LUMEN ET VIRTUS

Ruptured aortic aneurysm associated with diffuse salmonellosis: A case report

https://doi.org/10.56238/levv15n39-186

Paula de Oliveira Santana[1], Fernando Merlos[2], Priscila Gabriella Carraro Merlos[3] and Gabriela Machado Güther[4]

ABSTRACT

Case report: A 63-year-old female patient, hypertensive and diabetic, reported a sudden onset of chest pain at night, which persisted continuously for 20 days. According to CT scans and computed tomography angiography, the diagnostic hypothesis of ruptured thoracic aortic aneurysm was considered. During the postoperative evolution, the patient presented difficulty in extubation and persistence of infectious symptoms, because of this, new tests were performed, which indicated a possible fistula with subsequent upper digestive endoscopy. During this period, the patient persisted with infectious symptoms and lack of improvement. Bronchoalveolar lavage fluid culture was performed at the same time, which identified bacterial growth of Salmonella spp. Discussion: A study that analyzed 129 cases of Salmonella in a hospital in Massachusetts showed that DM is one of the most common risk factors for Salmonella spp in adults. In a study carried out in China, it was evident that 28.9% of the cases were considered asymptomatic, that is: presence of the bacteria, but absence of diarrhea. In the scientific society, there is concern about the antimicrobial resistance of Salmonella spp. Because of this, treatment with antibiotics is indicated, especially in cases with a higher risk of complications. It is considered that the consequences of the bacterium on the body can lead the patient to septic shock and death. Final considerations: Thus, having knowledge about triggering factors, main symptoms, and appropriate treatment becomes essential for the best evolution of the clinical condition of infected patients.

Keywords: Salmonella, Case Reports, Ruptured Aneurysm, Aorta.

[1] Medical Student
IDOMED Estácio Jaraguá do Sul, SC
[2] Intensive Care Physician and Master's Student in Public Health
Joinville General Hospital, SC
[3] Infectious Disease Physician and Master's Student in Public Health
Joinville General Hospital, SC
[4] Biomedical Postgraduate in Hospital Auditing
Joinville General Hospital, SC

INTRODUCTION

In 2017, it was estimated that enterocolitis caused by Salmonella spp. had 95.1 million cases worldwide, with 50,771 of the individuals dying. Thus, infection by Salmonella spp is a frequent pathology, however, in general, with low lethality (COLLABORATORS, 2019).

Salmonella spp belongs to the group of gram-negative bacteria and can be divided into two species: Salmonella bongori and Salmonella enterica, and the typhoid (ST) and non-typhoid (SNT) subgroups belong to S. enterica. As a result, the symptoms developed depend on whether the infection occurs due to the ST or TNS form, and therefore has different presentations (GAL-MOR, 2019).

In general, the symptoms of TNS characterize gastroenteritis, with nausea, vomiting, diarrhea, abdominal cramps and fever, with a self-limited evolution. On the other hand, the ST form presents as bacteremia with or without gastrointestinal symptoms, with fever as its main manifestation, which may or may not be associated with other symptoms, such as headache, abdominal pain, and weight loss. Both forms of presentation can progress to complications, such as reactive arthritis, in TNS, as well as meningitis, osteomillielitis, and septic arthritis, in TS (GAL-MOR, 2019). Therefore, bacterial strains that present greater virulence, when associated with host risk factors, such as immunosuppression and diabetes mellitus (DM), can evolve in the form of septhymia and have dissemination to various systems of the organism (COBB et al., 2021) (HOHMANN, 2001).

Transmission of Salmonella spp can occur via direct or indirect contact with contaminated animals, as well as consumption of infected food, such as eggs, pork, and beef (CHLEBICZ; ŚLIŜEWSKA, 2018). The diagnosis considered the gold standard for Salmonella spp. is the analysis of the individual's feces (GAL-MOR, 2019).

