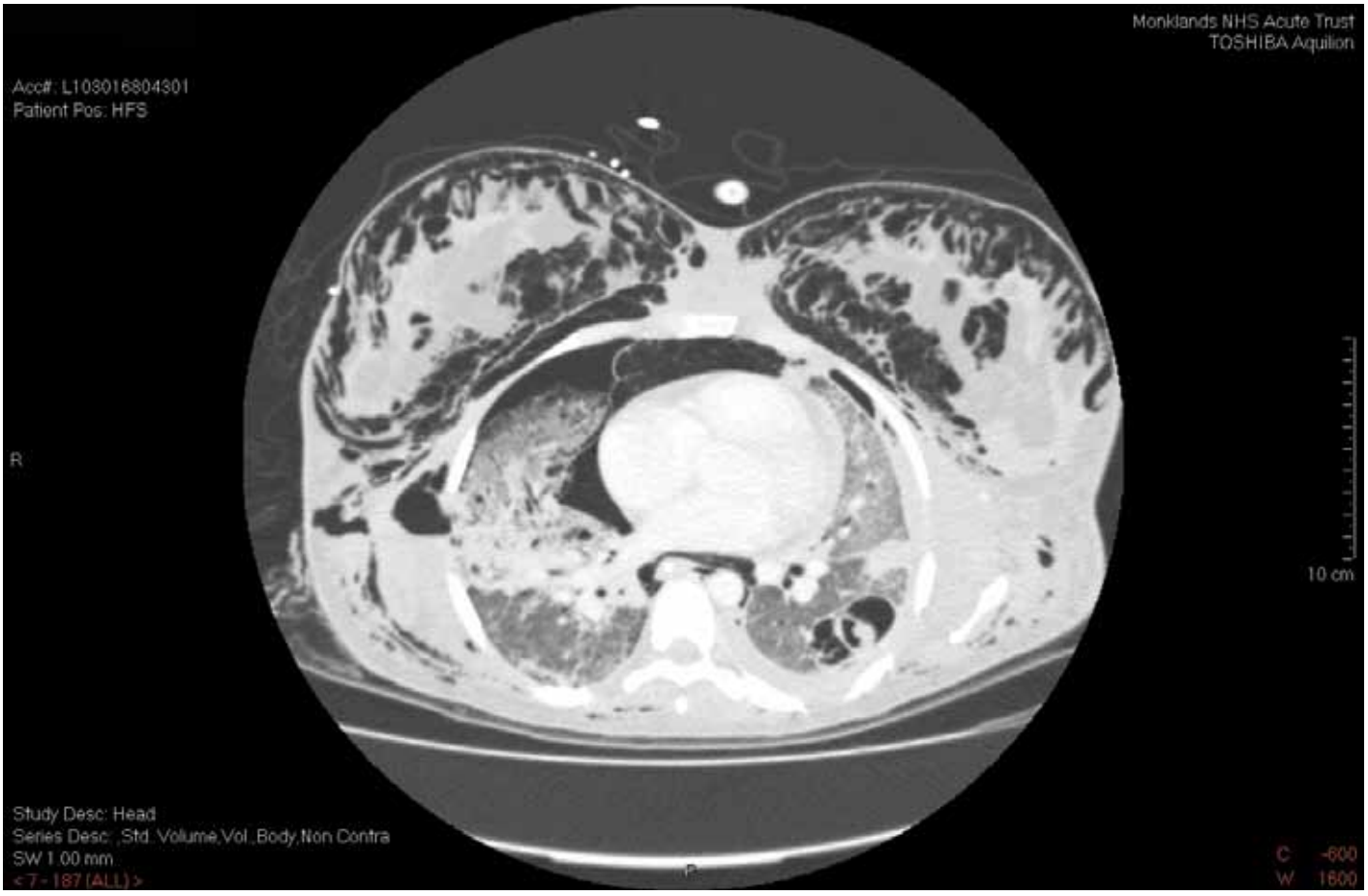
PATIENT CASE REPORT. CATEGORY: ADULT

TRANSITIONING FROM HFO TO NEURALLY ADJUSTED VENTILATORY ASSIST (NAVA) IN A LONG TERM ICU PATIENT

Clinical Background and Situation:

A 25 year old previously fit and healthy female patient presented to the ER with pneumococcal pneumonia with severe sepsis, with resulting respiratory failure, renal dysfunction, and septic shock. The patient was initially given oxygen therapy and volume to support blood pressure and renal dysfunction, and started on courses of antibiotics. She was admitted to intensive care early for further respiratory and cardiovascular support and monitoring. At the point of ICU admission, her main problem was one of deteriorating respiratory function, specifically critical hypoxia. She developed worsening respiratory failure from day 1, progressing from ALI to ARDS. She also developed bilateral pleural diffusions, necessitating drain placement and air leaks from the ARDS, and her oxygen requirement increased.



