



# The Rate of Idiopathic Spontaneous Pneumoperitoneum is 2.36%

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## ÖZET

*İdiopatik spontan pnömoperitoneumun sıklığı: 2.36%*

**Amaç:** Pnömoperitoneum genellikle viseral perforasyonu takiben, peritonit ile birlikte görülmekte ve acil cerrahi girişim gerektirir. Cerrahi bir sebebe baęlı olmayan spontan pnömoperiton (organ perforasyonuna baęlı gelişmeyen), intratorasik, intraabdominal, jinekolojik, iyatrojenik ya da dięer sebeplere baęlı olarak görülen nadir bir durumdur ve konserve olarak tedavi edilmelidir. Spontan idiyopatik pnömoperiton bir viseral perforasyona baęlı olmayabilir, ekstraabdominal olabilir ve sebep tespit edilemeyebilir. Biz bu çalışmamızda herhangi bir visceral organa baęlı olmayan serbest havası olan hastaların bulgularını retrospektif incelemeyi amaçladık.

**Gereç ve Yöntem:** Bu retrospektif çalışma kliniğimize görüntülemelerinde karın içi serbest hava saptanan karın ağrısı ile başvuran 338 hastanın incelenmesi ile oluşturulmuştur. Pnömoperiton sebebi cerrahiye baęlı olan hastalar çalışmadan çıkarılmıştır. Karın ağrısı olan hastalar akut karın bulguları olup olmamasına baęlı olarak iki gruba ayrılmıştır. Akut karın bulgusu olmayan hastalar en az 48-72 saat gözlem altında tutulmuştur. Akut karın bulgusu olan hastalara lökosit ve c-reaktif protein (CRP) düzeylerine göre diagnostik laparoskopi uygulanmıştır. Bu hastalar diagnostik laparoskopi veya laparotomide adım adım izlenen bir protokol ile etyoloji aranarak incelenmiştir.

**Bulgular:** 338 hastanın 8 tanesi (2.36%) idiyopatik spontan pnömoperiton tanısı almıştır. Dört hasta (1.18%) cerrahiye baęlı olmayan, dört hasta (1.18%) ise cerrahiye baęlı pnömoperiton olarak değerlendirilmiştir.

**Tartışma:** Cerrahi girişim spontan pnömoperiton ve akut karın bulguları olması durumunda kaçınılmazdır. Buna rağmen herhangi bir inflamatuvar oluşum gözlenmeyebilir. Cerrahi girişim adım adım protokolüne uygun olarak uygulanmalıdır.

**Anahtar kelimeler:** İdiopatik pnömoperitoneum, spontan pneumoperitoneum, cerrahi gerektirmeyen pnömoperitoneum

## ABSTRACT

*The rate of idiopathic spontaneous pneumoperitoneum is 2.36%*

**Objective:** Pneumoperitoneum often occurs following a visceral perforation, often seen with peritonitis, and requires urgent surgical intervention. Non-surgical spontaneous pneumoperitoneum (not associated with organ perforation) is a rare condition caused by intrathoracic, intraabdominal, gynecologic, iatrogenic, and other causes, and may be treated conservatively. Spontaneous idiopathic pneumoperitoneum is not caused by visceral perforation, the cause may be extra-abdominal origin and sometimes cannot be determined.

**Material and Method:** This study is a retrospective review of 338 patients who were examined in our clinic because of abdominal pain or if intraabdominal free air was determined in imaging. Patients whose cause of pneumoperitoneum was of surgical etiology were excluded from the study. Patients with abdominal pain were divided into two groups according to the absence or presence of acute abdomen findings. Patients without acute abdomen findings were kept under observation for a minimum of 48-72 hours. Diagnostic laparoscopy was performed in patients with acute abdomen findings, according to leukocyte and C-reactive protein (CRP) values. The patients were managed with a specific protocol if any pathologic etiology was detected in the step-by-step laparoscopic or laparotomic exploration.

**Results:** Of the 338 patients, 8 were diagnosed as having idiopathic spontaneous pneumoperitoneum (2.36%). Four patients were diagnosed as having non-surgical spontaneous pneumoperitoneum (1.18%), and 4 patients had surgical pneumoperitoneum (1.18%).

