Title:

Isolation of *Salmonella enterica* serotype Newport from a partly ruptured splenic abscess in a traveller returning from Zanzibar

Running Title:

*Salmonella* Newport splenic abscess in a traveller

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Abstract

Salmonella enterica ssp. enterica serotype Newport is a pathogen of growing importance due to its epidemic spread in dairy cattle and increasing rate of antimicrobial resistance. Human infections, however, are rare. We report a case of a splenic abscess in a young traveller returning from East Africa.
In February 2007, a 20-year-old Caucasian male returning from a vacation in
West Kenya, Zanzibar and Tanzania was admitted to our hospital in Germany with anorexia
and severe left upper abdominal pain. He had been well until the end of January, when he had
suddenly developed a high fever and malaise during a stay in Zanzibar. The patient had been
treated empirically for malaria in a local hospital with artesunate. He had developed vomiting,
diarrhea and severe pain to the left upper abdomen. The patient had thereupon been started on
ciprofloxacin 200 mg bid and had been transferred to Dar es Salaam. On examination, he had
a temperature of 39.8 °C, shallow breathing, tachycardia and a very sensitive left upper
abdomen. Abdominal ultrasound had shown an enlarged spleen with a hypodense lesion and a
splenic abscess had been suspected. Laboratory tests had revealed a white blood count of
21,500/µl and a raised ESR of 85 mm/h. Liver function tests had shown a mild elevation of
gamma-glutamyl transpeptidase activity. The patient had been rehydrated, the dosing of
ciprofloxacin had been increased to 500 mg bid and diclofenac had been administered. Upon
stabilization, the patient had been transferred to Germany.

At the time of hospitalization in Germany, the patient was afebrile. He had a
white blood count of 8,300/µl, CRP levels of 21.99 mg/dl and elevated liver enzymes (alanine
aminotransferase 136 U/l, aspartate aminotransferase 113 U/l, gamma-glutamyl
transpeptidase 421 U/l). INR was 1.26. A computed tomography (CT) scan demonstrated a
left-sided pleural effusion and a hypodense mass measuring 80 x 110 mm in the upper part of
the spleen which had ventro-medially ruptured. The abscess was covered by the liver (Figure
1). There were no lesions in the liver or any other abdominal organ. The abscess was drained
transhepatically in Seldinger technique under CT-guidance. 450 ml of pus were aspirated, the
abscess was flushed with Ringer solution and a drainage was inserted. Metronidazole (400 mg
bid) was added to the antibiotic regimen.
Microscopy of the aspirate showed many leukocytes but no bacteria were seen. After two days of cultivation on solid media at 37°C in an aerobic and 5% CO₂-enriched atmosphere, 2 mucoid nonhemolytic bacterial colonies grew on sheep blood agar. Gram staining demonstrated long, gram-negative rods. Oxidase testing was negative. After subcultivation for 24 h, the organism was growing lushly on blood agar and was lactose-negative when cultured on MacConkey agar. The agglutination test for salmonella using polyvalent antisera was positive. The isolated organism exhibited the antigenetic formula O:6, 8; H1:e; H2:1,2 and could thus be identified as *Salmonella* serovar Newport, belonging to the serogroup C. Biochemical identification was accomplished by using the Vitek 2 system (*Salmonella* serogroup C, P 99.00). The eubacterial PCR of the aspirated fluid was also positive, using primers directed against the conserved regions of the 16S-rRNA gene. Sequence analysis of the amplicon revealed 100% identity with *Salmonella enterica*. The isolate was susceptible to ampicillin, ampicillin/sulbactam, cefotaxime, the carbapenems, ciprofloxacin and cotrimoxazole. Multiple aerobic and anaerobic blood cultures remained negative throughout the whole incubation period.

