

ACUTE COLONIC PSEUDO-OBSTRUCTION (OGILVIE'S SYNDROME)



Pierre-Simon, Marquis de Laplace (1749 - 1827) 18th century portrait, Artist unknown.

.....We may regard the present state of the universe as the effect of its past and the cause of its future.

An intellect which at a certain moment would know all forces that set nature in motion, and all positions of all items of which nature is composed, if this intellect were also vast enough to submit these data to analysis, it would embrace in a single formula the movements of the greatest bodies of the universe and those of the tiniest atom; for such an intellect nothing would be uncertain and the future just like the past would be present before its eyes....

Pierre Simon Laplace, A Philosophical Essay on Probabilities, 1814.

Pierre Simon Laplace, one of the intellectual giants of the Age of Reason, was one of the first to articulate the philosophy of causality or scientific determinism. If the exact position and velocity of every atom in the Universe could be known to some Supreme Being - then all of the future and all of the past could be determined. It was the scientific argument for predestination. It was a view that was widely held - until the advent of the astonishing theories of quantum mechanics of the early Twentieth century.

From these new theories it was apparent that both the position and the velocity of a subatomic particle could never both be known at the same instant. It was the end of the age of determinism. Even Albert Einstein struggled with the concepts of a quantum reality - "God does not play dice!", he once famously quipped. But every experimental test since has proven quantum theory to be correct - or at least the best explanation we currently have for the basis of reality - as best as 21st century Physicists can determine, it seems that God, does indeed, play dice!

Pierre Simon Laplace was a child of the Enlightenment, he was firm believer that mathematical laws determined all of nature. Among his many brilliant achievements is a law that bears his name - Laplace's law - that defines the relationship between pressure, radius and wall tension of cylinders and of spheres.

Although nothing in our Universe can be certain, his deterministic equation nonetheless gives a good approximation of the likely outcome of a system under the stresses of pressure, dimension and consequent wall tension. By Laplace's famous law we may better understand the possible catastrophic consequences of a caecum acutely dilated beyond 10 cm!

ACUTE COLONIC PSEUDO-OBSTRUCTION (OGILVIE'S SYNDROME)

Introduction

Acute colonic pseudo-obstruction (or “Ogilvie’s syndrome”) is an under-recognized disorder characterized by **acute** and **extensive dilatation of the colon** in the *absence of an anatomic lesion* obstructing the gastrointestinal tract.

The condition is uncommon, however it is vital to recognize as, untreated, it is potentially lethal.

It can be caused by a range of conditions, however **post partum, post Caesarean section women** are at particular risk.

The cecum, with its larger diameter, requires less pressure to increase in size and in wall tension, and hence is the most frequent site for perforation. The greater the dilation, the more likely perforation will be, especially ≥ 10 cm.³

Acute colonic pseudo-obstruction (ACPO) should be considered in all women with symptoms of ileus after Caesarean Section, who present with progressive abdominal distension 2 - 12 days after caesarean section

History

Ogilvie’s syndrome is named for the British surgeon **Sir William Heneage Ogilvie** (1887- 1971), who first described it in 1948.¹

Epidemiology

The true incidence of **Ogilvie’s syndrome** is unknown as many mild cases resolve spontaneously.

There is no reliable national or international data for its frequency.

In **obstetric** cases, **caesarean section** with **spinal anaesthesia** seems to be the most common operative procedure associated with this syndrome.

It has, however, also been reported after caesarean hysterectomy and vaginal births.

There is no data on predisposing factors.

Classification

Pseudo-obstruction syndromes can be divided into:

1. **Acute (or “Ogilvie’s syndrome”)**

- In **acute** colonic pseudo-obstruction the colon may become *massively* dilated and if it is not decompressed, the patient risks perforation, peritonitis, and death.

Or

2. **Chronic forms.**

Physiology

Colonic motor and secretory functions are mediated by the autonomic nervous system.

The **sympathetic nervous system** arises from the spinal cord at the level of the thoracic and lumbar spinal cord.