**Conclusion:** Surgery was unavoidable in patients with spontaneous pneumoperitoneum and acute abdomen findings. Even though no inflammatory process has been determined, surgical exploration should be performed in a step-by-step protocol.

**Key words:** Idiopathic pneumoperitoneum, spontaneous pneumoperitoneum, non-surgical pneumoperitoneum

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## INTRODUCTION

Although pneumoperitoneum often develops because of luminal organ perforation, 5-14% of cases develop without luminal organ perforation or any known cause (1-3). Consequently, this condition has been characterized as spontaneous pneumoperitoneum (SP) or non-surgical pneumoperitoneum. SP can be related to intrathoracic, intraabdominal, iatrogenic or other causes. SP does not usually result in peritonitis, may have a benign prognosis, and can be treated with medication. SP is a rare condition and has unknown etiology; therefore, all visceral perforation and intraabdominal free air causes should be excluded.

In this study, we evaluated patients with acute abdomen findings, whose SP was diagnosed during surgical exploration. Our study has no new technique or algorithm, the researcher's primary aim was to determine the total rate of idiopathic SP.

## MATERIAL AND METHODS

This study is a retrospective review of 8 patients with idiopathic SP, who were treated in our surgery clinic between October 2010 and June 2015. Patients with abdominal pain were divided into two groups depending on the absence or presence of acute abdomen findings. Patients without acute abdomen findings were evaluated for a period of minimum 48-72 hours. If the patients had high leukocyte and CRP values, they were treated with cefuroxime axetil 3x1.5 gr, and metronidazole 3x500 mg IV. If no increase in leukocyte or CRP values were determined, patients were followed up for a period of 48-72 hours without treatment, but with frequent physical examinations. Patients were discharged if acute abdomen findings were no longer present after follow-up and diagnosed as having idiopathic SP.

In the second group of patients with acute abdomen findings, diagnostic laparoscopy was performed regardless of leukocyte and CRP values. If any pathologic finding was detected in a step-by-step laparoscopic or laparotomic exploration, patients were treated with cefuroxime axetil 3x1.5 gr, and metronidazole 3x500 mg IV for 48-72 hours. If symptoms declined, oral forms of antibiotics were given.

## Standard Surgical Technique

A standard 30-degree optical camera was inserted periumbilically using a 10 mm port using the open access method. In the first look, erythematous peritoneum or purulent exudative liquid was investigated, as was the presence of any inflammatory organ. If free liquid was detected, two more 5-mm ports were inserted into the abdomen. The stomach, duodenum, small bowel, and entire colon were explored till the peritoneal reflection. If no pathologic finding was detected, the gastrocolic ligament was dissected. The small curvatura was explored by dissecting the omentum minus. The posterior area of transverse colon was explored. If any perforation was detected, a fourth 5-mm port was inserted suprapubically and laterally, and the fascia was dissected. Again, if no perforations were detected, Kocher's maneuver was performed and the posterior duodenum was explored. If no pathologic finding was present, 5 cc/300 cc diluted methylene blue was injected through the nasogastric catheter and rectally,

**Table 1:** Causes of spontan pneumoperitoneum (3)

Category	Mechanism
Postoperative	Retained air open laparotomy Retained air from laparoscopy
Thoracic	Intermittent positive-pressure ventilation Barotrauma Increased intrathoracic pressure-cough, retching Valsalva maneuver Asthma Bronchoscopy Cardiopulmonary resuscitation and mouth-to-mouth ventilation Adenotonsillectomy Pulmonary tuberculosis Blunt trauma Bronchopulmonary fistula Spontaneous rupture of pulmonary blebs
Abdominal	Pneumatosis cystoides intestinalis Endoscopic procedures Postpolypectomy syndrome Peritoneal dialysis Collagen vascular disease Pneumocholecystitis Jejunal and sigmoid diverticulosis Distended hollow viscus Subclinical perforated viscus
Gynecologic	Vaginal insufflation Knee-chest exercises Pelvic inflammatory disease Coitus Gynecologic examination procedures Vaginal douching



**Figure 1:** Our experience of pneumoperitoneum

respectively. If no coloring was determined in the abdomen, a drain was positioned in the pouch of Douglas and the exploration was ended. The same steps were followed in the laparotomy technique.

