# Extreme Reduction of Lung Volumes Secondary to Acute Abdominal Distension

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## Introduction

Abdominal compartment syndrome (ACS) is a condition documented with a high mortality and morbidity rate. Its causes are variable. As intrabdominal pressure rises, the diaphragm is forced upwards which increases intrathoracic pressure, leading to significant contraction of pulmonary volumes and heart filling. Thus, ACS leads to multiple organ failure not only from pressure itself, but also through decreased organ perfusion and oxygenation that results in bowel ischemia, renal failure, and liver dysfunction.

## Case Report

A 70-year-old female presented from a nursing home to our emergency department for unresponsiveness. Past medical history is significant for bipolar disorder, schizoaffective disorder, dementia, prior GI bleed, and anxiety. She was at her known baseline and had a large bowel movement night before but was unresponsive on the morning of admission.

On admission, physical exam showed a distended, rock-hard abdomen to palpation and absent bowel sounds. Peritoneal signs were unable to be assessed due to the patient's nonresponsive status. ABG revealed severe metabolic and respiratory acidosis with a pH of 7.06, a CO2 of 52.0, and bicarbonate of 14.4. She was emergently intubated, sepsis bolus administered, and pressure support initiated. Her poor abdominal compliance was further seen with an elevated plateau pressure of 51cm H20.

Surgery was consulted for emergent exploratory laparotomy. During preparation, the patient underwent cardiac arrest with PEA and ROSC achieved after 13 minutes. On exploratory laparotomy, ischemia of the GI tract from the stomach to the rectum was noted. Findings were contacted to the family who decided to discontinue invasive measures. She was converted to comfort care and pronounced shortly after.

## Vitals

| Time | Temp | Pulse | Resp | BP | SpO2 | O2 Device |
|---|---|---|---|---|---|---|
| 2215 | — | 70 | 29 | 43/26 ! | — | — |
| 2210 | — | 70 | 31 ! | 56/37 ! | — | — |
| 2206 | — | 70 | 23 | 105/68 | — | — |
| 2155 | — | 45 ! | — | 61/31 ! | — | — |
| 2050 | — | 49 ! | 14 | — | 61 ! | — |
| 2045 | — | 86 | 0 ! | — | 27 ! | — |
| 2040 | — | 91 | 0 ! | — | 60 ! | — |
| 2035 | — | 92 | 0 ! | — | 52 ! | — |
| 2000 | — | 122 | — | 97/25 ! | — | — |
| 1900 | — | 102 | 0 ! | 120/100 ! | — | — |
| 1859 | 95.7 (35.4) | 102 | 28 | 120/100 ! | — | — |
| 1750 | — | 109 | 3 ! | 115/90 | 59 ! | — |
| 1730 | — | 97 | 18 | 127/99 ! | 60 ! | — |
| 1725 | — | 93 | 0 ! | 137/111 ! | 62 ! | — |
| 1720 | — | 87 | 0 ! | — | 69 ! | — |
| 1715 | — | 74 | 0 ! | 119/102 ! | 51 ! | Ventilator |
| 1700 | — | 71 | 0 ! | 36/21 ! | 94 | Ventilator |
| 1640 | — | — | — | — | — | Ventilator |
| 1630 | — | 85 | 13 | 59/39 ! | — | — |
| 1623 | 94.3 (34.6) | 88 | 22 | 64/47 ! | 74 ! | — |
| 1615 | — | 90 | 18 | 107/55 | 77 ! | — |

## Imaging

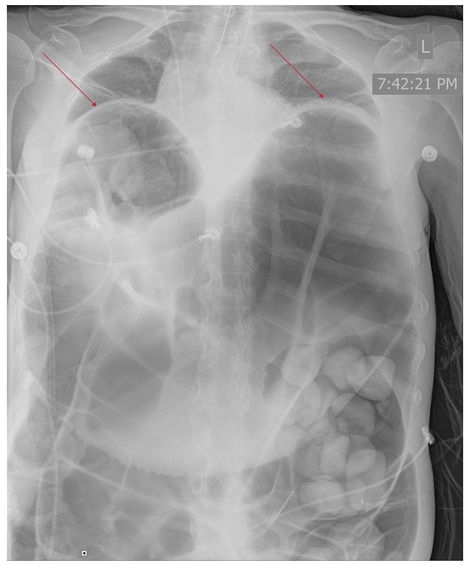


Figure 1: Chest xray shows elevation of the diaphragm (red arrows) and contraction of lungs to the 5th rib bilaterally, displacement of the heart to the 4th rib, and expansion of intraabdominal organs.

## Discussion

In this patient's case, her presentation was likely associated with abdominal compartment syndrome (ACS) from severe bowel ischemia. Management of ACS requires balance among three determinants: management of the pressure, end-organ characteristics, and cause. Pressure is measured via the bladder, with >25mmHg considered diagnostic for ACS. End organ dysfunction is a common finding in ACS, commonly impacting the lungs but also AKIs, hemodynamic instability, shock, and other intraabdominal complications. Etiology should guide treatment, often needing imaging such as CT or US. Many treatment modalities exist, but surgical decompression considered the last but also the standard of treatment to decrease intraabdominal pressures, evacuate any causes of overload, or find/treat the underlying problem.

Respiratory dysfunction is a common sequela of ACS due to elevated pressures causing diaphragmatic elevation. Airway pressures are greatly increased with decrease in tidal volume and compliance. Intubation is almost always necessary with recommendations to increase PEEP, to maintain plateau pressures under 35 cmH20, and to measure extravascular lung water index to prevent lung edema.

## Conclusion

This patient presented with severe abdominal distension leading to cardiopulmonary collapse. This case was primarily guided by her physical exam, imaging findings, and eventual surgical intervention. Patient's presentation was unique with a rigid, distended abdomen and x-ray findings revealing severe displacement of the diaphragm and compression of her heart and lungs.

## References

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