Parasympathetic innervation of the colon is delivered from two sources:

- From the ascending colon to the splenic flexure parasympathetic innervation is supplied by the **vagus nerve**.
- Distal to the splenic flexure, parasympathetic innervation is via lumbar nerves from spinal segments **S2 to S4**

Sympathetic innervation of the colon is via:

- The celiac plexus
- The mesenteric ganglia.

In general, the parasympathetic nervous system increases gut motility and the sympathetic system decreases motility.

Abnormalities of the autonomic nervous system, characterized by sympathetic dysfunction, parasympathetic dysfunction, or a combination of both, have been used to explain the etiology of Acute colonic pseudo-obstruction, (ACPO).

In **contrast** to **Sir William Heneage Ogilvie's** initial theory of "sympathetic deprivation", the benefit of **neostigmine** suggests that **parasympathetic failure** is more likely to be the etiology for Ogilvie's syndrome.

Pathophysiology

Physiological ileus is an *expected physiological consequence of abdominal surgery* and has been defined as:

- Disruption of normal intestinal peristalsis that usually persists for 0 - 24 hours in the small intestine 24 - 48 hours in the stomach, and up to 72 hours in the distal large colon.

This type of ileus generally resolves without serious sequelae.

A **pathologic ileus** is suspected when return of intestinal function is:

- Delayed

Or

- Symptoms develop

The aetiology of a small bowel ileus can differ from a large bowel ileus due to local neurological, hormonal and anatomical factors.

Causes:

Patients with Ogilvie's syndrome have underlying medical or surgical conditions that predispose them to the syndrome.

Pseudo-obstruction appears to related to an **autonomic dysfunction** with:

- **Decreased parasympathetic activity**

And /or

- **Sympathetic stimulation**

Obstetric related:

Caesarean sections are thought to *more significantly* effect **distal large bowel** motility due to:

1. Minimal intraoperative small bowel handling
2. Disruption of the sacral plexus through spinal anaesthesia
3. Compression by the gravid uterus
4. Opioid use.

Distal large bowel ileus causes proximal accumulation of gas and fluid, with the **caecum** being most at risk of **over-distension** and **perforation**.

This variant of ileus is known as Acute Colonic Pseudo-Obstruction or **Ogilvie's Syndrome** and if unrecognized it is associated with significant morbidity.

Additionally **pregnancy itself** predisposes to Ogilvie's syndrome.

Pregnant women have:

1. Prolonged gastrointestinal transit time in the third trimester due to mechanical intestinal obstruction by the gravid uterus
2. Increased levels of progesterone reducing gastrointestinal smooth muscle contractility.
3. Reduced physical activity
4. Dietary habits changes such as increased iron supplements.

These factors combined with *further insult* to distal large bowel motility from **Caesarean Section** places women at high risk of Acute Colonic Pseudo-Obstruction.

Non-obstetric related:

Other *non-obstetric* related causes of **acute** colonic pseudo-obstruction include:

1. Abdominal - pelvic surgery in general:
 - Of obstetric and gynaecological procedures, Caesarean section is the commonest associated factor.
2. Trauma
3. Serious sepsis
4. Medications:

In particular:

 - Opioids
 - Anticholinergic agents.
 - Anaesthetic agents (especially spinal anaesthesia)
5. Electrolyte disturbances
6. Diabetes mellitus
7. Renal failure/ uraemia

Complications:

Despite the absence of mechanical obstruction, patients can nonetheless go on to bowel **necrosis** and **perforation (especially if dilatation is severe)** which a consequent **generalised peritonitis**, and ultimately death from **septic shock**.

The largest dilatations in ACPO patients usually develop in the **cecum**.

According to **Laplace's law**, the intraluminal pressure needed to stretch the wall of a hollow tube is inversely proportional to its diameter.

Accordingly, the cecum, with its larger diameter, requires less pressure to increase in size and in wall tension, and hence is the most frequent site for perforation.

