


Postpartum pneumoperitoneum and peritonitis after water birth

Vanessa Brown¹, Sascha Dua^{1*}, Anna Athow¹, Rudi Borgstein¹, Oladapo Fafemi¹

1. Department of General Surgery, North Middlesex University Hospital Trust, London, UK

* **Correspondence:** Miss Sascha Dua, 18 Eton Rise, Eton College Road, London, NW3 2DD, UK

 saschadua@hotmail.com

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ABSTRACT

Pneumoperitoneum (the presence of free gas in the peritoneal cavity) usually indicates gastrointestinal perforation with associated peritoneal contamination. We describe the unusual case of a 28-year-old female, who was 7 days postpartum and presented with features of peritonitis that were initially missed despite supporting radiological evidence. The causes of pneumoperitoneum are discussed. In the postpartum period the female genital tract provides an alternative route by which gas can enter the abdominal cavity and cause pneumoperitoneum. In the postpartum period it is important to remember that the clinical signs of peritonism, guarding and rebound tenderness may be diminished or subtle due to abdominal wall laxity.

CASE REPORT

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A 28-year-old woman presented to the emergency department with a two-day history of generalised abdominal pain. She had given birth to her first child three days previously at home. The child had been born by normal vaginal delivery (water birth) complicated by a 4th degree tear, which was repaired immediately at another hospital. The patient had been discharged the following day on oral metronidazole and amoxicillin.

On her first attendance at our emergency department, three days after delivery, the patient was tachycardic with a heart rate of 118 beats per minute and abdominal examination revealed a distended, tympanic abdomen with generalised tenderness. Laboratory markers revealed a white cell count of $17.5 \times 10^9/l$, a neutrophilia of $15.6 \times 10^9/l$ and a C reactive protein (CRP) of 195 mg/l. A supine abdominal radiograph

was performed (Fig. 1) and the patient referred to the gynaecologist who requested an ultrasound of the abdomen and pelvis to rule out retained products of conception (Fig. 2). The ultrasound showed a bulky uterus with a small amount of fluid in the cavity. Free fluid was also noted in the pelvis and dilated loops of small bowel were also seen. A second abdominal radiograph was advised by the radiologist. The second supine abdominal film was performed the next day (Fig. 3) and reviewed by the gynaecologist, by which time the patient's symptoms had largely resolved. A diagnosis of constipation was made and she was discharged with analgesia and laxatives.

The patient re-presented four days later complaining of persistent abdominal pain, diarrhoea, vomiting and pyrexia of 38.4 degrees Celsius. Erect chest radiograph revealed free gas under the diaphragm (Fig. 4). The patient was referred to the general surgeon. On examination the abdomen was soft with abdominal wall laxity consistent with recent puerperium.

Lower abdominal tenderness was noted along with minimal rebound tenderness and guarding. The white cell count was $18.6 \times 10^9/l$, with a neutrophilia of $17.2 \times 10^9/l$ and a CRP of 227 mg/l.

As the patient was systemically unwell with signs of an acute abdomen, an emergency laparotomy was performed. A CT scan was not performed as the patient's symptoms, supported by the evidence of pneumoperitoneum on plain film mandated surgical intervention. At surgery, a formal abscess wall was encountered within the abdominal cavity and 1,200 ml of clear yellow purulent fluid was found in the peritoneal cavity with soft fibrin plaques between bowel loops (Fig. 5). There was no faeculent odour. Careful examination was made of the entire gastrointestinal tract, including underwater insufflation of the rectum. No perforation was found. Rectal examination was normal. Speculum examination of the vagina revealed an intact repair.

Postoperatively, the patient was treated with metronidazole and co-amoxiclav and made a slow but uncomplicated recovery. Cultures taken from the peritoneal fluid grew *Streptococcus Faecalis* and *Candida Albicans* and her antibiotics were changed as guided by sensitivities.

