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# Radiographic findings following irrigation of chronic perineal drain with hydrogen peroxide



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## ABSTRACT

**INTRODUCTION:** Hydrogen peroxide is a widely available agent used for irrigation and disinfecting. With misuse, significant side effects have been noted ranging from nausea to abdominal cramping to portal venous gas, air embolism and death.

**PRESENTATION OF CASE:** We present an 81 year old male who developed a rectovesicular fistula following radiation for metastatic prostate cancer. He had recurrent bleeding and infections and underwent a pelvic exenteration which was complicated by a persistent pelvic abscess requiring placement of a transperineal drainage catheter. After months of persistent drainage, he noted decreased output and irrigated the catheter with 3% hydrogen peroxide. He presented to the emergency room with fever, diarrhea and abdominal cramping but no rebound or guarding. CT depicted free air in the pre-sacral space extending into the retroperitoneum and diffusely throughout the peritoneum. Given his clinical exam and upon review of imaging, we assumed his radiographic findings were related to the direct instillation of hydrogen peroxide into his chronic pelvic cavity.

**DISCUSSION:** Hydrogen peroxide has been used therapeutically for over 100 years. Hydrogen peroxide exerts direct cytotoxicity by corrosion and lipid peroxidation and indirectly by oxygen gas formation. When the oxygen produced exceeds the solubility in the blood, arterial and venous gas embolism occur. It is this sequelae of hydrogen peroxide that is described most frequently in the literature.

**CONCLUSION:** Instillation of hydrogen peroxide into a chronic pelvic cavity resulted in a benign pneumoperitoneum. This effect of hydrogen peroxide is a significant and potentially treatment altering radiographic finding.

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## 1. Introduction

Hydrogen peroxide is a widely available agent used commonly as an irrigation and disinfecting solution. It has been reported, however, to have significant side effects, particularly with ingestion. The severity of these are related to the concentration and method of exposure ranging from nausea and abdominal cramping to portal venous gas, air embolism and death. We present a case of extensive pneumoperitoneum associated with the instillation of hydrogen peroxide into a chronic pelvic abscess cavity.

## 2. Presentation of case

We present the case of an 81 year old male who developed a rectovesicular fistula following resection and radiation for metastatic prostate cancer. After long standing pelvic pain and worsening hematochezia and pneumaturia, he underwent a

diverting colostomy and percutaneous nephrostomy tubes. Unfortunately, he had recurrent bleeding and urinary tract infections and underwent a cystectomy, ileal conduit and proctectomy. Initially he did well post-operatively but returned several weeks later with obstruction and pelvic abscess requiring placement of percutaneous drainage catheter. He was noted to have persistent pelvic abscess with a perineal fistula. A catheter was placed transanally in an effort to decompress this persistent cavity as imaging depicted an open rectal stump. A completion proctectomy with gracilis flap for closure of the perineal defect was performed. This post-operative course was complicated by wound dehiscence and further persistence of pelvic cavity with drainage. A transperineal catheter was placed for drainage of this chronic cavity (Fig. 1). The patient noted stable, persistent drainage from this catheter for several months. However, abruptly he noted decreased output from his catheter and irrigated it with 3% hydrogen peroxide rather than the prescribed saline flushes. He presented later that day to the emergency room with fever, diarrhea and abdominal cramping but no rebound or guarding. CT imaging was obtained which depicted free air in the pre-sacral space extending into the retroperitoneum

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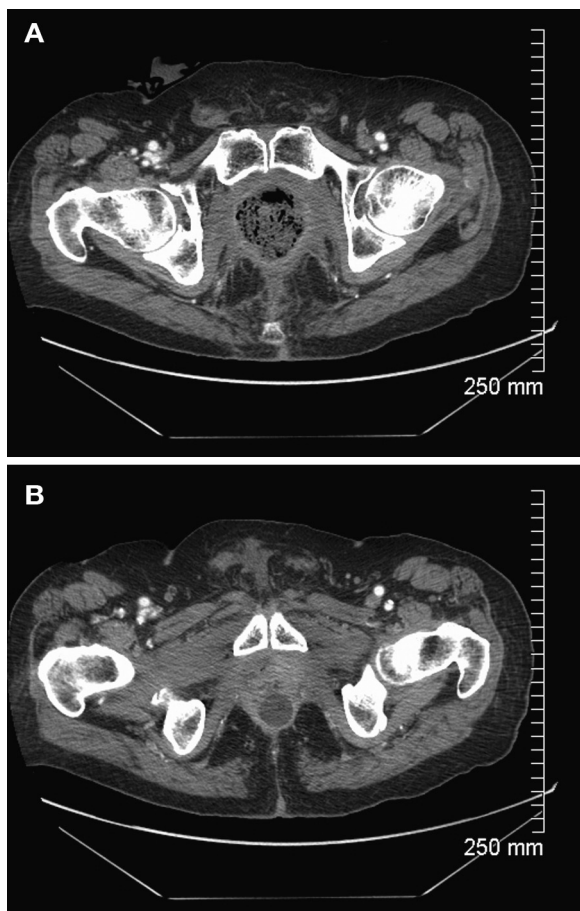


Fig. 1. Pelvic abscess (A) with transperineal drainage catheter (B).

