

## Non-Cardiogenic Pulmonary Edema in Salicylate Poisoning

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### Abstract

Salicylate-induced pulmonary edema (SIPE) can occur in both acute and chronic users of aspirin or salicylate products. The medical history, especially when it reveals the use of salicylates, is critical when considering this diagnosis. Unfortunately, the neurologic and systemic effects of salicylate toxicity may hinder the ability to obtain a reliable medical history. SIPE should be considered in patients who present with pulmonary edema and neurological changes, anion-gap metabolic acidosis, or possible sepsis. Some patients may be treated for “pseudosepsis” or other conditions, thereby delaying the diagnosis of salicylate intoxication. Misdiagnosis and possibly delayed diagnosis of SIPE can lead to a significant increase in morbidity and mortality. Serum and urine alkalization by administration of intravenous sodium bicarbonate are commonly utilized therapeutic strategies. Finally, hemodialysis is a therapy, which should be considered early in the course of treatment. The objective of this case report and review is to emphasize the importance of rapid diagnosis and appropriate treatment in patients with SIPE, and summarize the current literature as it relates to the adult population.

### Introduction

Salicylate-induced pulmonary edema (SIPE) is a complication of salicylate toxicity, which can be difficult to diagnose and treat. Significant mortality and morbidity may result from delayed diagnosis or misdiagnosis of SIPE. This case report signifies the early reorganization and treatment of this uncommon condition.

### Case Report

41 years old AAF with past medical history of Asthma and Poly-substance abuse, presented to the ER with shortness of breath. Patient was found to be in severe respiratory distress and only a limited history could be obtained. Patient was subsequently intubated in due to hypoxic respiratory failure. As per the limited history prior to intubation she denied any chest pain, recent fevers, cough, palpitations, headaches dizziness and any urinary or bowel complaints. She was on Albuterol inhaler. She also admitted to using cocaine on the day of presentation.

On examination patient was a febrile, tachycardic and very trachypnic. Pupils were bilaterally equal, round and reactive to light. Neck was supple and Jugular venous pressure was not elevated. Minimal wheezing was heard on auscultation of lungs.

Preliminary blood work done in the ER was significant for a Bicarbonate of 9 with Na of 136 and Chloride of 111 hence the anion gap being 26. She had normal renal and liver function tests. Her hematology was significant for hemoglobin of 9.4 with a mild leukocytosis of 13.2. Initial arterial blood gas was showing severe metabolic acidosis with respiratory alkalosis. Further, blood-work was sent to identify causes of anion gap acidosis and was significant for salicylate level of 56 and a normal alcohol, acetaminophen and lactic acid levels. Later patients family was contacted who found an empty bottle of ASA at home and believed she was using it for pain since the last few days. However they denied any suicidal ideation and possibility of acute ingestion.

A CXR (Figure 1) done in ER showed bilateral patchy interstitial infiltrates suggestive of pulmonary edema. The  $\text{paO}_2/\text{FiO}_2$  was less than 200 and patient was admitted to MICU with low tidal volumes and PEEP on ventilator settings as per the ARDS protocol (Figure 2).

Considering salicylate poisoning with acidosis, bicarb drip was started. Later on chest X-ray was highly suggestive of pulmonary

edema. Transthoracic echocardiogram showed a normal left ventricular function, indicating non-Cardiogenic origin of the pulmonary edema. Considering severe non-Cardiogenic pulmonary insetting of salicylate poisoning, decision was made for emergent hemodialysis. Patient responded very well to hemodialysis. Salicylate levels started trending down and patient was successfully extubated on day 3 of ICU stay.

### Discussion

The pathogenesis of SIPE is uncertain and possibly multifactorial. It has been speculated that aspirin causes pulmonary edema by central nervous system “irritation” [1]. Hypothalamic stimulation leads to



Initial CT scan also showed bilateral pulmonary edema.

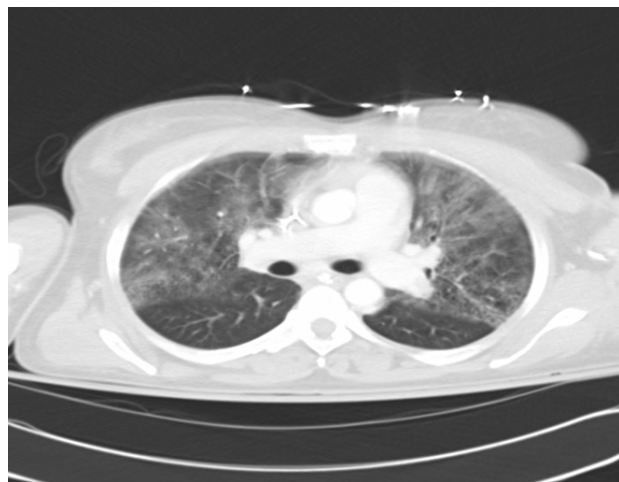
**Figure 1:** Bilateral pulmonary edema.

