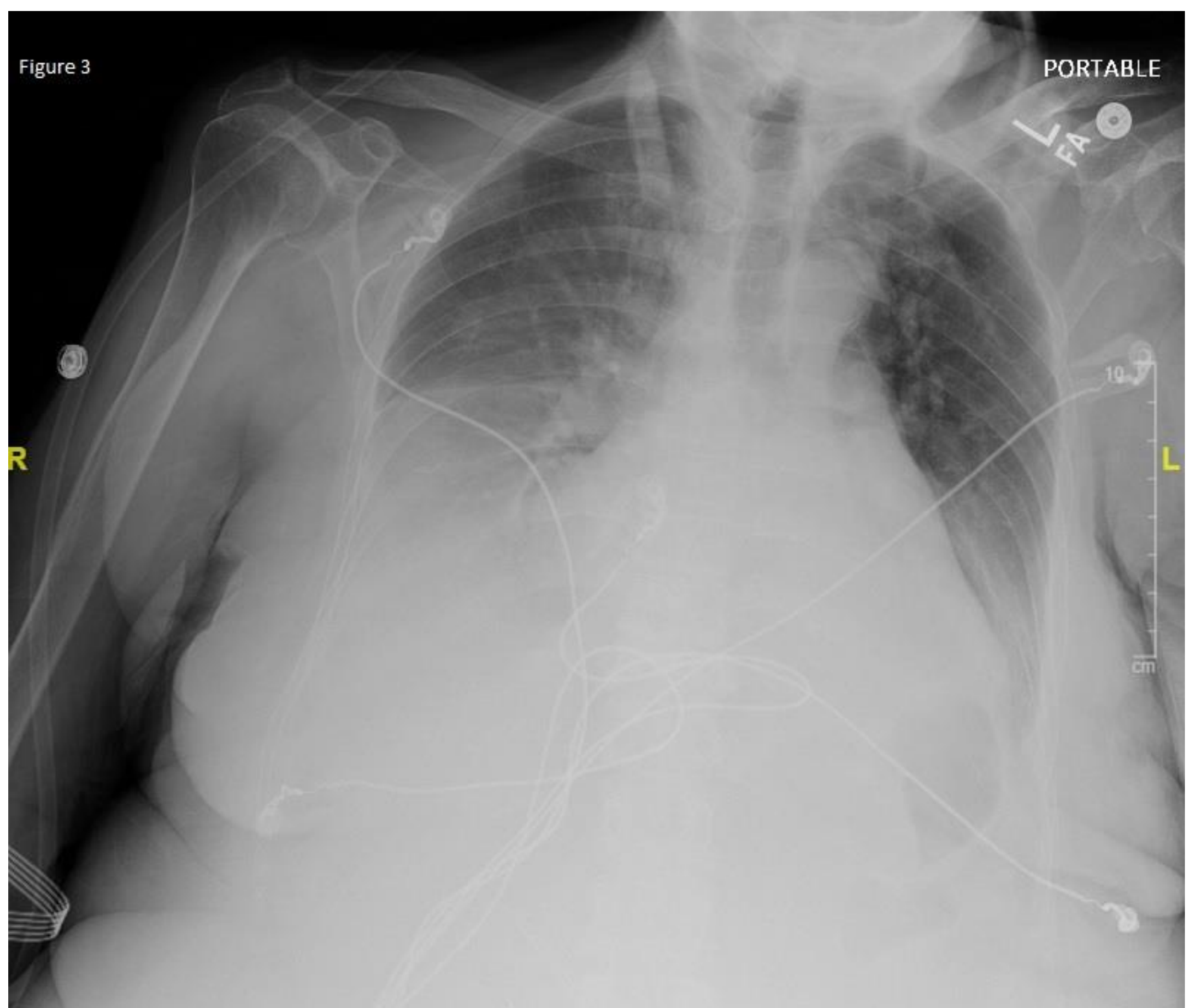


Figure 3: Chest X-ray post ERCP with bilateral pleural effusions

## Discussion

- Patient developed flash pulmonary edema twice; once after laparoscopic cholecystectomy, and after ERCP.
- Starting with post-surgical atelectasis in the lung, followed by increased blood flow to the dilated coronary sinus after biliary manipulation
- Increased vascular congestion leads to cardiogenic pulmonary edema
- Fluid transudation is mediated by rise in pulmonary capillary pressure caused by increase in pulmonary venous and left atrial pressure, resulting in filtration of protein-poor fluid across the pulmonary endothelium into the alveolar spaces causing decreased diffusion capacity, hypoxia and shortness of breath
- The solution was **rapid escalation of oxygenation as well as the administration of IV furosemide.**