A caecal diameter of **> 9 cm** is considered dilated

The greater the dilation, the more likely perforation will be, especially **≥ 10 cm**.³

Rupture or ischemic perforation of the bowel, carries a high mortality rate (> 50% according to some literature³).

There can also be significant **fluid, (“third space”) losses** into the distended bowel.

Clinical features

Acute colonic pseudo-obstruction (ACPO) should be considered in all women with symptoms of ileus after Caesarean Section, who present with progressive abdominal distension 2 - 12 days after caesarean section

The clinical distinction between Ogilvie's syndrome and mechanical obstruction is difficult to make, as both groups of patients essentially present with obstructive symptoms

Features of **Acute colonic pseudo-obstruction** include:

1. Vomiting
2. Abdominal distension / hyper-resonant to percussion.
3. Reduced flatus (but variable).
4. Abdominal pain.
5. Abdominal tenderness
6. Bowel sounds:
 - May be hypoactive, high pitched, or absent bowel (i.e diagnostically unhelpful).
7. Sign of possible **perforation** include:
 - Pyrexia
 - Tachycardia

- Hypotension
- Peritonism (i.e. guarding/ rigidity):
 - ♥ This is a serious sign and suggests perforation/ peritonitis.

Pseudo-obstruction may also present with a sudden painless enlargement of the proximal colon accompanied by abdominal distension.

Investigations

Blood tests:

1. FBE
2. U&ES/ glucose
3. CRP
4. LFTs

Plain radiography:

Findings on **plain radiology** can be identical to a mechanical large bowel obstruction.

Plain radiography, however is a good *initial screening* investigation.

Bowel dilation is often limited to the cecum and right colon.

The *concurrent* finding of *both small and large* bowel distension on AXR may be explained by:

- Large bowel distension with an incompetent ileocaecal valve
- Adynamic ileus (less likely).

CT Scan:

Concerning clinical or plain x-ray features warrant further investigated with an abdominal-pelvic CT scan.

The hallmark of colonic pseudo-obstruction is the presence of dilatation of the large bowel (**often marked**) *without* evidence of an **abrupt transition point** or a **mechanically obstructing lesion**.

It is important to note, however, that a **gradual** transition point may be seen, usually at or near the splenic flexure.

Caecum diameter can be more accurately determined by CT scan, (compared to plain radiology).

CT scan is the investigation of choice if perforation is suspected.

Radiological Differential Diagnoses:

General imaging differential considerations include:

1. Adynamic ileus:
 - No transition point
 - Often history has a cause for the ileus, e.g. surgery
 - Small bowel is also often dilated
2. Mechanical large bowel obstruction:
 - Abrupt transition point often with an identifiable obstructing lesion
3. Toxic megacolon secondary to Clostridium difficile colitis
 - C. difficile infection is usually preceded by antibiotic use or chemotherapy and is therefore usually encountered in unwell, hospitalized patients with significant co-morbidity
 - Bowel wall thickening usually a prominent feature
4. Ischaemic colitis
 - Usually bowel wall is thickened, but can be thinned and dilated
 - Absent/poor wall enhancement
 - Usually involves vascular territories
5. Sigmoid volvulus / caecal volvulus
 - Transition point evident
 - Whirlpool sign of the twisted mesentery

Management

Treatment can be:

1. **Conservative:**

If diagnosed early, conservative management is often successful and morbidity is minimal.

Conservative management is appropriate for patients with a caecal diameter of ≤ 10 cm and *without* signs or symptoms of **peritonism/ perforation/ sepsis**.

Conservative management consists of:

- Bowel rest (i.e. “Nil orally”).
- Nasogastric tube insertion
- Intravenous fluids
- Analgesia
 - ♥ Minimize opioid use as much as possible.

Avoid

- Aperients
- Antispasmodics

2. **Medical:**

Neostigmine:

Criteria for medical management have been defined as patients with a caecal diameter of 10 cm in whom 24 hours of conservative treatment has failed. ²

There should be no evidence of perforation or peritonism or sepsis.