CT lung scan of patient during high frequency oscillation

Case contributed by Dr Jim Ruddy, Intensivist, Monklands Hospital, Lanarkshire, Glasgow, Scotland.

Interventions and course of therapy:

She was on a lung protective strategy from the start, with Pressure Control ventilation with low tidal volumes, and recruitment maneuvers, but once she was up to 60% oxygen on day 6 she was proned to try to improve oxygenation. This improved the condition, but on turning her supine she deteriorated, likely due to a worsening of her pleural effusions, and so chest drains were inserted. She required several periods of proning over the first 7-8 days.

The patient continued to deteriorate. She developed worsening surgical emphysema requiring multiple bilateral chest drains, and she continued to have FiO_2 of 0.7, PEEP 15-20 cm H_20, Pressure Control low tidal volume strategy and recruitment maneuvers. Subsequently she developed a pneumoretroperitoneum, so we wondered if she had pulmonary interstitial emphysemia secondary to her ARDS, as well as all of the classic complications of ARDS. Because of the situation, we considered on day 16 to put her on High Frequency Oscillation (HFO) to hopefully seal any ongoing leaks, as she continued to have surgical emphysema, which was steadily deteriorating. Her kidney function deteriorated markedly and renal replacement therapy was instituted for both renal failure and aggressive fluid management. She went on the oscillator at day 18 and was on HFO until day 22, when we wanted to image her chest and put her on Pressure Control on the ventilator. The CT scan showed worsening lung condition with ARDS and consolidation and fluid together with persistent air in her pleural cavity despite chest drains and worsening surgical emphysema. At this time, her general condition deteriorated with worsening cardiovascular and renal failure. Over the next few days she stabilised and was deemed stable enough to perform a tracheostomy-percutaneously. This was a difficult procedure complicated by a possible injury to the posterior wall of the trachea, possibly leading to a fistula with her oesophagus. Although exact diagnosis was unclear, she was now proving very difficult to ventilate due to a combination of leak from her upper airway and high pressures. She underwent a very stormy course over the next few hours and required further HFO and intermittent prone ventilation to treat her life-threatening hypoxaemia.

She was ventilated on HFO from day 26 until day 62, when she was persistently doing well on the oscillator with a FiO_2 of around 0.5. Because of her severe neuromuscular weakness likely due to critical illness polyneuropathy, she was attempting to breathe on the HFO but was too weak to generate any flow triggering. Because of this uncoupling of her diaphragm, we felt that this scenario lent itself ideally to placing a NAVA Edi catheter and initiating Edi monitoring and NAVA ventilation. This proved very useful as it confirmed an Edi of 70 microvolts, showing a desire to breathe, in our minds. She did not require any sedation at this point at all - tolerating the HFO and subsequent NAVA surprisingly well.

Results:

Initial NAVA level settings used on day 62 were 1.0 µv/ cmH_20. She remained on NAVA with a respiratory rate between 20 and 29, 5 cmH_20 of PEEP, FiO_2 of 0.4 with a PO_2 of 21 kPa and CO_2 of 10.4 kPa. By day 65 we could reduce the NAVA level to 0.5 µv/ cmH_20 without any change in her ventilation. This NAVA regime was used until day 82, and as her muscle strength improved, so reduced her Edi such that her ventilation was improved to a level of FiO_2 of 0.35, respiratory rate of 33 and NAVA level of 0.5. At this point, she did not require any further support from NAVA. The patient was decannulated and discharged from the ward on day 100 after ICU submission.

