

Detection of *Salmonella enteritidis* in a immunocompetent patient with myocarditis

Miyokardit tanılı immünokompetan hastada *Salmonella enteritidis* saptanması

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ABSTRACT

Salmonella is a gram-negative, motile, non-spore-forming, facultative anaerobic bacterium belonging to the *Enterobacteriaceae* family. There are several subtypes that can cause disease in humans and animals. Infection can be caused by food, such as eggs, poultry, contaminated waters, and can also be monitored after contact with animals. In humans, it may present with different clinics ranging from asymptomatic carriage to enteric fever. Factors such as the age of the host, immunosuppressive status and additional comorbidities may be effective in the course of the disease. Extraintestinal complications can be observed during the course of enteric fever clinic. Among these complications, clinical conditions such as endocarditis, visceral abscess, osteomyelitis can be considered. In this case, we presented the myocarditis clinic in a patient who presented with vomiting, chest pain and diarrhea, and *Salmonella* was found in the stool.

Key Words: Myocarditis, *Salmonella*, diarrhea

ÖZET

Salmonella, gram negatif, hareketli, sporsuz, fakültatif anaerobik, *Enterobacteriaceae* ailesine ait bir bakteri türüdür. İnsanlarda ve hayvanlarda hastalık yapabilen çeşitli alt tipleri mevcuttur. Bulaşma yumurta, kümes hayvanları, kontamine sular gibi gıda kaynaklı olabileceği gibi hayvanlarla temas sonrasında da izlenebilmektedir. İnsanlarda asemptomatik taşıyıcılıktan enterik ateşe kadar farklı kliniklerle ortaya çıkabilir. Hastalığın seyrinde konağın yaşı, immunsupresif durumu ve ek komorbiditeleri gibi faktörler etkili olabilmektedir. Enterik ateş kliniği seyri sırasında extraintestinal komplikasyonlar izlenebilmektedir. Bu komplikasyonlar arasında endokardit, visceral abse, osteomyelit gibi klinik durumlar sayılabilmektedir. Biz de bu vakamızda kusma, göğüs ağrısı ve diyare kliniği ile gelen gaitada *Salmonella* saptanan hastada miyokardit kliniğini sunduk.

Anahtar Kelimeler: Miyokardit, *Salmonella*, diyare

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Geliş Tarihi / Received : 24.02.2021

Kabul Tarihi / Accepted : 30.01.2022

DOI ID : 10.5505/TurkHijyen.2022.38159

Öztürk FE, Yıldız Y, Yağcı Çağlayık D. Detection of *Salmonella enteritidis* in a immunocompetent patient with myocarditis.

Türk Hij Den Biyol Derg, 2021; 79(2): 301 - 306

INTRODUCTION

Myocarditis is a clinical condition in which inflammation is seen in the cardiac muscular tissue and infectious and non-infectious agents are involved in the etiology. Among the non-infectious causes, factors such as cardiac toxins, chemotherapeutic drugs, systemic diseases and radiotherapy are counted (1). Among the infectious factors, viral, bacterial, fungal and protozoal agents can be counted (1).

Among the bacterial agents, *Salmonella* is a very rare factor especially in western societies where sanitation techniques are developed (2). Usually foodborne contamination. Poultry and eggs are among the foods often blamed. While non-typhoidal *salmonella* infection is usually self-limited in immunocompetent individuals, complications such as osteomyelitis and endocarditis can be observed in immunosuppressed individuals (3). In this case report, we aimed to present the clinic of *salmonella*-associated myocarditis, which started with diarrhea, nausea, vomiting, chest pain in an immunocompetent 49-year-old male patient with no known disease.

