

COVID-19: Droplet Contamination & Aerosolization during Pleural Decompression

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ABSTRACT

Introduction: In response to the COVID-19 pandemic, it is argued that pleural decompression is an aerosol generating procedure and that personal protective equipment (PPE) provides adequate protection. We investigated this by simulating and mapping viral droplet contamination during pleural decompression (PD) and intercostal catheter (ICC) insertion to elucidate the hazard to the clinician.

Methods: We constructed a model using the Life/form Chest Tube Manikin® (3D Scientific), to simulate a tension haemopneumothorax. The manikin's hemi-thoraces were filled with ~1000 ml of red-dyed water, 2 mm of 100 mg/mL fluorescein and ~500 ml of air. The proceduralist wore the currently recommended PPE, which included an N95 mask, a visor, a cap, a surgical gown and gloves. An open cut down technique was employed to decompress the right pleural space and a 28 French ICC was inserted. The procedure was filmed and photographed under normal lighting and blue light to assess fluorescent marker contamination.

Results: Slow motion video review revealed droplet contamination of the surgeons' upper limbs, trunk and facial visor during the procedure. Post-procedure, areas of red fluid were visible on both gloves, the dominant forearm and waist of the gown. There was no visible contamination to the proceduralist's head, neck or chest under normal lighting. However, under blue light, fluorescein droplet contamination was visible extending onto the visor, shoulders and chest.

Conclusion: Our simulation demonstrates that droplet contamination to the proceduralist occurs during PD. It is highly plausible that aerosolization occurs as well, though this may not be visible to the naked eye. There appears to be no other studies, to date, reporting on the evidence relating to this subject.

Keywords: Aerosolization, COVID-19, Pleura, Decompression, Trauma, Droplet, Contamination

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