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Title Page

Non-Surgical Pneumoperitoneum after Oro-Genital Intercourse

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Running Title:

Benign Pneumoperitoneum

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Non-Surgical Pneumoperitoneum after Oro-Genital Intercourse

ABSTRACT:

Introduction: In many cases, a pneumoperitoneum is due to air escaping from a perforated hollow viscus or surgical intervention but there are increasing reports of non-surgical causes.

Presentation of Case: We report a case where a pneumoperitoneum was identified after oro-genital sexual intercourse.

Discussion: There were nineteen reported cases of non-surgical pneumoperitoneum from gynaecologic causes up to May 2013. We report an additional case four hours after oro-genital intercourse. Close clinical observation and symptomatic treatment are usually all that is required but operative interventions should be considered if the patient develops abdominal pain, peritoneal signs, fever or leukocytosis during observation.

Conclusion: This adds to the world literature on non-surgical pneumoperitoneum from oro-genital intercourse. Clinicians should be aware of this condition and focus on medical-sexual history as this information could prevent a patient from being exposed to expensive diagnostics and invasive operative treatments. Patients should also be educated about the mechanisms to avoid future possible diagnostic dilemmas.

INTRODUCTION:

1 In many cases a pneumoperitoneum is due to air escaping from a perforated hollow
2 viscus or surgical intervention. This is considered a surgical emergency, demanding
3 prompt control of the perforation and peritoneal toilet. However, there are increasing
4 reports of non-surgical pneumoperitoneum, a condition in which radiographs
5 demonstrate free peritoneal air. These may lead to unnecessary laparotomy but, if
6 correctly diagnosed, can be managed successfully by observation alone.¹ We report
7 one such case where a pneumoperitoneum was identified after oro-genital sexual
8 intercourse.
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PRESENTATION OF CASE:

A 21-year-old woman with a body mass index of 22.3 presented to hospital complaining of sudden onset right-sided abdominal pain. She was dehydrated and pyrexia at 100°F. The abdomen was asymmetrically distended and tender with peritonitis on the right side. Leukocytosis was present with a white cell count at 16.1×10^3 units. Serum electrolytes, urea, creatinine and amylase levels were normal.

She was taken to the operating room for abdominal exploration through a midline laparotomy incision. An enlarged right polycystic kidney was encountered with bossellated surface (Fig. 1). There was pyonephrosis with a thin, translucent renal cortex and a grossly dilated ureter present down to the bladder. The left kidney was mildly enlarged with a normal ureter. No further abnormalities were detected at any other intra-abdominal viscera.

Since there was no discernible renal parenchyma and an obvious pyonephrosis, a right nephroureterectomy was performed (Fig 2). She was discharged home 5 days post-operatively after an uneventful recovery period.

Pathologic examination revealed a 12x20x32cm right kidney that weighed 4870 grams. Histology confirmed pyonephrosis of the kidney with no normal renal cortex. A thin translucent membrane <1mm mural thickness represented the renal capsule (Fig 3). There were multiple cysts lined by flattened cuboidal cells and marked inflammatory cell infiltrates. Circumferential scarring at the distal ureter near the vesico-ureteric junction was responsible for the hydro-ureter. Urinary cultures revealed significant growth of *Escherichia Coli* Spp but no gas forming organisms were present.

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Eight weeks post-operatively, she was sent for elective CT urogram to evaluate the left kidney function. To our surprise, a large pneumoperitoneum was present, predominantly on the right side (Figs 4 and 5).

Clinically she was well. There was no history of colonoscopy, cystoscopy or any other invasive interventions since the time of operation. The abdomen was soft, flat and non-tender (Fig 6). She had a white cell count of $4.3 \times 10^6/\text{dl}$ and no evidence of metabolic acidosis. Upon further detailed questioning she admitted to engaging in sexual activity approximately four hours prior to CT scanning. Specifically, there was cunnilingus lasting approximately 15 minutes and that was followed by regular vaginal intercourse. She denied deliberate vaginal insufflation, anal intercourse or any other sexual acts.

She was admitted for clinical observation. No antibiotics were prescribed. Over the subsequent 48 hours, she remained clinically well with no fever, abdominal signs or leukocytosis. She was discharged and remained well up to six months later. As she remained clinically well, a conscious decision was made not to subject this patient to any form of repeat imaging to reassess the pneumoperitoneum.

