

Ovarian Endometrioma Superinfected With *Salmonella*: Case Report and Review of the Literature

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We present the case of a 28-year-old woman with *Salmonella* serovar Schwarzengrund gastroenteritis acquired during foreign travel. Her case was complicated by superinfection of a pre-existing ovarian endometrioma with a quinolone-resistant organism; the resultant ovarian abscess ultimately required surgical removal for resolution. We review the key features of this case and the previous literature on *Salmonella* ovarian abscess. This report highlights (1) the potential for metastatic spread of *Salmonella* to the ovary in women with pre-existing cysts or endometriomas and (2) the increasing worldwide burden of quinolone-resistant *Salmonella*.

Keywords. ovarian abscess; quinolone resistance; *Salmonella*; travel medicine.

CASE REPORT

A 28-year-old woman with an ovarian cyst presented with 2 weeks of diarrhea, abdominal pain, and fevers after traveling to the United Arab Emirates (UAE). One year before admission, she developed occasional sharp left lower quadrant abdominal pain and was diagnosed with an ovarian cyst. One month before admission, she traveled to the UAE for 1 week. While there, she stayed mainly in large cities, but she did travel once to a rural area where she was exposed to camels. She did not eat any unpasteurized milk, cheese, raw meat, or vegetables, and she drank only bottled water.

One week after returning, she developed nonbloody diarrhea that occurred 5–7 times per day and was associated with crampy abdominal pain and fevers to 103°F. She took oral ciprofloxacin for 3 days with incomplete resolution of symptoms.

One week later she was admitted to our hospital for further evaluation.

The patient denied sick contacts or new sexual partners. She had no significant drug or alcohol use history. She was not taking any medicines immediately before her hospitalization.

On admission, her temperature was 102.5°F and her heart rate 120 beats per minute. There was a palpable, nontender mass in her left lower quadrant. The remainder of her exam was unremarkable.

She had a white blood cell count of 22 000 cells/μL (77% neutrophils). Renal and liver function testing was normal. Computed tomography (CT) of the abdomen and pelvis demonstrated a 12-cm hypodense pelvic mass arising from one of the ovaries (Figure 1). Blood and stool cultures were drawn, and she was started on empiric intravenous (IV) ciprofloxacin and metronidazole.

After 2 days of antibiotic therapy, her fevers, diarrhea, and leukocytosis persisted. Stool cultures were positive for group B *Salmonella*. Out of concern for a quinolone-resistant organism, ciprofloxacin was discontinued and IV ceftriaxone was initiated. Soon thereafter (on hospital day 3), her blood cultures turned positive for group B *Salmonella* resistant to ciprofloxacin (minimum inhibitory concentration [MIC] = 1 μg/mL, with susceptibility defined as MIC ≤0.06 μg/mL) and susceptible to ceftriaxone (MIC ≤1 μg/mL). The blood isolate was additionally resistant to levofloxacin (MIC = 4) and susceptible to ampicillin (MIC = 4), cefepime (MIC ≤1), and trimethoprim/sulfamethoxazole (MIC ≤20). Minimum inhibitory concentration to azithromycin was 8, without defined susceptibility. Sensitivities were determined by Etest (bioMérieux, Durham, NC).

Despite treatment with ceftriaxone, her symptoms, leukocytosis, and fevers persisted. Repeat CT of the abdomen was unchanged, and further infectious studies were unremarkable. Gynecologic oncology removed a grossly infected large left ovarian abscess. Fluid cultures from this mass also grew group B *Salmonella*, and pathology revealed infected endometrioma.

Postoperatively, she had gradual resolution of her symptoms, leukocytosis, and fevers. She was discharged to complete 2 weeks of ceftriaxone from the date of her surgery. She was seen in outpatient follow up 2 weeks later and had no residual symptoms. After discharge the organism was speciated as *Salmonella* Schwarzengrund.

METHODS

We searched PubMed using Medical Subject Heading (MeSH) terms “*Salmonella* AND ovarian AND (cyst OR abscess)”. We identified 32 English-language cases or case series published

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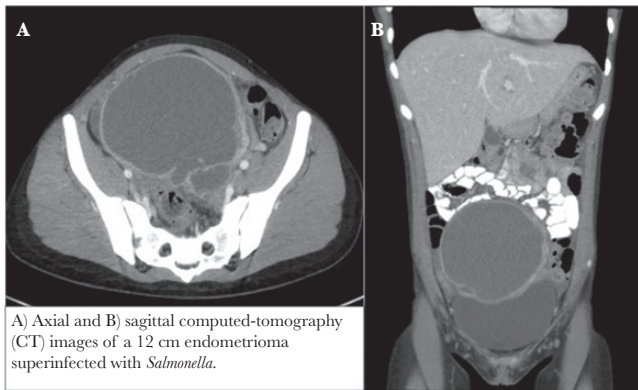


Figure 1. Cross-sectional imaging.

since 1963 that specifically mentioned that *Salmonella* was cultured from an ovarian fluid sample [1–32]. We summarized the key features of 33 cases of *Salmonella* ovarian abscess (those identified and the case reported here).