CASE

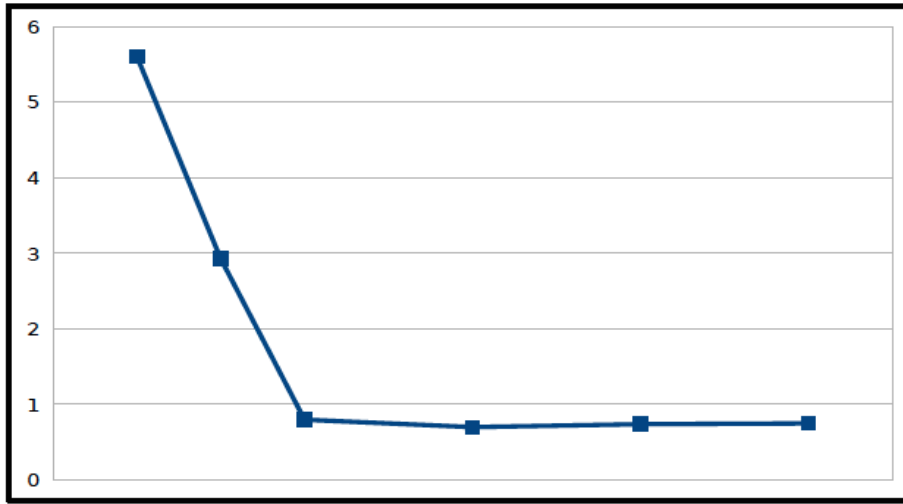
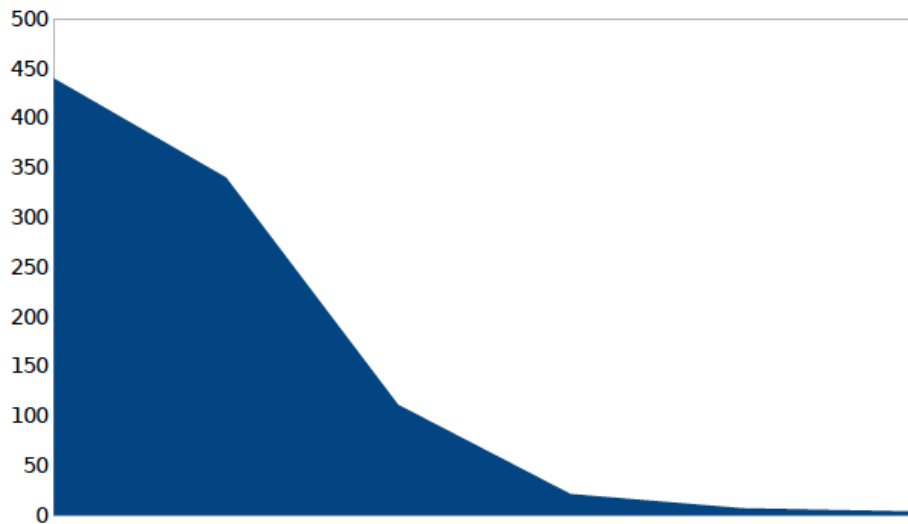
A 49-year-old male patient with no known disease was admitted to the emergency department with nausea, vomiting, fever and diarrhea lasting ten times a day for four days. At the emergency service evaluation, the patient was oriented and cooperated. His general condition was evaluated as poor. The respiratory rate was recorded as 32/minute. No pathology was observed in the cardiovascular system examination of the patient whose bilateral respiratory sounds were decreased. Abdominal examination revealed no defense and rebound. Bowel sounds increased in all four quadrants. His skin was evaluated as dehydrated. In laboratory tests, wbc:11400 mm³, Hemoglobin:19.3 g/dl, Hct:56.8, platelet:189 000 /ul, bun:67 mg/dl kre:5.61 mg /dl ast:87 u/l alt:21 u/l na:123 mEq/l ph:7.27 hco₃:9.2 pco₂:21