DISCUSSION:

A pneumoperitoneum can be detected on plain radiographs in 60% of patients after open surgery and 25% after laparoscopy¹⁻² but we expect a progressive reduction in volume as gas is resorbed across the peritoneum.²⁻⁴ On follow-up radiographs, there is usually complete reabsorption of room air within 5 days of open surgery.⁵ Carbon dioxide is much more rapidly absorbed at average rates of 37ml/min, with complete resolution of pneumoperitoneum within 2-4 hours of laparoscopy.⁴

Computed tomography scans are far more sensitive for a pneumoperitoneum than plain radiographs.^{2,6} A pneumoperitoneum can be detected on CT in >85% of post-operative patients at day 3 and >50% at day 6.⁷ Additionally, lean adults tend to have prolonged duration of pneumoperitoneum after abdominal procedures than overweight adults.⁸ Although our patient had two recognized predispositions (BMI of 22.3 and recent open surgery), we considered it unlikely that this was secondary to her laparotomy because there has never been a post-operative pneumoperitoneum reported 8 weeks after laparotomy.

Excluding post-operative cases, the presence of a pneumoperitoneum signals the presence of a perforated hollow viscus in 90%³ to 95%² of cases. These patients require emergent surgical treatment that is directed at controlling the perforation and achieving peritoneal toilet. In a minority of cases, a pneumoperitoneum is detected in the absence of clinical signs that suggest an intra-abdominal emergency. The terms benign⁹, spontaneous¹⁰⁻¹³ and non-surgical¹³⁻¹⁵ pneumoperitoneum have been applied to these cases.

Daley³ classified non-surgical pneumoperitoneum into abdominal, thoracic and pelvic causes. Compared to the other causes of non-surgical pneumoperitoneum, a pelvic (gynaecologic) cause is uncommon. Mularski et al² performed a systematic

review of world literature on non-surgical pneumoperitoneum and identified only 15 reported cases that were due to gynecologic causes up to the year 2000. We performed a Pubmed search using the keywords “spontaneous”, “non-surgical”, “benign”, “pelvic” and “gynaecologic” in May 2013 and encountered 4 additional cases of non-surgical pneumoperitoneum from gynaecologic causes.¹⁶⁻¹⁹

The common gynaecologic causes include pelvic examinations^{2,3,4,18,20}, post-partum knee-chest exercises^{3,21,22}, coitus^{3,4,16,19,23,25}, oro-genital sex²⁶⁻²⁹, vaginal douching^{3,4,30}, pelvic inflammatory disease³¹, hysterosalpingography³¹ and water skiing³². The essential mechanism is the passage of air through the vagina, cervix, uterus and fallopian tubes into the peritoneum³⁻⁴ or through a vaginal stump opening in patients who have had hysterectomies.^{25,33,34}

The only identifiable cause in our patient was the recent history of oro-genital intercourse 4 hours prior to CT. This reinforces the need to take a thorough history because most patients will not volunteer sexual histories since they cannot readily make a link between sexual practices and their symptoms or radiographic findings. This may prevent the exposure of these patients to expensive investigations and non-therapeutic laparotomies³⁻⁴.

This should still be considered a diagnosis of exclusion since peritonitis may be masked in immunocompromised patients³. Once the diagnosis is established, however, close clinical observation and symptomatic treatment are usually all that is required.^{4,15} Antibiotics are not indicated as there is no infective pathophysiologic mechanism.⁴ Operative intervention should be considered if the patient develops abdominal pain, peritoneal signs, fever or leukocytosis during observation.

CONCLUSION:

This case adds to the world literature on non-surgical pneumoperitoneum from oro-genital intercourse. Clinicians should be aware of this condition and focus on medical-sexual history as this information could prevent a patient from being exposed to expensive diagnostics and invasive operative treatments. Patients should also be educated about the mechanisms to avoid future possible diagnostic dilemmas.