**RESULTS**

Three hundred thirty-eight patients were examined in our clinic because of abdominal pain or if free air was determined in imaging methods. Patients with underlying surgical or non-surgical etiologies for pneumoperitoneum were excluded from the study (4,5). The excluded etiologic factors of spontaneous pneumoperitoneum are shown in Table 1. Twenty-one (6.21%) patients were excluded from the study because of these etiologic factors.

Two hundred fifty-eight (76.33%) of the 338 patients' conditions were diagnosed using computerized tomography (CT) and surgery was performed according to the surgeon's opinion. The remaining 58 patients were divided into two groups according to the presence of acute abdomen findings.

Six patients, who had no acute abdomen findings, were examined according to white blood cell (WBC) and CRP values. Antibiotic treatment was given to 2 patients whose WBC and CRP levels were high. Diagnostic laparoscopy was performed in one patient in this group when acute abdomen findings appeared. The remaining patients were discharged after 72 hours because their WBC and CRP values decreased. Four patients without

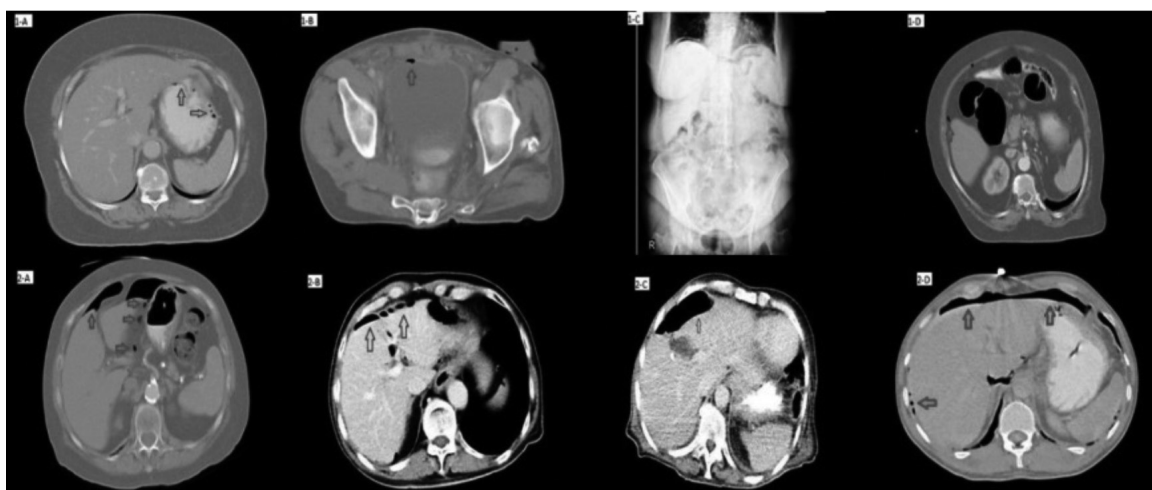
leukocytosis and were evaluated with a 4x1 physical examination, and one patient underwent diagnostic laparoscopy because of symptoms of acute abdomen. Three patients were discharged because pain decreased (Figure 1).

In total, 4 patients were diagnosed as having idiopathic spontaneous pneumoperitoneum (1.18%) in the no acute abdomen group. The remaining 53 patients and 2 patients (who had no previous findings of acute abdomen) with new developing acute abdomen findings underwent diagnostic laparoscopy. A surgical pathology was detected in 45 patients; no pathologic finding was detected in 10 patients during laparoscopic or open surgery in the first exploration. Further step-by-step laparoscopic investigations were undertaken in 7 patients and 3 with laparotomy.

The gastrocolic ligament was dissected in the further

**Table 2:** Diagnosis, numbers and rates of patients who underwent surgery

	N=309	%
Gastric ulcer perforation	24	7.76
Gastric tumor perforation	4	1.29
Duodenal ulcer perforation	242	78.31
Perforated duodenal diverticulum	3	0.97
Small Bowel perforation (lymphoma, Crohn etc.)	3	0.97
Appendiceal perforation	12	3.88
Acute mesenteric ischemia	3	0.97
Ischemic cecal perforation	2	0.64
Perforation of the proximal colon due to colon cancer	3	0.97
Colon cancer Perforation	4	1.29
Perforated colonic diverticular disease	9	2.9