Give 2 mg neostigmine IV over a 3 - 5 minute period

Patients should be monitored and atropine should be available at the bedside to counter significant symptomatic neostigmine-induced bradycardia, (note however that atropine can worsen the pseudo-obstruction!).

Neostigmine may be repeated for patients with an incomplete response, patients without a response, or those with a recurrence.

Success rates of up to 50% have been documented.

If the second dose of neostigmine fails to resolve the caecal dilatation, the patient should proceed to more aggressive measures of decompression.

Signs of resolution of ACPO may be observed within 30 minutes of administration

Mechanical intestinal obstruction is a **contraindication** to the use of neostigmine.

3. **Decompression:**

Colonoscopic decompression of the colon is effective, causing decreased caecal diameter in a good proportion of cases.

However, recurrence rates of 10% - 65% have been noted after initial success as documented by increased caecal diameter on radiography.

Additional benefits of decompression included definitive assessment of the colon to exclude mechanical obstruction.

A decompression tube may also be placed

Colonoscopy is contraindicated with evidence of ischemia or perforation as these patients should proceed to surgical intervention.

4. **Surgical:**

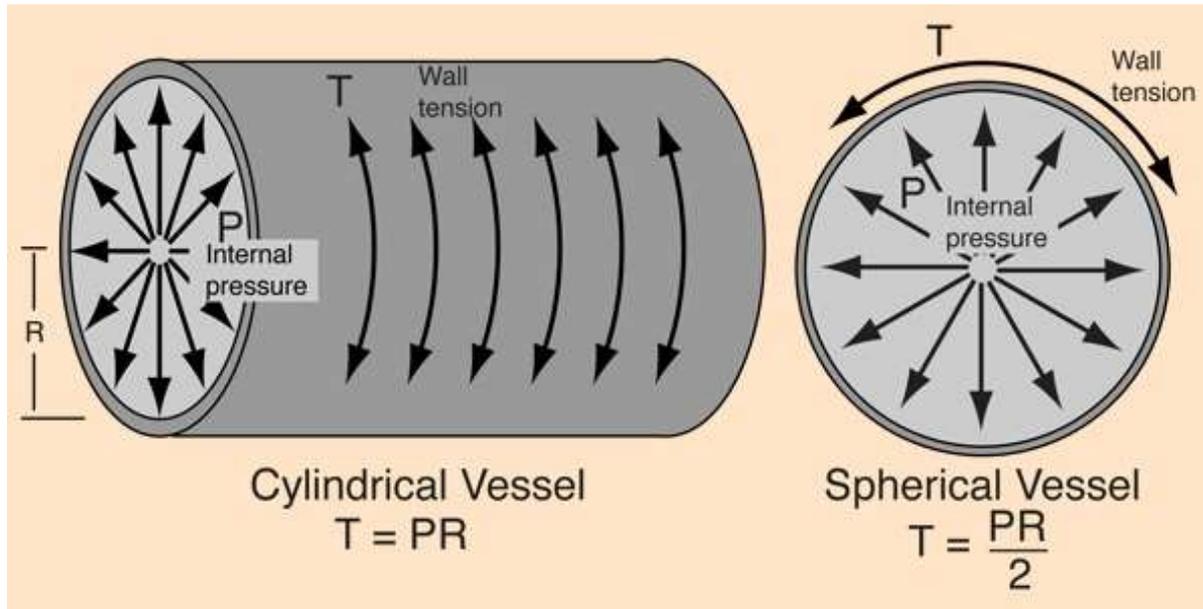
Surgical cecostomy is the definitive intervention for patients with ACPO unresponsive to other therapies and without evidence of ischemia or perforation.

Formal laparotomy is reserved for treatment of patients displaying peritoneal signs or perforation.

The actual surgical procedure performed is based on the status of the bowel at the time of operation. Procedures can range from surgical cecostomy to right hemicolectomy to total abdominal colectomy.

Appendix 1

Laplace's Law:



The larger the vessel radius, the larger the wall tension required to withstand a given internal fluid pressure.