DISCUSSION

Pneumoperitoneum (the presence of free gas in the peritoneal cavity), in the absence of a history of recent surgical intervention, usually indicates gastrointestinal perforation with associated peritoneal contamination. Non-surgical causes of pneumoperitoneum include pneumomediastinum / pneumothorax, pneumatosis cystoides intestinalis, intraperitoneal abscess with gas forming organisms, and post Rubin test. In females, air tracking up through the genital tract and escaping into the peritoneal cavity, thereby causing pneumoperitoneum, has been well described (1). Mechanisms include pelvic manipulation/insufflation, post-partum knee-chest exercises, vaginal douching, orogenital sex, rigorous sexual intercourse, Jacuzzi use, and post vaginal laceration (1,2).

Pneumoperitoneum in the post-partum period after a normal vaginal delivery is extremely rare, having only been reported in a handful of cases in the medical literature (3). The majority of cases of postpartum pneumoperitoneum occurred in the 1950s and 1960s when 'Knee-chest' exercises were recommended postpartum to return a retroverted uterus to the anteverted position (3). It is thought these exercises caused the vagina to balloon with air which was then forced up into the uterus through the fallopian tubes, causing a pneumoperitoneum via the patent female genital tract. These exercises have since been discontinued due to several instances of fatal air embolism.

Despite the benign causes of pneumoperitoneum, especially in females, a patient with pneumoperitoneum associated with systemic upset and biochemical derangement requires exploratory laparotomy. The cause of

pneumoperitoneum in this case is unclear as no obvious perforation was identified at surgery. The presence of sepsis and 1,200 ml of free fluid within the abdominal cavity makes a sealed perforation most likely.

In the postpartum period, the clinical signs of peritonism (guarding and rebound tenderness) may be diminished or subtle due to abdominal wall laxity. In this case report, the diagnosis of pneumoperitoneum was also delayed by the failure to recognise Rigler's sign on abdominal radiograph on the first admission.

Rigler's sign is the second most common sign of pneumoperitoneum seen on supine abdominal radiographs but occurs in only 32% of proven pneumoperitoneums. (4) Rigler's sign was described by Leo George Rigler; an American radiologist; in 1941(5). It is a radiological sign of massive pneumoperitoneum visible on a plain supine abdominal radiograph, and occurs when both the intraluminal and extraluminal sides of the bowel are surrounded by air, thereby making both sides of the bowel wall visible. The extraluminal air is free air within the peritoneal cavity. It can sometimes be mimicked by overlying loops of bowel, or by ingested oral contrast creating a pseudo- Rigler's sign.

Also visible on the second abdominal radiograph, in the right quadrant, is the edge of the 'oval' or 'football' sign (Fig. 3). This refers to a large oval radiolucency, often likened to an American football, which is also representative of a massive pneumoperitoneum. This is thought to have been first described by Roscoe E Miller and describes the radiological appearances in the supine position of free air collecting anterior to the abdominal contents, forming a sharp interface with the parietal peritoneum forming an oval shadow, not associated with a bowel loop (6).

There are a multitude of other signs of pneumoperitoneum on plain film that have been well described. The three that occur in the right upper quadrant are of particular importance as they occur the most frequently and are more sensitive for small volumes of free air (4,7). The first right upper quadrant sign occurs when free air accumulates in the anterior subhepatic space, often forming a linear opacity along the posterior inferior liver margin. The second sign is when air accumulates in Morison's pouch, or the posterior subhepatic space, forming the 'doges cap sign', a triangular opacity with a concave medial border inferior to the 11th rib and superior to the right kidney. The third sign is when air accumulates anterior to the ventral surface of the liver, often in a geographical shape (7).

The erect chest radiograph; when performed after the patient has been positioned in the upright position for at least 10 minutes; is a sensitive study for detection of as little as 1ml of free intraperitoneal air (4). In massive pneumoperitoneum, the 'continuous diaphragm sign' occurs when there is sufficient free air to form a continuous band underneath the diaphragm. The 'Cupola sign' occurs on a supine chest radiograph when free air accumulates beneath the central leaf of the central tendon of the diaphragm, forming a dome shaped lucency overlying the lower thoracic spine (Fig. 4) (8).

This case reiterates the importance of consulting a radiologist should the interpretation of investigations lie outside of ones area of expertise.