The treatment of uncomplicated forms of Salmonella infection generally does not require antimicrobials, requiring only fluid replacement, in order to reduce the chance of antimicrobial resistance occurring. However, when the use of antibiotics is indicated, as in the case of bacteremia, the use of fluoroquinolones and/or 3rd generation cephalosporins is preferred, for example (CHLEBICZ; ŚLIŜEWSKA, 2018).

Infected aneurysms, in turn, are shown to be an uncommon pathology, with an average incidence of 0.7-1% among aortic repair surgeries. Among the etiological agents, Staphylococcus and Streptococcus stand out, and Salmonella spp. is one of the most prevalent bacteria only in East Asia, with little incidence in South America. (LEE et al., 2008). In addition, there are several pathophysiological mechanisms that lead to infected aneurysm, and the following are possible pathways: septic emboli; atheromatous plaque infection; infection of the existing aneurysm; infection of the aorta by an adjacent organ; post-traumatic aneurysm and for example (SEKAR, 2010).

Treatment of Salmonella spp.-infected aneurysm should be a combination of antibiotics and surgical procedure (GUO; BAI; YANG; WANG; GU, 2018).

The study of the occurrence of Salmonella spp is fundamental, since there is a frequent occurrence of the pathology in society, as well as the possibility of unfavorable evolution. Thus, the present study aims to present a case report of a patient with ruptured aortic aneurysm associated with the diagnosis of diffuse salmonellosis, associated with a literature review on the subject.

CASE REPORT

I.P., female, 63 years old, hypertensive, diabetic and diagnosed with scleroderma for 5 years. The patient sought medical attention at the General Hospital of Joinville, Santa Catarina, where he reported that 20 days ago he had sudden chest pain at night, which persisted continuously. In addition, she had intense night sweats, headache, myalgia, arthralgia, retroorbital pain, fever, gingivorrhagia and associated epistaxis. The search for medical care occurred due to the onset of hemoptysis and persistence of chest pain. At the time of admission, he reported that his eldest son died at the age of 38 due to a ruptured aortic aneurysm.

On physical examination at the time of admission, the patient had blood pressure (BP) of 177 x 112 mmHg, heart rate (HR) 96 bpm, respiratory rate (RR) 16 irpm, axillary temperature (Tax) 36.2°C, oxygen saturation (SatO2) of 97%, weighing 75 kg and body mass index of 28.5. The patient was in good general condition, lucid, oriented, coherent, with moist and ruddy mucous membranes, afebrile, acyanotic, and with atypical fascis. Cardiac auscultation was in a regular rhythm, in two stages, with normophonetic sounds and no murmurs. Pulmonary auscultation showed bilateral breath sounds, with no adventitious sounds. Abdominal examination showed bowel sounds present, with a depressed abdomen that was painless on palpation, with no signs of peritonitis. The extremities were warm and well perfused, and the pulses were present and symmetrical, and there was no edema of the lower limbs.

Laboratory tests showed hemoglobin of 12.8, hematocrit of 37.1, leukocytes 21,250, rods 6%, segmented 85%, platelets 253,000, CRP 211, glutamic-oxaloacetic transaminase (GOT) 15, pyruvic transaminase (PGT) 36, creatinine 0.7 and prothrombin time 1.21. Arterial blood gas analysis showed pH 7.50, PCO2 37mmHg, PO2 134mmHg, HCO3 29mEq/kg and SatO2 99%. In addition, troponin was negative.

In addition, dengue NS1 antigen and IgM antibody for dengue were requested, both of which had reactive results. On the other hand, the COVID-19 SWAB and influenza A and B showed non-reactive results.

An electrocardiogram was requested, which presented normal results. The echocardiogram showed concentric left ventricular remodeling and grade I diastolic dysfunction, with an estimate of normal left atrial pressure at rest, as well as mild mitral valve regurgitation.

Chest CT scans showed sparse pulmonary micronodules, calcified and noncalcified, of undetermined etiology, probably representing infectious granulomas, with no evidence of disease activity. In addition, laminar atelectasis of relaxation in the parenchyma adjacent to the aortic arch and alteration of the lateral and inferior contour of the aortic arch were evidenced, with increased attenuation of adjacent mediastinal connective tissue. In addition, the presence of aortic and coronary atheromatous calcifications was noted, but the absence of other significant alterations on CT.