For a given vessel radius and internal pressure, a spherical vessel will have half the wall tension of a cylindrical vessel.

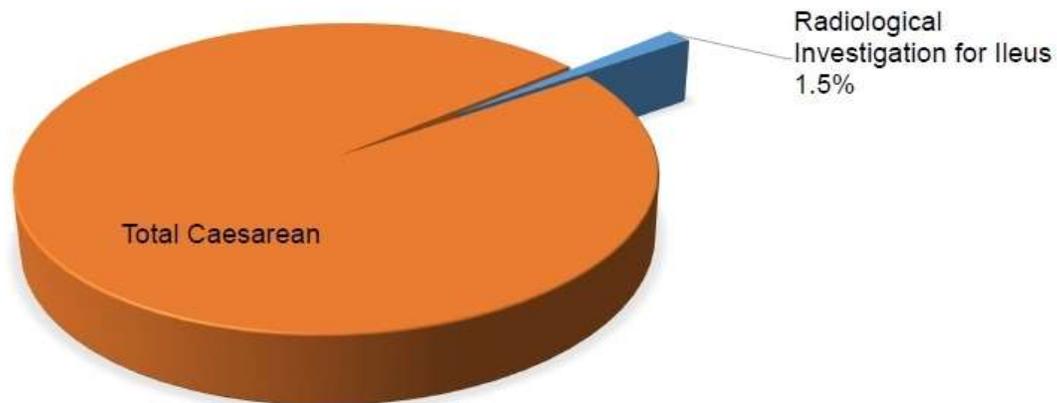
Appendix 2

A Case series:

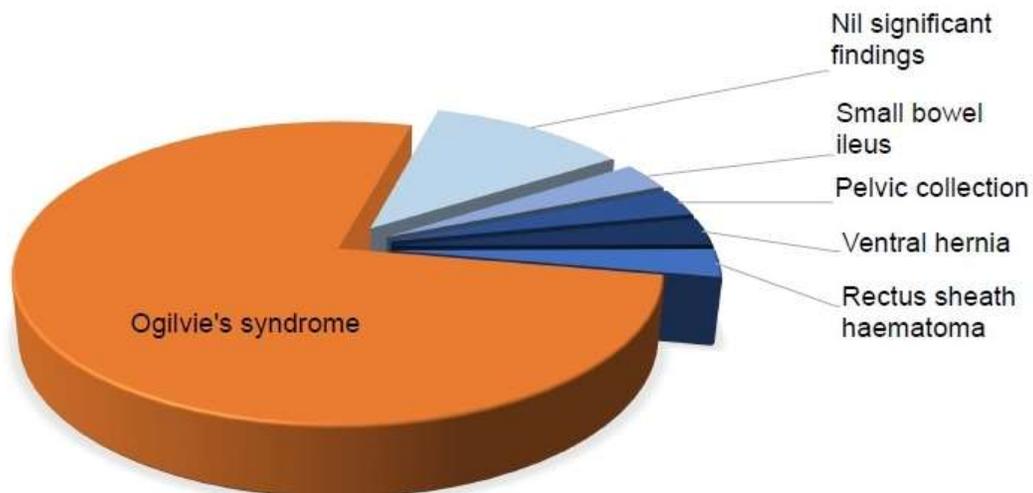
From a Poster presentation - RWH study 2018: ⁶

To determine the incidence of small and large bowel ileus post Caesarean Section using Abdominal X-ray (AXR), and the incidence of ACPO on Computerised Tomography (CT) scan.