All imaging should be reviewed and findings documented prior to discharge of a patient, in particular if a radiologist has requested further investigations they should be reviewed by a radiologist prior to discharge of the patient.

This is also the first reported case of pneumoperitoneum following parturition in a birthing pool. The possibility of contamination, either from the patient's own flora or that of the water, must be considered. The significance of the fourth degree tear, and her primagravida status is unclear.

TEACHING POINT

The clinical features of peritonism in post-partum females may be altered or diminished due to abdominal wall laxity. Plain radiographs are still of paramount importance in assisting in the diagnosis of pneumoperitoneum.

ABBREVIATIONS

CRP = C reactive protein

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FIGURES

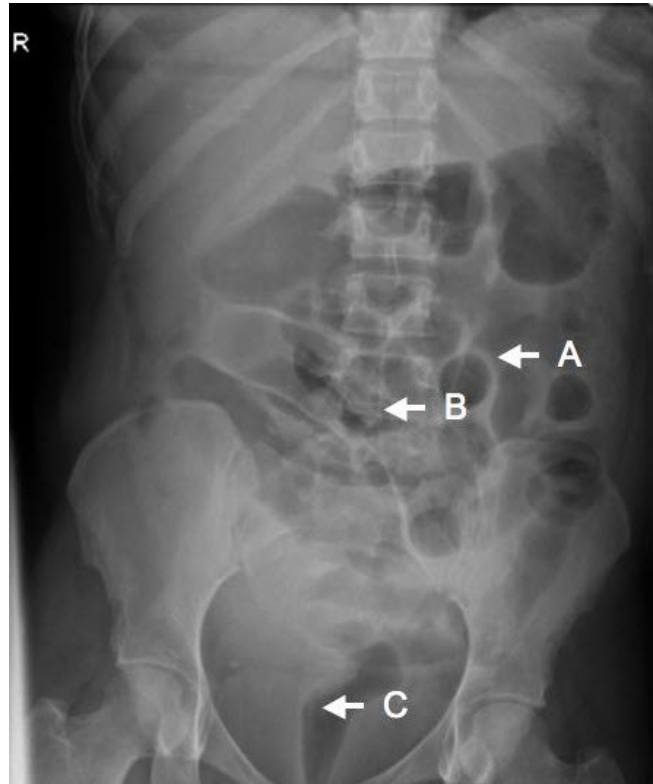


Figure 1: 28 year old woman with postpartum pneumoperitoneum and peritonitis after water birth. Plain supine abdominal x-ray performed 4 days after delivery showing (A) mural oedema, (B) some prominent loops of small bowel centrally and (C) air in the rectum.



Figure 2: 28 year old woman with postpartum pneumoperitoneum and peritonitis after water birth. Pelvic ultrasound scan showing normal post-partum uterus in sagittal plane. Fluid seen anterior to the uterus (marked with arrow).