Chest CT angiography revealed a saccular aneurysm of the aortic arch, measuring 3.0 x 2.4 x 2.7 cm, with a 1.8-cm neck, with irregular contours, surrounded by tissue with expansive effect and attenuation of soft tissues in the mediastinum. In addition, compression of the left pulmonary artery and the primary bronchus on this side were observed, suggesting the presence of hematoma related to the contained rupture of the aneurysm. Pulmonary thromboembolism was ruled out, as well as there was no signs of right ventricular overload.

In another CT scan of the chest performed, alteration of the lateral and inferior contour of the aortic arch was identified, with increased attenuation of adjacent mediastinal connective tissue, in addition to aspects similar to those performed on 11/08.

The diagnostic hypothesis of ruptured thoracic aortic aneurysm was considered, with a zone 1 saccular aneurysm with blood in the mediastinum, according to the opinion of the vascular surgeon. In addition, the analysis of cardiovascular surgery guided admission to the intensive care unit (ICU), together with blood pressure control with beta-blockers and change of decubitus in the morning.

After 4 days of admission to the hospital, the aneurysm was surgically approached. During the postoperative evolution, the patient presented difficulty in extubation and persistence of infectious symptoms, because of this, new X-ray (X-ray) and CT tests were performed, which indicated a possible fistula. Thus, after 4 days, an upper digestive endoscopy (UGI) was also performed due to suspected fistula. On examination, an extensive fistulous orifice in the cervical-middle esophagus and mild enanthematous endoscopic pangastritis were detected. During this period, the patient persisted with infectious symptoms and lack of improvement.

In addition, bronchoalveolar lavage fluid culture was performed, which identified bacterial growth of Salmonella spp resistant to amikacin and gentamicin and sensitive to amoxicillin with clavulanate, aztreonam, cefepime, ceftazidime, ceftazidma with avibactam/tazobactam, ceftriaxone, ciprofloxacin, ertapenem, meropepenem, and piperacillin with tazobactam. On the following day, the bronchoalveolar lavage culture was repeated, which showed the same results as the previous day.

The treatment of choice for Salmonella spp. was the use of Levofloxacin, which belongs to the fluoroquinolone class. This conduct occurred due to the severity of the condition, as well as the unavailability of intravenous sulfamethoxazole. Due to other complications, the patient progresses to death.

DISCUSSION

DIABETES MELLITUS (DM) AND OTHER RISK FACTORS FOR SALMONELLA

It is noted that the patient studied has DM as a comorbidity. A study that analyzed 129 cases of Salmonella spp. in a hospital in Massachusetts, in the United States, showed that DM, together with the use of corticosteroids, malignant diseases, HIV, previous use of antibiotics and immunosuppressive drugs are the most common risk factors for Salmonella spp in adults (HOHMANN, 2001). Therefore, it is important to analyze the risk factors present in patients in order to have the appropriate diagnosis.

In addition, the environment in which the individual is exposed can also contribute to infection with Salmonella spp. In a study that followed 49 patients diagnosed with Salmonella spp. in Tanzania, for example, it was found that the risk of infection by the bacteria was 3 times higher in those who ate frequently in restaurants. In addition, in the same study, it was observed that those who consumed water from rivers or wells were twice as likely to have the disease, as well as drinking untreated water increased the risk of the disease three times (NGOGO et al., 2020).

SALMONELLOSE DIAGNOSIS

The diagnosis of the patient studied was according to the clinical association, due to the absence of postoperative improvement, in conjunction with complementary tests, such as bronchoalveolar lavage culture. Thus, such a diagnosis did not occur due to the presence of the classic symptoms of the infection, such as diarrhea. In a study carried out in China, which evaluated 290 patients, it was evident that 28.9% of the cases were considered asymptomatic, that is: presence of the bacteria, but absence of diarrhea (PAUDYAL et al., 2020). Similarly, another study carried out in China analyzed 88 samples of Salmonella spp. isolated, in which it was identified that 61 of the cases were in individuals with no symptoms (XU et al., 2021).