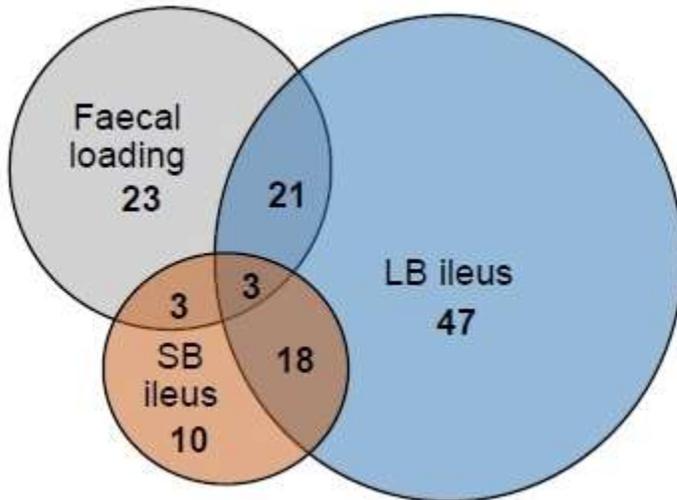
*Included in this study were 9610 women who underwent Caesarean Section at the Royal Women's Hospital between 1st January 2013 and 31st June 2017. Of these women, **143** underwent radiological investigation during admission for suspected ileus.*



Percentage of women post Caesarean at RWH who underwent radiological investigation for symptoms of ileus



Diagnoses of women further investigated with CT for symptoms of ileus

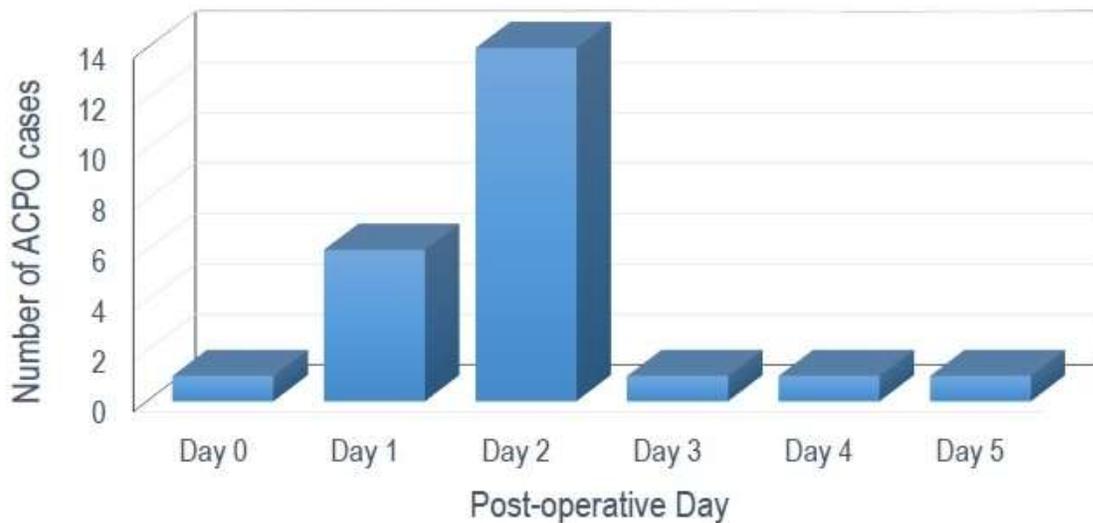


Venn diagram of AXR results for investigation of ileus symptoms post Caesarean

Twenty-one women had concurrent AXR findings of faecal loading and large bowel ileus. Pregnant women have prolonged gastrointestinal transit time in the third trimester due to mechanical intestinal obstruction by the gravid uterus, increased levels of progesterone reducing gastrointestinal smooth muscle contractility, reduced

physical activity, and dietary habits changes such as increased iron supplements. These factors combined with further insult to distal large bowel motility from Caesarean Section places women at high risk of ACPO.

The concurrent finding of both small and large bowel distension on AXR may be explained large bowel distension with an incompetent ileocaecal valve, with a less likely alternative being adynamic ileus.