Following the intervention, the patient’s condition markedly improved. Repeated CT scans showed initially a slight bleeding into the former abscess, which completely resolved. After 5 days, the drainage could be removed. The patient was discharged 3 days later and metronidazole was discontinued. At that time, white blood count was 6,300/µl and CRP levels were 1.40 mg/dl. Ciprofloxacin was discontinued after 21 days of treatment. A follow-up period of 10 weeks was uneventful.
*Salmonella enterica* serotype Newport has been recognized as an emerging animal pathogen in the recent years (22). In Africa, outbreaks of *Salmonella* Newport-associated diarrhea in humans have been linked to poultry and the consumption of undercooked eggs (1). In the United States, the pathogen has undergone a marked and rapid epidemic spread in dairy cattle (4). A particular multidrug-resistant (MDR) strain of this serotype that exhibits resistance to expanded-spectrum cephalosporins has been described (7, 17, 9) and a reservoir in dairy cattle has been established (22, 5). Cattle infected with MDR *Salmonella* Newport shed the bacteria in manure for weeks or months (22) and manure applied to agricultural fields could be a source for human infections. *Salmonella* Newport has been detected in raw milk (10) and an association of *Salmonella* Newport infection and the consumption of raw ground beef exists (21). A concurrent increase of MDR *Salmonella* Newport isolations from both animal and human populations has already been reported in the United States (14). In Tanzania, the prevalence of resistance to expanded-spectrum cephalosporins in *Salmonella* Newport is low (2). The source of infection in the case of the young traveller described here remains uncertain. However, the patient remembered that he had eaten undercooked eggs for breakfast five times during his stay in Zanzibar. Thus, a source in poultry can be assumed which is in concordance with a previous Ethiopian report (1). Antibiotic resistance of salmonellae in poultry is increasing in East Africa (16). However, the organism isolated was not of the MDR type.

*Salmonella* Newport has caused a wide spectrum of clinical disease in humans, such as diarrhea (1), ileocecal lymphadenitis (15), chest wall abscess (20), pyosalpinx (18), spondylitis (6), osteomyelitis (19), endocarditis (13), meningitis (12), and septicaemia (11).

Most *Salmonella* infections result in mild to moderate, spontaneously resolving gastroenteritis (7). However, complications such as septicaemia, meningitis, or abscess formation may occur. In splenic abscesses caused by salmonellae, *S. Typhi*, *S. Enteritidis*, and *S. Typhimurium* are
the most frequently isolated serotypes. Rarely other serotypes are found (8). In one case

described in 1978, a splenic abscess due to *Salmonella* Newport had caused a subsequent
empyema (3). Risk factors for splenic abscesses caused by salmonellae include
immunosuppression, intravenous drug abuse, hemoglobinopathies or previous trauma (8). In
the case described, there were no clinical or laboratory findings indicative of a
hemoglobinopathy or an underlying immunosuppression. A HIV test was negative.
Intravenous drug abuse was denied and the patient could not remember any trauma.

Splenic abscesses are more prevalent in males and in younger age groups. Most
abscesses are preceded by infections elsewhere in the body. Those sites serve as a focus for
dissemination of microorganisms, unless the spleen is directly infected by a penetrating injury
(8). Clinical symptoms often consist of fever and left upper quadrant tenderness. Laboratory
tests show marked leukocytosis. The list of causative organisms is long, but in travellers
returning from tropical areas, special attention should be paid to infections with salmonellae,
*Entamoeba histolytica* and *Burkholderia pseudomallei*, the causative agent of meliodosis.
Computed tomography is the most sensitive tool for diagnosing a splenic abscess (8), but
sonography is less costly and readily available in many curative centers. Most authors
recommend splenectomy as the treatment of choice. In selected cases, and when the causative
organism has been identified, drainage and antimicrobial chemotherapy can be considered as
a therapeutical option (8), which proved successful in our patient.
References


Figure Legends

Figure 1

Computed tomography of the upper abdomen after oral and intravenous contrast application. The scan shows a hypodense splenic abscess (A) measuring 85 mm in diameter with a medial perforation (P) which is covered between the liver (L) and the spleen (S). The semilunar septum-like structure in the medial part of the lesion (arrow) corresponds to the surface of the spleen.