In general, Salmonella spp. infection can be clinically difficult to differentiate from other bacteria that cause gastroenteritis. Because of this, for the proper diagnosis of Salmonella infection of the SNT form, isolation through stool analysis is considered the gold standard, but in cases where there are symptoms of systemic dissemination, blood and lymph node culture can be considered, for example. However, in recent years there has been a frequent choice of PCR test due to its great sensitivity. For the ST form, the agglutination test is widely used (GAL-MOR, 2019).

Thus, the adequate structure of hospitals and laboratories becomes essential for the definitive diagnosis of Salmonella spp., especially in severe cases, such as blood dissemination. Because of this, when there is a lack of adequate infrastructure in health centers, it can favor a delay in diagnosis and adequate management, as well as failure to identify antimicrobial resistance (KURTZ; GOGGINS; MCLACHLAN, 2018).

CHOSEN TREATMENT AND DOCUMENTED ATB RESISTANCE

The treatment of choice for the patient in question was the use of levofloxacin. However, within the scientific society, there is concern about the antimicrobial resistance of Salmonella spp. Because of this, treatment with antibiotics is indicated mainly in cases with a higher risk of complications, such as age over 50 years with atherosclerosis, immunocompromised and the presence of cardiac alterations. In these cases, therefore, fluroquinolones, 3rd generation cephalosporins, amoxicillin and sulfamethoxazole with trimethopin are considered as the first choice, for example. In more severe cases, when the use of the previous drugs is unsuccessful, the class of carbapenems should be used, which have good action on the most resistant strains of Salmonella spp (MCDERMOTT; ZHAO; TATE, 2018). In a study with 88 samples of Salmonella spp., for example, it was noted that all of them were susceptible to meropenem, which belongs to the class of carbapenems (XU et al., 2021).

In addition, according to the antibiogram performed by the patient's bronchoalveolar lavage, it was noted that the bacterial strain present was resistant to amikacin and gentamicin, i.e., drugs of the aminoglycoside class. Accordingly, a study that analyzed 640 samples of Salmonella spp. found that in 16% of cases they were also resistant to gentamicin. In this same analysis, it was observed that, among the 7,232 phenotypes analyzed, there were 68 cases with the presence of antimicrobial resistance in the complete analysis of the genes, and 40 samples had resistance to aminoglycosides (MCDERMOTT et al., 2016). Thus, resistance to aminoglycosides is an important factor within the analysis of the treatment of Salmonella spp.

SEPSE POR SALMONELLA SPP

From the moment the bacterium enters the individual's bloodstream, after passing through the gastrointestinal barrier, the patient is considered to be in a state of bacteremia caused by Salmonella spp. Thus, the consequences of the bacterium on the body can be so great, to the point of leading the patient to septic shock and death (ENG et al., 2015). In a study of 206 patients with Salmonella spp. bacteremia, conducted in Taiwan, it was observed that the most prevalent comorbidities were malignant diseases, hypertension, DM, human immunodeficiency virus (HIV), cirrhosis, and rheumatologic disease, respectively. In this group of patients, mortality was 18.4% (CHEN et al.,

2018). Therefore, it is important to associate the patient's personal history and the current disease in order to avoid progression to bacteremia.

INFECTED ANEURYSM AND SALMONELLA SPP AS AN ETIOLOGICAL AGENT

Comorbidities are predisposing factors for infected aneurysms. A study conducted in Beijing showed that among the underlying diseases, hypertension, diabetes and atherosclerosis favor a higher risk of occurrence of infected aneurysm. In addition, with Salmonella spp as the etiological agent, there is a greater chance of fatal complications. Possible unfavorable outcomes include aneurysm rupture due to rapid growth, hemorrhage, and embolism. (GUO; BAI; YANG; WANG; GU, 2018)

CONCLUSION

Salmonella spp. is a bacterium of great importance in the health area, both for its high prevalence and for the possible consequences it can generate in the body. When related to infected aneurysms, it is necessary to study, since the occurrence of the association is low. Thus, knowledge about triggering factors, main symptoms, and appropriate treatment becomes essential for a better evolution of the clinical condition of infected patients.