CONFLICT OF INTEREST STATEMENT:

There are no potential sources of conflict declared by any of the authors

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CONSENT:

Written informed consent was obtained from the patient for publication of this case report and case series and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

AUTHOR CONTRIBUTIONS

SOC conceptualized this manuscript, collected data and wrote the manuscript.
PBJ assisted in writing this manuscript and checked it for intellectual content.
EWW assisted with data collection and analysis of the manuscript.
VN assisted with data collection, writing and analysis of the intellectual content in this paper.

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Figure 1



Figure 1: Right hydronephrosis and hydroureter encountered at laparotomy

Figure 2

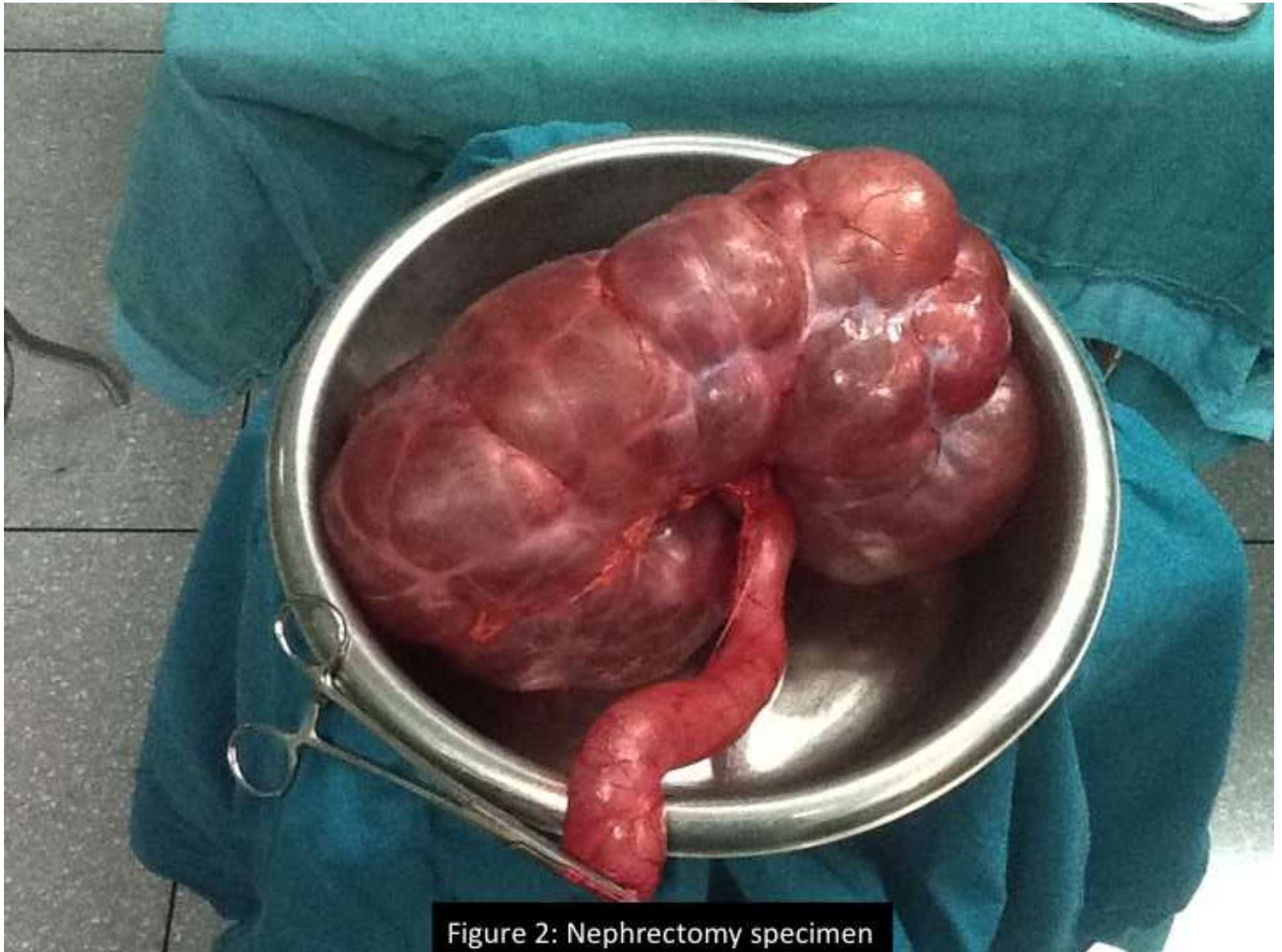


Figure 2: Nephrectomy specimen

Figure 3



Figure 3:Gross examination of right kidney reveals cystic transformation and cortical replacement