Postoperative day of first radiological investigation for ileus symptoms post Caesarean

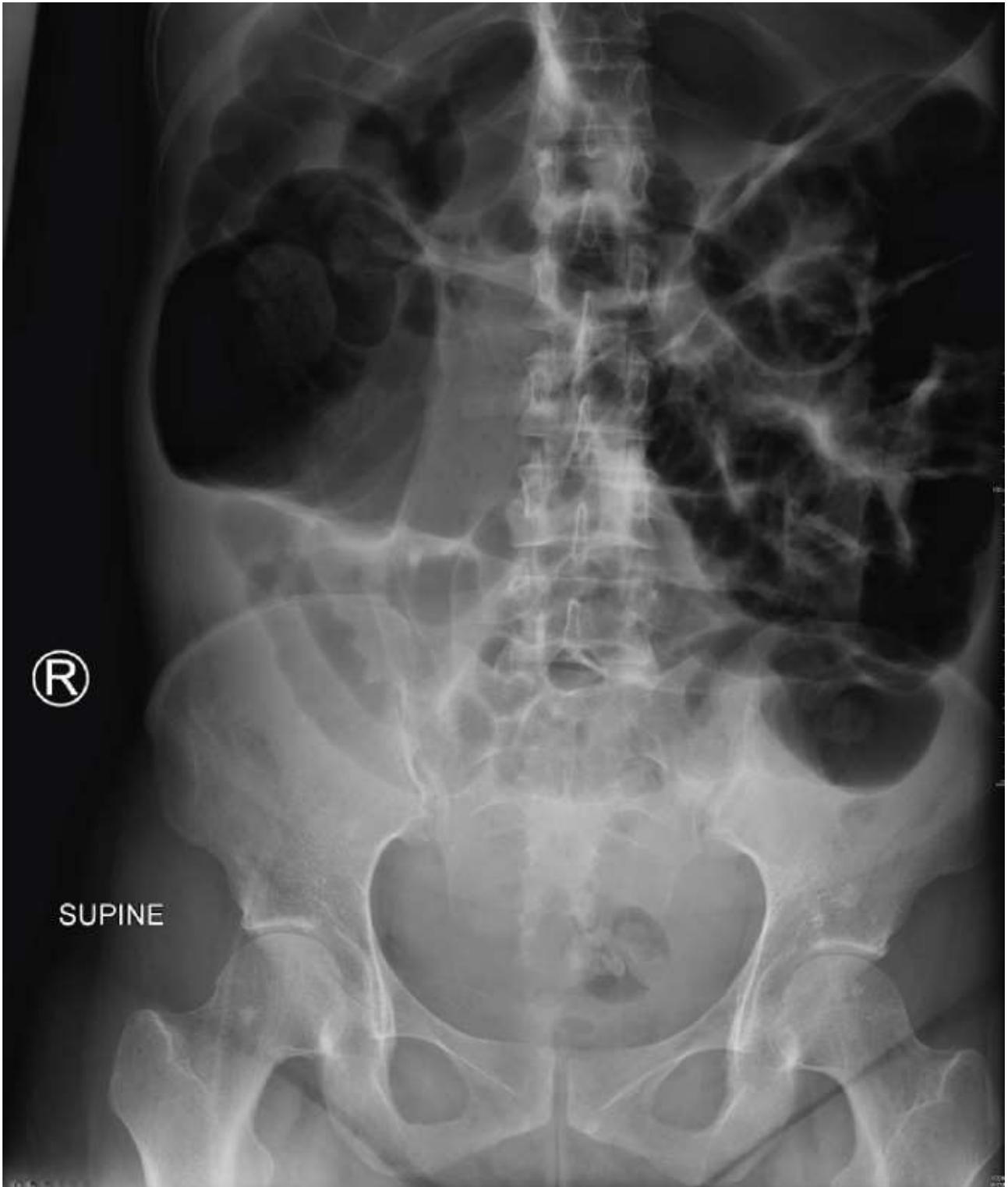
Conclusion:

ACPO (Ogilvie's syndrome) should be considered in all women with symptoms of ileus after Caesarean Section.

Appendix 3



Abdominal X-ray of a case of Ogilvie's syndrome showing a dilated colon with the cecum measuring 12.5 cm in diameter.³



Abdominal X-ray of case of Ogilvie's syndrome showing a dilated colon with the cecum measuring 9.5 cm in diameter.³

References

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