*Report previously presented at the 2023 Brazilian Congress of Internal Medicine.

REFERENCES

1. Chen, S.-Y., et al. (2018). Value of blood culture time to positivity in identifying complicated nontyphoidal Salmonella bacteremia. *Diagnostic Microbiology and Infectious Disease*, 91(3), 210-216. https://doi.org/10.1016/j.diagmicrobio.2018.02.005

2. Chlebicz, A., & Śliżewska, K. (2018). Campylobacteriosis, Salmonellosis, Yersiniosis, and Listeriosis as zoonotic foodborne diseases: A review. *International Journal of Environmental Research and Public Health*, 15(5), 1-29. https://doi.org/10.3390/ijerph15050863

3. Cobb, J., et al. (2021). Oral Salmonella msbB mutant as a carrier for a Salmonella-based vaccine for prevention and reversal of type 1 diabetes. *Frontiers in Immunology*, 12, 1-10. https://doi.org/10.3389/fimmu.2021.667897

4. Collaborators, Gbd 2017 Non-Typhoidal Salmonella Invasive Disease. (2019). The global burden of non-typhoidal salmonella invasive disease: A systematic analysis for the Global Burden of Disease Study 2017. *Lancet Infectious Diseases*, 19, 1312-1324.

5. Eng, S.-K., et al. (2015). Salmonella: A review on pathogenesis, epidemiology and antibiotic resistance. *Frontiers in Life Science*, 8(3), 284-293. https://doi.org/10.1080/21553769.2015.1051243

6. Gal-Mor, O. (2019). Persistent infection and long-term carriage of typhoidal and nontyphoidal salmonellae. *Clinical Microbiology Reviews*, 32(1), 1-31.

7. Guo, Y., Bai, Y., Yang, C., Wang, P., & Gu, L. (2018). Mycotic aneurysm due to Salmonella species: Clinical experiences and review of the literature. *Brazilian Journal of Medical and Biological Research*, 51(9), 1-9.

8. Kurtz, J. R., Goggins, J. A., & McLachlan, J. B. (2018). Salmonella infection: Interplay between the bacteria and host immune system. *HHS Public Access*, 1-24.

9. Hohmann, E. L. (2001). Nontyphoidal salmonellosis. *Clinical Infectious Diseases*, 15, 263-269.

10. Lee, W.-K., et al. (2008). Infected (mycotic) aneurysms: Spectrum of imaging appearances and management. *Radiographics*, 28(7), 1853-1869.

11. McDermott, P. F., et al. (2016). Whole-genome sequencing for detecting antimicrobial resistance in nontyphoidal salmonella. *Antimicrobial Agents and Chemotherapy*, 60(9), 5515-5520.

12. McDermott, P. F., Zhao, S., & Tate, H. (2018). Antimicrobial resistance in nontyphoidal salmonella. *Microbiology Spectrum*, 6(4), 1-26. https://doi.org/10.1128/microbiolspec.arba-0014-2017

13. Ngogo, F. A., et al. (2020). Factors associated with Salmonella infection in patients with gastrointestinal complaints seeking health care at regional hospital in Southern Highland of Tanzania. *BMC Infectious Diseases*, 20(1), 1-8. https://doi.org/10.1186/s12879-020-4849-7

14. Paudyal, N., et al. (2020). Persistent asymptomatic human infections by Salmonella enterica serovar Newport in China. *mSphere*, 54(3), 1-8.

15. Sekar, N. (2010). Primary aortic infections and infected aneurysms. *Annals of Vascular Diseases*, 3(1), 24-27.

16. Xu, H., et al. (2021). Characterization of Salmonella serotypes prevalent in asymptomatic people and patients. *BMC Infectious Diseases*, 21(1), 1-9. https://doi.org/10.1186/s12879-021-06340-z