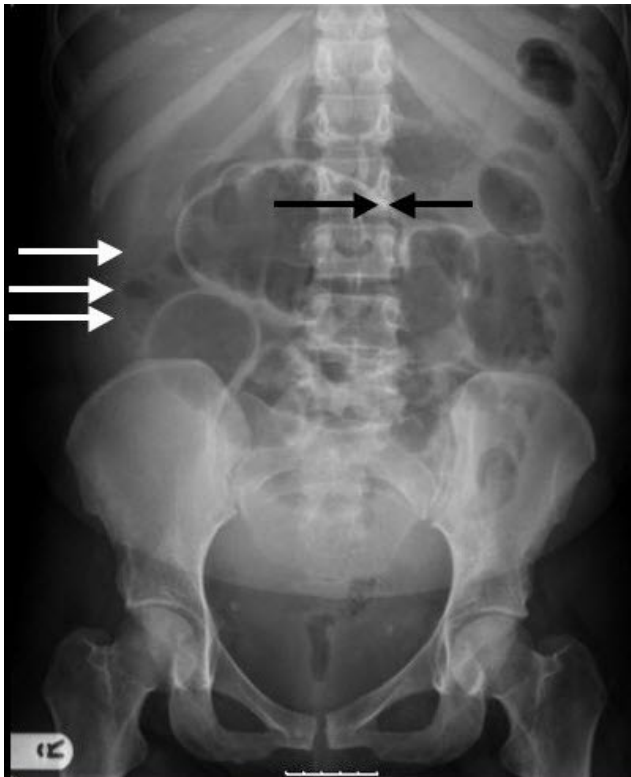


Figure 3: 28 year old woman with postpartum pneumoperitoneum and peritonitis after water birth. Plain supine abdominal x-ray demonstrating Rigler's sign indicated with black arrows (the presence of air on both sides of the bowel wall, enabling both sides of the bowel wall to be clearly visualised). Another sign of pneumoperitoneum, the 'oval sign' is also noted with the edge of a shadow seen in the right quadrant that does not correlate with a bowel loop (white arrows).

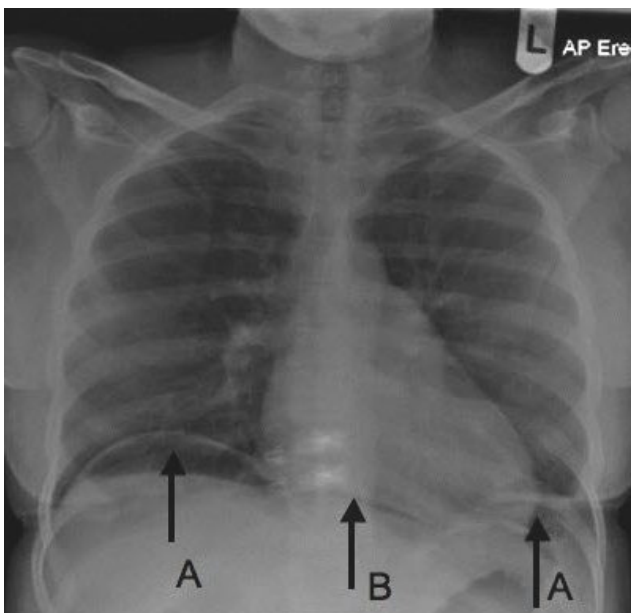


Figure 4: 28 year old woman with postpartum pneumoperitoneum and peritonitis after water birth. Erect

anteroposterior radiograph of the chest demonstrates air under both hemi-diaphragms (A) and an arcuate collection of free intraperitoneal air within the median subphrenic space (B, Cupola sign).

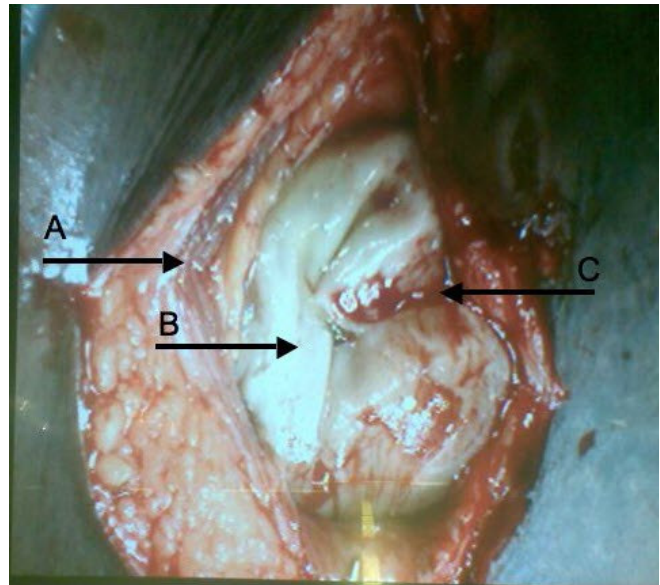


Figure 5: 28 year old woman with postpartum pneumoperitoneum and peritonitis after water birth. Intra-operative photograph showing well-established abscess cavity on opening the abdomen. Edges of vertical midline laparotomy wound (A), abscess wall (B), serous fluid (C)

KEYWORDS

Rigler's sign, post-partum, pneumoperitoneum, perforation

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