DISCUSSION

This case highlights several important considerations in management of *Salmonella* gastroenteritis and bacteremia. First is the potential for metastatic infection. *Salmonella* can cause endovascular and orthopedic infections [33–35], visceral abscesses of virtually any organ [36], as well as superinfection of ovarian cysts and endometriomas (as in this case) [13, 15]. Previously reported cases of ovarian cysts and endometriomas with *Salmonella* superinfection are summarized in (Table 1). The age range of affected patients was 2–48 years. In a large proportion (45%) of cases, there was no preceding diarrheal illness reported, and most (79%) did not have positive blood cultures for *Salmonella*. Most common *Salmonella* serovars were Enteritidis ($N = 7$) and Typhi ($N = 6$). Most commonly used antibiotics were penicillins ($N = 8$), third-generation cephalosporins ($N = 8$), and fluoroquinolones ($N = 8$). All underwent surgery, and 1 patient died. Three of 33 cases were complicated by sepsis [14, 28, 29]. There were no significant other metastatic foci of infection identified, although 2 cases had bilateral ovarian abscesses due to *Salmonella* [7, 8]; 1 patient developed findings concerning for a septic knee, but joint fluid was not sent for cultures, and her symptoms resolved with antibiotics [9].

This is the first reported case of an ovarian cyst superinfected with *Salmonella* serovar Schwarzengrund. In a 2004 study of approximately 8000 reported culture-confirmed cases of *Salmonella*, 7% of infections were invasive (infecting a normally sterile site) [35]. *Salmonella* Schwarzengrund was among the serovars least likely to cause invasive infection (14% of Schwarzengrund infections were invasive, compared with 80% and 75% for *Salmonella* serovars Dublin and Typhi, respectively).

Table 1. Reported Cases of Ovarian Cysts Superinfected With *Salmonella*, Including the Current Case, Between 1963–2016 ($N = 33$) [1–32]

Category	Characteristic	N (%)
Age range, years	2–48 (mean = 27)	—
Comorbidity	None significant	13 (39)
	Not reported	13 (39)
	SLE	4 (12)
	Pregnancy	2 (6)
	RA	1 (3)
Location	Asia	14 (42)
	Europe	10 (30)
	North America	6 (18)
	Australia/New Zealand	2 (6)
	Africa	1 (3)
Preceding diarrheal illness	Yes	18 (55)
Positive blood culture	Yes	7 (21)
Diagnostic test	Ultrasound	17 (52)
	CT	8 (24)
	Surgery	6 (18)
	Radiograph	1 (3)
	Not reported	1 (3)
Ovarian pathology	Endometrioma	12 (36)
	Teratoma	8 (24)
	Other/nonspecific	7 (21)
	Not reported	6 (18)
<i>Salmonella</i> serovar	Enteritidis	7 (21)
	Typhi	6 (18)
	Paratyphi A	2 (6)
	Typhimurium	2 (6)
	Other/unknown	15 (45)
	Schwarzengrund	1 (3)
Antibiotic used ^a	Penicillin	8 (24)
	3rd-generation cephalosporin	8 (24)
	Fluoroquinolone	8 (24)
	Chloramphenicol	5 (15)
	Metronidazole	4 (12)
	Aminoglycoside	4 (12)
	Tetracycline	3 (9)
	Co-trimoxazole	2 (6)
	1st-generation cephalosporin	2 (6)
	2nd-generation cephalosporin	2 (6)
	4th-generation cephalosporin	2 (6)
	Carbapenem	1 (3)
Lincomycin	1 (3)	
Antibiotic duration range, days ^b	4–42 (median = 14)	—
Death		1 (3)

Abbreviations: CT, computed tomography; RA, rheumatoid arthritis; SLE, systemic lupus erythematosus.

^aIn some cases, more than 1 antibiotic was used.

^bIndicates length of antibiotic continuation after definitive surgery. Data reported for 23 cases.

A second important aspect of this case is the antibiotic resistance pattern (described above). The patient was initially started on empiric therapy with ciprofloxacin, but she was switched to ceftriaxone once initial cultures were positive for group B *Salmonella*. *Salmonella* resistant to quinolones has been recognized in the United States since the early 1990s [37–39], and

the prevalence of decreased susceptibility to ciprofloxacin in *Salmonella* has risen from 0.4% in 1996 to 4.3% in 2014 [40, 41]. Many cases are documented in travelers returning from Asia, where prevalence of decreased susceptibility to ciprofloxacin is approximately 50% in some countries, including Thailand and Taiwan [42]. There are limited data on quinolone resistance in the Middle East, where our patient likely acquired infection. Estimates of decreased susceptibility to ciprofloxacin from this region range from 2.3% (Saudi Arabia, 1999–2002) [43] to 30% (West Bank, 2005–2007) [44]. Specifically in *Salmonella* Schwarzengrund, there is concern for spread of multidrug resistance from poultry to humans in Asia and Europe [45].

CONCLUSIONS

This case should alert clinicians to assess patients with suspected or confirmed *Salmonella* gastroenteritis for metastatic sites of infection, including ovarian abscess in women with pre-existing cysts, and to consider resistance to commonly used antibiotics if the clinical course is not progressing as expected. Although quinolone-resistant *Salmonellae* have been recognized for approximately 30 years, the prevalence of this resistance pattern is increasing worldwide, and emerging in the Middle East, and should be considered in travelers returning from this region.

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