**Figure 2:** The first line of images are of 4 patients who were diagnosed as having idiopathic pneumoperitoneum without surgery. The second line shows images from 4 patients who were diagnosed as having idiopathic pneumoperitoneum with surgery

explorations. In one patient of the laparoscopic group and in one of laparotomy group, a tumor perforation was detected on the posterior side of the stomach. In one patient, after dissecting the right Toldt's fascia, a retrocecal appendicitis and a newly developing perforation was detected. In another patient of the laparoscopy group and in one patient of laparotomy group, after dissecting the left Toldt's fascia, a diverticular perforation was detected in the descending colon. In these patients, both of whom were obese, inflammation was detected in the retroperitoneal area (Hinchey I), but no intraperitoneal finding existed. In the laparotomy group, a posterior duodenal diverticular perforation was detected after performing a Kocher maneuver and inflammation was only retro-pancreatic.

Methylene blue was given to 4 patients but no pathologic finding was determined. The Douglas drains of these patients were removed after 24 hours because no pathologic liquid was seen. These 4 patients were diagnosed as having idiopathic spontaneous pneumoperitoneum (1.18%).

The diagnoses of patients who underwent surgery are shown in Table 2. Images of spontaneous pneumoperitoneum and surgical algorithm are presented in Figure 2.

## DISCUSSION

Etiologic factors of SP and non-surgical pneumoperitoneum have been defined in the literature, although these definitions often existed as case reports. The pathophysiology and reasons for SP were described in a review of Mularski et al. In this review, the authors found 196 reported cases of non-surgical pneumoperitoneum, of which 45 underwent surgical exploration without evidence of perforated viscus. Furthermore, the authors reported that 11 (31%) of 36 miscellaneous or idiopathic cases of non-surgical pneumoperitoneum underwent surgical exploration (4). In literature and also in our study the basic difference between surgical and non-surgical pneumoperitoneum was the existence of acute abdomen findings. If a patient were admitted to the clinic with mild abdomen pain and with no signs of acute abdomen findings, abdominal X-ray or computerized tomography (CT) would be performed and pneumoperitoneum was diagnosed incidentally. If an etiologic factor exists in a patient's history, spontaneous pneumoperitoneum

diagnosis would be easy and patients could be treated without surgery.

However, a group of patients exist who are hard to diagnose with no risk factors but with acute abdomen findings. Six of our patients were in this group; acute abdomen developed in 2 patients during follow-up and the decision was made for surgery. The basic problem that remains to be determined is to what extent should the abdomen be explored.

The standard diagnostic exploration was as follows: an angled scope was used at the periumbilical trocar site for inspection of the intra-abdominal organs, including the surface of the liver, gallbladder, stomach, intestine, pelvic organs, and visible retroperitoneal surfaces along with examination for free intraperitoneal fluid (6,7).

A surgeon normally expects to determine pathologic findings in patients who have no contrast extravasation, but have free air in imaging. In our experience, if no inflammatory process is determined in the first look of surgical exploration, a surgeon should perform a further laparoscopy or laparotomic exploration for the diagnosis of SP.

In line with our algorithm, a surgeon performed further laparotomy and detected a diverticular micro-perforation beneath the Toldt's fascia of the sigmoid colon. In another 2 patients, spontaneous posterior duodenum diverticula perforations were detected after performing a Koch maneuver. In one patient, a newly developing retrocecal appendicitis perforation was detected with no free liquid.

In a patient who was followed up without surgery, pneumatosis cystoides were detected in the stomach. Gas-filled cysts can form in every part of gastrointestinal system, but the most common location is the terminal ileum. The exact reason for these cysts is unclear (8,9). The stomach was also included in this study because of the uncertainty and rare location.

There are limitations to our paper, including our small number of cases; however, there are only case reports in the literature. Another limitation was our inability to explain the use of methylene blue or inclusion of drains. The use of drains is controversial today even in major surgeries. Our surgeons use them because of our obsession with their use; there is no supporting literature in this context.

An absolute operative protocol as we suggest with

no omitted steps in the diagnosis of idiopathic pneumoperitoneum seems to be justified because surgery is unavoidable in patients with idiopathic pneumoperitoneum and acute abdomen findings. Surgical explorations should proceed in a step-by-step

manner even in the absence of inflammatory process findings.

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