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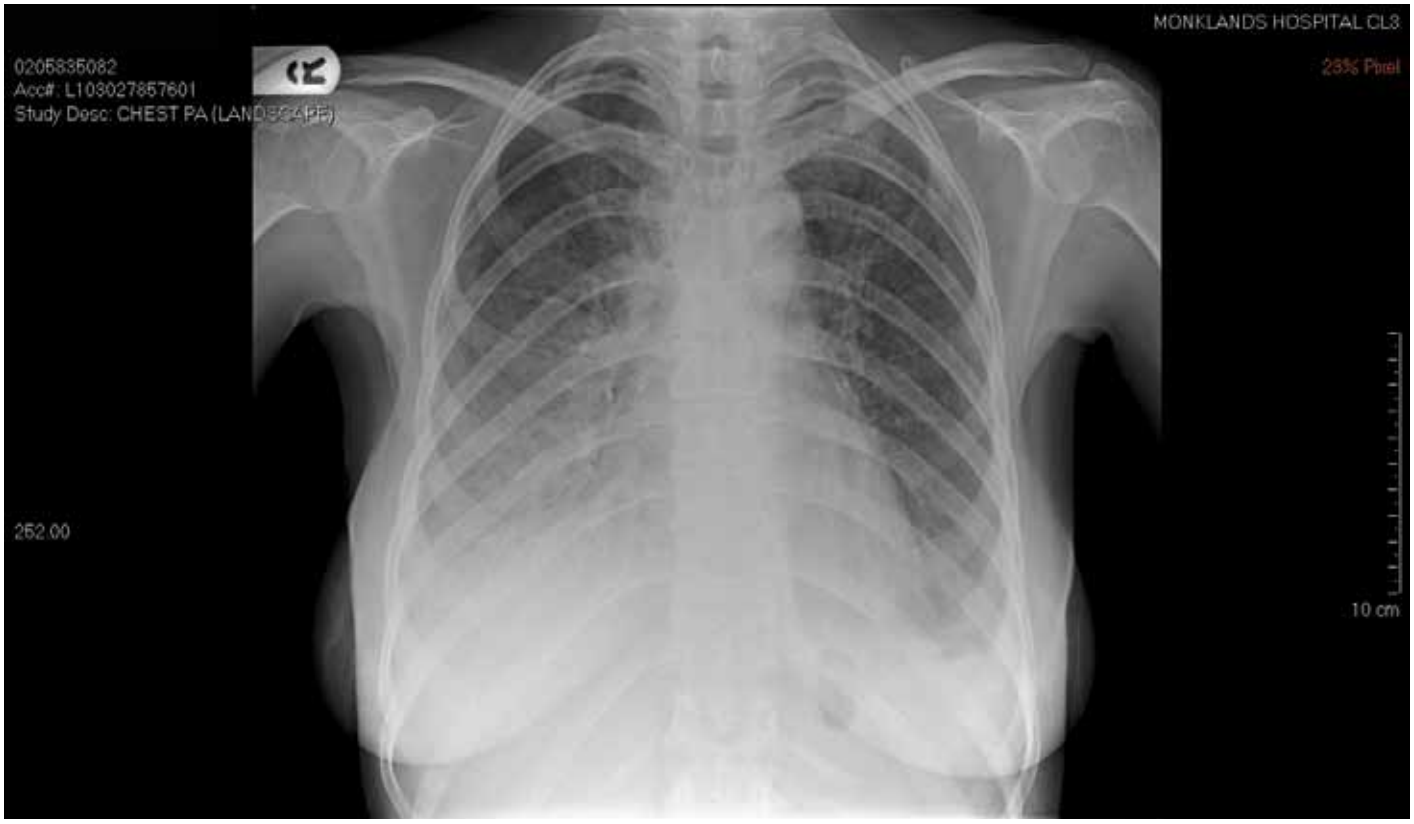

Patient lung x-ray post ICU

Case summary:

A 25 year old female patient presented to the ER with pneumococcal pneumonia and severe sepsis, with resulting respiratory failure, renal dysfunction and septic shock. Despite initiation of a lung protective ventilation strategy, the patient developed severe complications including ARDS, bilateral pleural effusions, bilateral pneomothoracies, possibly a bilateral bronchopleural fistula, a difficult tracheostomy and retroperitoneal complications. The patient was treated with High Frequency Oscillation (HFO) from day 26 until day 62. Ventilation therapy was initiated with Neurally Adjusted Ventilatory Assist (NAVA) on day 62 at NAVA level 1.0 µv/cmH_20. The patient tolerated NAVA ventilation well for a significant period of 20 days, and as she successfully regained diaphragmatic and respiratory muscle strength, the NAVA level was reduced accordingly until she did not require further support from NAVA on day 82. On day 100, the patient was decannulated and discharged from the ICU.

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