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The implications of covid 19-related pneumomediastinum



The occurrence of spontaneous pneumomediastinum in a patient with covid 19 infection [1] is reminiscent of the occurrence of pneumomediastinum in a 64-year old woman with severe acute respiratory syndrome (SARS), as reported by Tak-Sun et al. in 2004 [2]. In the latter instance the occurrence of pneumomediastinum was associated with chest pain and new T wave inversion over the precordial leads. Creatine kinase and troponin levels, however, were normal. Echocardiography and coronary angiography also showed no abnormalities [2]. In that example [2], as well as in the recently reported case of covid-19-related pneumomediastinum [1], clinicians should be aware of the full implications of covid-19-related pneumomediastinum, which encompass a differential diagnosis that includes acute myocardial infarction, takotsubo cardiomyopathy, pulmonary embolism, and esophageal perforation.

Pneumomediastinum can manifest itself as ST segment elevation [3], thereby simulating ST-elevation myocardial infarction (STEMI). When such an occurrence comes about in a patient with covid 19-related pneumomediastinum the differential diagnosis would include covid-19-related acute myocardial infarction, the latter a potential consequence of plaque disruption that might be generated by the severe systemic inflammatory state attributable to covid 19 infection [4]. Covid 19 is also a stress-related disorder, and stressful episodes increase the risk of the occurrence of Tako tsubo cardiomyopathy (TTC). In the era antedating the covid 19 epidemic, the association of stress-related TTC and pneumomediastinum was exemplified by a 30 year old primigravida who experienced chest pain 6 h after an uneventful delivery. Her electrocardiogram (ECG) showed T wave inversion in the anterior precordial leads, and the serum troponin was raised to 1.88 ng/ml. Coronary angiography disclosed normal coronary arteries but wall-motion abnormalities (WMA) were noted in the basal segments. Trans-thoracic echocardiography (TTE) showed a left ventricular ejection fraction (LVEF) amounting to 27%, and a pattern of left ventricular wall motion abnormalities consistent with reversed/inverted TTC. After one month treatment with beta-blockers and angiotensin converting enzyme inhibitors her LVEF reverted to normal [5]. In the covid-19 context TTC was reported in a 59 year old woman who had presented with fever, cough, and hypoxemia. Chest radiography showed typical bilateral infiltrates. She tested positive for the SARS-Cov-2 antigen. Her ECG showed ST segment elevation in leads I and AVL. Serum troponin peaked at 11.02 ng/ml. Her TTE demonstrated akinesia in the middle to distal anterior, anteroseptal, anterolateral, and apical segments, and moderate hypokinesia in the middle and distal inferolateral segments. The basal segments, however, were hyperdynamic. Apical ballooning was also noted, and her LVEF was as low as 20%. By day 6 her LVEF had increased to 55%, thereby supporting the provisional diagnosis

of covid-19-related TTC [6]. Pneumomediastinum may also be a complication of pulmonary embolism (PE) [7]. PE, in turn, is a well recognised complication of covid-19 infection [4].

Pneumomediastinum has a more sinister significance when it is an early sign of esophageal perforation [8,9]. Even in that context it may be associated with ST segment elevation [8], thereby simulating STEMI. Esophageal perforation typically occurs after a bout of nausea [10] and/or vomiting, the latter a symptom complex which may be a feature in 2%–4.7% of covid-19 patients [11].

Comment

Both in the covid-19 context and outside that context pneumomediastinum may be associated either with coronary heart disease or with TTC. This association may be characterised either by T wave inversion or by ST segment elevation. Covid-19, in turn, is a risk factor for coronary artery disease, for TTC, and for PE. Clinicians should also be vigilant for the possibility that pneumomediastinum may be a manifestation of TTC or PE, or an early sign of esophageal perforation.

I have no funding, and no conflict of interest.

References

- [1] Janssen J, Kamps MJA, Joosten TMB, Barten DG. Spontaneous pneumomediastinum in a male adult with COVID-19. *Amer. J Emerg Med.* 2020 Article in Press.
- [2] T-S TSE, Tsui K-L, Yam LY-C, So LK-Y, Lau AC-W, Chan K-K, et al. Occult pneumomediastinum in a SRA patient as recurrent chest pain and acute ECG changes mimicking acute coronary syndrome. *Respiology.* 2004;9:271–3.
- [3] Brearley WD, Taylor L, Haley MW, Littmann L. Pneumomediastinum mimicking acute ST segment elevation myocardial infarction. *Int J Cardiol.* 2007;117 e73–e75.
- [4] Long B, Brady WJ, Koifman A, Gottlieb M. Cardiovascular complications in COVID-19. *Am J Emerg Med.* 2020. <https://doi.org/10.1016/j.ajem.2020.04.048>.
- [5] Hamadanchi A, Lichtenauer M, Dannberg G, Figulla H-R. Association of inverted Takotsubo cardiomyopathy with post partum pneumo-mediastinum: when a “broken lung” meets a “broken heart” *Wiener klinische Wochenschrift.* 126; 2014; 1. <https://doi.org/10.1007/s00508-013-0455-7>.
- [6] Minhas AS, Scheel P, Garibaldi B, Liu G, Horton M, Jennings M, et al. Takotsubo syndrome in the setting of COVID-19. *JACC Case Reports.* 2; 2020; 1321–5.
- [7] Maldjian PD, Petsavage JM. Intracardiac thrombus and pulmonary embolism with cavitation and pneumomediastinum in a patient with protein S deficiency. *J Thorac Imaging.* 2006;21:222–4.
- [8] Mansour KA, Teaford H. Atraumatic rupture of the esophagus into the pericardium simulating acute myocardial infarction. *J Thorac Cardiovasc Surg.* 1973;65:458–60.
- [9] Macia I, Moya J, Ramos R, Morera R, Escobar I, Saumench J, et al. Spontaneous pneumomediastinum. *Eur J Cardiothorac Surg.* 2007;31:1110–4.
- [10] Skaug B, Taylor KR, Chandrasekaran S. Oesophageal rupture masquerading as STEMI. *BMJ Case Reports.* 2016. <https://doi.org/10.1136/bcr-2016-214906>.
- [11] Ramachandran P, Onukogu I, Ghanta S, Gajendran M, Perisetti A, Goyal H, et al. Gastrointestinal symptoms and outcomes in hospitalized corona virus disease 2019 patients. *Dig Dis.* 2020. <https://doi.org/10.1159/000509774>.

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18 August 2020