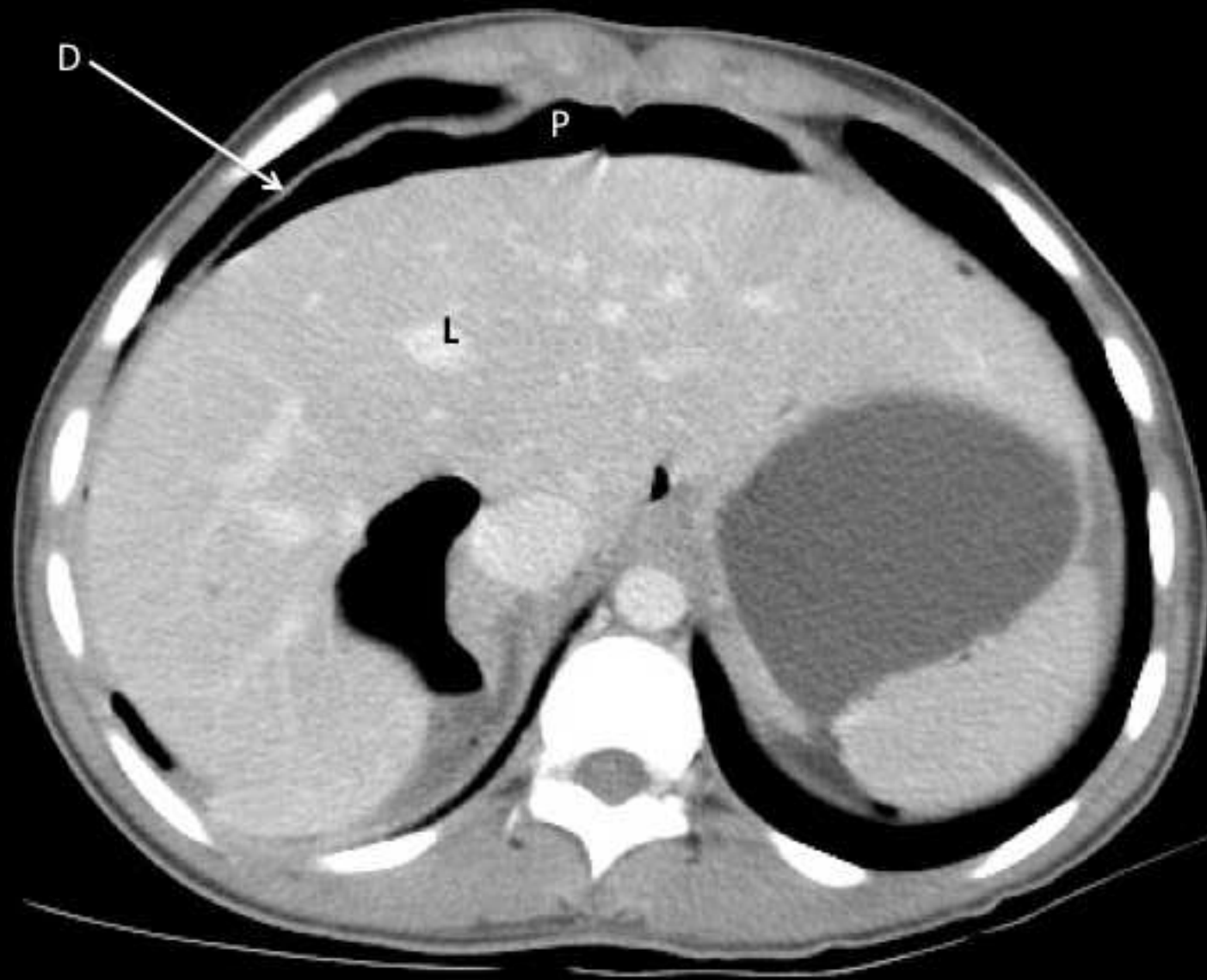


Figure 3: Axial CT slice of upper abdomen demonstrating a pneumoperitoneum (P) that is contained by the diaphragm (D) and liver (L).