## Conclusion

Although Persistent left superior vena cava is considered a benign condition, it can lead to life-threatening complications if it is not appropriately managed; more research needs to be conducted to study the mechanism of pulmonary pathology leading to flash pulmonary edema in the setting of biliary manipulation procedures and once more research is conducted, then the underlying mechanism can be understood.

## References

• Tyrak, K., Holda, J., Holda, M. K., Piatek, K., & Klimek-Piotrowska, W. (2017). Persistent left superior vena cava. *Cardiovascular Journal of South Africa : Official Journal for Southern Africa Cardiac Society [and] South African Society of Cardiac Practitioners*, 28(3), e1–e4. <https://doi.org/10.5830/cvja-2016-084>

• Boyer, R., Sidhu, R., Ghandforoush, A., Win, T. T., & Heidari, A. (2019). Persistent Left Superior Vena Cava: Implications of Surgical Management. *Journal of Investigative Medicine High Impact Case Reports*. <https://doi.org/10.1177/2324709619855754>

• Ermis, N., Cakin, O., Akcay, S., Aktürk, E., & Korkmaz, H. (2011). Persistent Left Superior Vena Cava Draining into the Coronary Sinus: A Case Report. *Cardiology Research*. <https://doi.org/10.4021/cr85w>

• Azizova, A., Onder, O., Arslan, S., Ardali, S., & Hazirolan, T. (2020). Persistent left superior vena cava: clinical importance and differential diagnoses. *Insights Into Imaging*, 11(1). <https://doi.org/10.1186/s13244-020-00906-2>

• Gropper, M. A., Wiener-Kronish, J. P., & Hashimoto, S. (1994). Acute cardiogenic pulmonary edema. *Clinics in Chest Medicine*, 15(3), 501–515. [https://doi.org/10.1016/s0272-5231\(21\)00946-1](https://doi.org/10.1016/s0272-5231(21)00946-1)

• Bello, G., De Santis, P., & Antonelli, M. (2018). Non-invasive ventilation in cardiogenic pulmonary edema. *Annals of Translational Medicine*, 6(18), 355. <https://doi.org/10.21037/atm.2018.04.39>

• Sharp, J. M., Griffith, G. T., Bunnell, I. L., & Greene, D. L. (1958). VENTILATORY MECHANICS IN PULMONARY EDEMA IN MAN1. *Journal of Clinical Investigation*, 37(1), 111–117. <https://doi.org/10.1172/jci103577>

• F. Rimoldi, S., Yuzepolskaya, M., Allemann, Y., & Messerli, F. M. (2009). Flash Pulmonary Edema. *Progress in Cardiovascular Disease*, 52(3), 249–259. <https://doi.org/10.1016/j.pcad.2009.10.002>

• Radunovic, M., Lazovic, R., Popovic, N., Magdelinic, M., Bulajic, M., Radunovic, L., Vukovic, M., & Radunovic, M. (2016, December 15). *Complications of laparoscopic cholecystectomy: Our experience from a retrospective analysis*. Open access Macedonian journal of medical sciences. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5175513/>

• Sadhu, S., Sarkar, S., Jahangir, T. A., Verma, R., Shaikh, F., Dubey, S. K., & Roy, M. K. (2011, April). *Laparoscopic cholecystectomy in patients with cardiac dysfunction*. The Indian journal of surgery. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3077169/>

*This research was supported (in whole or in part) by HCA Healthcare and/or an HCA Healthcare affiliated entity. The views expressed in this publication represent those of the author(s) and do not necessarily represent the official views of HCA Healthcare or any of its affiliated entities.*