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**Figure 2:** Bilateral opacities suggestive of ARDS.

neurogenically control adrenergic discharge, which results in increased venous return and increased left ventricular end-diastolic pressure [2]. However, Karliner [3] considered it unlikely that left ventricular failure from acute sympathetic discharge is an important mechanism in pulmonary edema and he emphasized widely divergent experimental and clinical observations relative to neurogenic pulmonary edema. The normal transthoracic echocardiogram in this case report precludes the particular mechanism. However, the central neurogenic theory should not be entirely discounted. Moss [4] has demonstrated that central nervous system damage can lead to “Shock Lung”, a form of non-cardiogenic pulmonary edema. It is postulated that central nervous system damage can lead to neurologically mediated pulmonary vascular constriction in the pulmonary circulation, resulting in pulmonary edema and normal wedge pressure.

While most types of non-cardiogenic pulmonary edema are due to direct physical or chemical damage, there are many other complex operative mechanisms, including antigen-antibody reactions, release of vasoactive substances (histamine, kinins, prostaglandins etc), disseminated intravascular coagulation and immunologic reactions to drugs [5]. SIPE might be mediated through one or more of these mechanisms since aspirin is a potent inhibitor of prostaglandin synthesis. It is conceivable that SIPE may result from an imbalance of vasoconstrictive and vasodilatory prostaglandin production.

The commonly employed forms of treatment for salicylate intoxication, i.e. forced alkaline diuresis and hemodialysis, are both potentially hazardous for the lungs. Forced alkaline diuresis with crystalloid solutions has the potential to increase lung microvascular pressure and the transfer of fluid across the injured pulmonary vascular bed, and to decrease colloid oncotic pressure, a factor, which may be important in the pathogenesis of “non-cardiac pulmonary edema. It may worsen the pulmonary edema, if patient is already in non-cardiogenic pulmonary edema due to direct injury to lungs by aspirin as in our patient.

No clear guidelines exist on when to use HD in salicylate intoxication or SIPE. However, several references suggest the use of HD specifically in salicylate-intoxicated patients with evidence of organ damage, such as pulmonary edema, CNS disturbances, and

renal impairment [6,7]. As in our patient who was benefited from emergent hemodialysis. Many references have recommended use of HD in patients who have a very high salicylate concentration (>100 mg/dL) regardless of symptoms present [8]. However, patients on chronic salicylate may benefit from HD when implemented at lower serum concentrations, especially in the presence of clinical decline. Other benefits HD may offer include improvement in acid-base and electrolyte abnormalities. Given the pharmacokinetic properties of salicylate after intoxication (i.e. increased unbound fraction in serum) it seems appropriate to consider HD as a valuable therapeutic modality in salicylate induced pulmonary edema until additional morbidity and mortality data is available. At the present time, clinical judgment, not salicylate concentrations, should be the major guiding force in the decision of when to use HD.

## References

1. Davis PR, Burch RE (1974) Pulmonary edema and salicylate intoxication. *Ann Intern Med* 80: 553-554.
2. Worthen M, Argano B, Siwadlowski W, Bruce DW, Mac Canon DM, et al. (1969) Mechanisms of interstitial veratrine pulmonary edema. *Dis Chest* 55: 45-48.
3. Karliner JS (1972) Non-cardiogenic forms of pulmonary edema. *Circulation* 46: 212-215.
4. Moss G (1974) Shock lung: A disorder of the central nervous system. *Hosp Practice* 9: 77-86.
5. Robin ED, Cross CE (1973) Pulmonary edema. *N Engl J Med* 288: 292-304.
6. McGuigan MA (1987) A two-year review of salicylate deaths in Ontario. *Arch Intern Med* 147: 510-512.
7. Thisted B, Krantz T, Strøm J, Sorensen MB (1987) Acute salicylate self-poisoning in 177 consecutive patients treated in ICU. *Acta Anaesthesiol Scand* 31: 312-316.
8. Goldfrank LR, Flomenbaum NE, Lewin NA, Howland MA, Hoffman RS, et al. (2002) *Goldfrank's Toxicologic Emergencies*. New York, McGraw Hill, 7<sup>th</sup> edn.