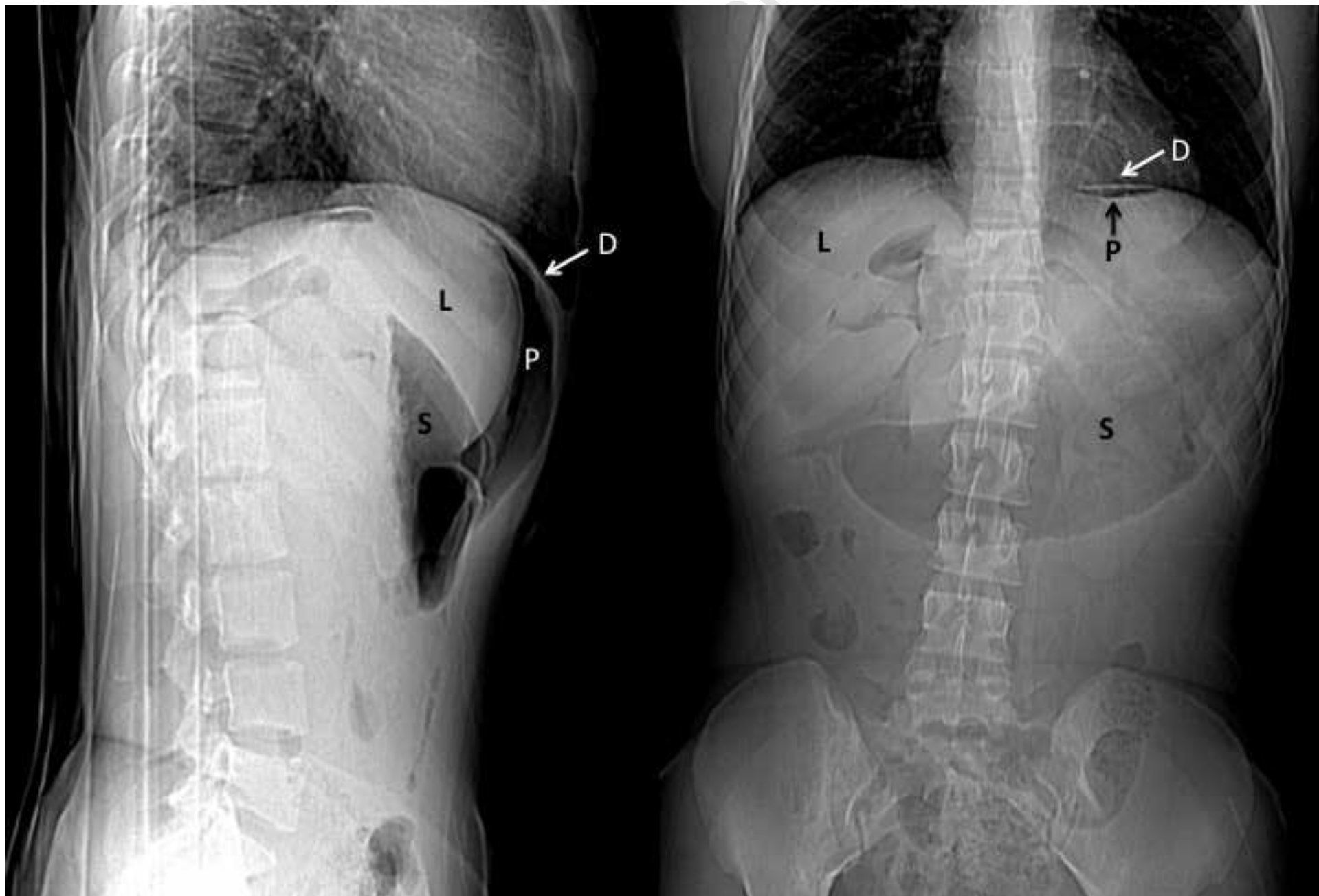


Figure 4: CT scout films of the abdomen demonstrating a pneumoperitoneum (P) that is contained by the diaphragm (D) and liver (L). A dilated stomach (S) is also seen.



Figure 5: Index patient immediately post CT scanning demonstrating a flat abdomen.