(Fig. 2) and diffusely throughout the peritoneum (Fig. 3). However no portal venous gas was noted.

The patient was admitted with concern for sepsis and started on antibiotics. He did not appear to have an acute abdomen on examination. Given his clinical exam and upon careful review of the imaging, we assumed his radiographic findings were related to the direct instillation of hydrogen peroxide into his pelvic cavity rather than concern for perforation. There was no noted free pelvic fluid or bowel thickening on imaging. He was monitored for several days and his catheter was repositioned for optimal drainage



Fig. 2. Pneumoperitoneum adjacent to a loop of small bowel.

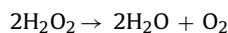


Fig. 3. Free air in the pre-sacral space extending into the retroperitoneum.

of his persistent collection. He was discharged with an oral antibiotic regimen and resumed flushing his drain with saline. Resolution of free air was noted on subsequent imaging (Fig. 4).

3. Discussion

Hydrogen peroxide is a colorless, odorless oxidizing agent. It is available in concentrations ranging from 3 to 90%. Catalase cleaves the covalent bonds of hydrogen peroxide to liberate water and oxygen.



Hydrogen peroxide is found in multiple household items used for cleaning and general antiseptics. It is used industrially for bleaching. Hydrogen peroxide has been used therapeutically for over 100 years. Early reports describe use for assistance with impaction, meconium ileus, detection of gastrointestinal bleeding and enhancement of radiologic procedures but most have been abandoned.<sup>1</sup>

Recently there have been a variety of medical uses of hydrogen peroxide described in the literature. In the 1980s it was intermittently instilled into chronic indwelling catheter drainage bags in an effort to decrease risk of urinary tract infections. This practice however, fell out of favor after several reports that instillation did not in fact reduce the risk of infection.<sup>2-6</sup> Hydrogen peroxide has been used in upper gastrointestinal bleeding with nasogastric tube



Fig. 4. Follow up imaging obtained 4 weeks later shows resolution of free air within the pelvis.

instillation to remove clot and better detect the source of bleeding.<sup>7</sup> Reports also describe use for endoscopic debridement of walled off pancreatic necrosis.<sup>8</sup>

When used in smaller concentrations, cautiously and properly, little to no deleterious effects have been reported however, multiple cases describe the adverse effects of hydrogen peroxide when misused, particularly with ingestion. Some report greater than 85% of hydrogen peroxide poisoning occur with ingestion.<sup>9</sup>

Hydrogen peroxide exerts direct cytotoxicity by corrosion and lipid peroxidation and indirectly by oxygen gas formation. 30 mL of 35% hydrogen peroxide can liberate nearly 3.5 L of oxygen. When the oxygen produced exceeds the solubility in the blood, arterial and venous gas embolism occur.<sup>10</sup> It is this sequelae of hydrogen peroxide that is described most frequently in the literature. With ingestion, patients experience abdominal pain, nausea, vomiting and in more severe cases, portal venous gas.<sup>11–15</sup> Our patient experienced similar symptoms of abdominal pain, nausea and vomiting but no portal venous gas. Instead, pelvic instillation of hydrogen peroxide liberated oxygen within the abdominal cavity depicted as severe pneumoperitoneum on imaging. One may expect similar findings following debridement of walled off pancreatic necrosis but this was not reported by Abdelhazef et al.<sup>8</sup>

#### 4. Conclusion

Instillation of hydrogen peroxide into a chronic pelvic abscess cavity resulted in a benign pneumoperitoneum. The radiographic

findings were concerning for whether operative exploration was indicated, particularly in a complicated surgical patient. This effect of hydrogen peroxide is a significant and potentially treatment altering radiographic finding.

#### Conflict of interest

The authors declare that there are no conflicts of interest.

#### Funding

None.

#### Ethical approval

Informed consent was obtained from the patient for publication of this case report and accompanying images.

#### Authors contributions

Dr. Melin contributed by collecting the background information and writing. Dr. Heckman ably supported Dr. Melin in writing the article and supplying and editing the radiographic images available for the article. Dr. Hussain assisted in editing the work alone, whereas Dr. Thompson and Dr. Melin too did the main editing. Dr. Thompson took the sole responsibility of mentorship of this work.

#### Key learning points

- Hydrogen peroxide has been used for years as a disinfecting solution.
- Hydrogen peroxide exerts direct cytotoxicity by corrosion and lipid peroxidation and indirectly by oxygen gas formation.
- When used incorrectly, deleterious effects have been noted particularly when ingested.
- With ingestion side effects from nausea and vomiting to portal venous gas and death have been reported.
- We describe a patient who had a transperineal drain in a chronic pelvic cavity. This was irrigated with hydrogen peroxide by the patient and he was noted to have significant pneumoperitoneum on imaging.
- Benign pneumoperitoneum is noted with irrigation of a transperineal drain with hydrogen peroxide.

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