lactate:5.3, procalcitonin:100, crp:440 mg/l, ck mb:9 ng /ml, troponin:927. The creatinine value of the patient, which was measured three years ago, was found to be 1.13 mg/dl. Considering the available laboratory and clinical data, the patient was evaluated as prerenal acute renal failure and hypovolemic hyponatremia. Hydration was started intravenously. Peripheral blood culture and stool culture were sent from the patient who had acute phase increase and had diarrhea. Enteric panel in stool was sent from the patient who was learned to have consumed raw eggs before the onset of the complaints. Covid 19 PCR test taken. The patient with increased cardiac enzyme was evaluated with ECG. Coronary angiography was performed with the pre-diagnosis of myocardial infarction upon detection of ST elevation in the inferior leads. Coronary arteries were evaluated as normal. Service follow-up of the patient was continued after angiography. The sent Covid PCR sample was negative. Covid 19 mRNA vaccine was not administered. *Salmonella* spp was detected in the enteric panel, which was examined with BioFire Film array (Biomerieux) in the stool sample of the patient. No reproduction was reported in blood culture. Current ECG changes and bradycardia observed in clinical follow-ups were evaluated as *Salmonella*-associated myocarditis. Ciprofloxacin antibiotic therapy was started. IV hydration continued. Decrease in the number of defecations was observed with hydration and antibiotic therapy. Acute phase reactants decreased. On the tenth day of treatment, this was observed as BUN:14 mg/dl creatinine: 0.84 mg/dl. The control ECG also showed that the ST elevations decreased. The patient, whose complaints were resolved, was discharged with oral antibiotic therapy. It was learned from the antibiogram that the growing *Salmonella* bacteria were sensitive to the empirically initiated quinolone. It was also susceptible to ampicillin and trimethoprim/sulfomethoxazole.

“Informed Consent Form” has been taken from the patient.

Table 1. Changes in laboratory parameters after hydration and antibiotic therapy

Changes in laboratory parameters with treatment						
	21.10.2020	22.10.2020	23.10.2020	25.10.2020	27.10.2020	29.10.2020
BUN/kreatin	67/5,61	58/2,93	16/0,8	9/0,7	10/0,74	14/0,75
CRP	400	340	111	21	6,62	3,59
Prokalsitonin	100	75,8	21	1,82	0,46	0,24
Ck-mb	9	7,6	5,4	-	-	-
Trop-t	927	414	210	77	43	24

**Figure 1.** Creatinin follow-up with i.v hydration**Figure 2.** CRP follow-up with antibiotic treatment

DISCUSSION and CONCLUSION

Myocarditis is a clinical condition in which inflammation is seen in the myocardial tissue with infectious and non-infectious factors in its etiology. Absence of pathognomonic clinical presentation, mimicking other myocardial-related diseases, and non-specific biopsy findings are among the compelling factors in diagnosis (4). Endomyocardial biopsy is shown as the gold standard for diagnosis. Dallas criteria are used in tissue diagnosis. The presence of sampling errors in the biopsy, the presence of complications that may occur in the biopsy, and the low sensitivity and specificity of histological findings make the application of tissue diagnosis difficult. In clinical practice, the diagnosis is often made clinically. The lack of diagnostic criteria with high sensitivity and specificity makes it difficult to estimate the true prevalence of myocarditis (5).

There are toxic, immune-mediated, radiotherapy-related and infectious causes in the etiology of myocarditis. Among the infectious agents, viral agents are often considered as causative agents. *Coxsackievirus A* and *Coxsackievirus B*, *Parvovirus*, *influenza*, HHV6, EBV, VZV, CMV can be counted among the leading viral factors. In addition to viral factors, bacterial, fungal, parasitic agents are also considered to be among the infectious pathogens that can be causative agents (6).

Among bacterial pathogens, *Chlamydia*, *Legionella*, *Mycoplasma*, *Staphylococcus*, *Mycobacterium tuberculosis* are frequently counted (6). *Salmonella*-associated myocarditis is considered very rare among infectious pathogens (7). There are case-level reports in western society where sanitation techniques are advanced. Transmission is usually observed after consumption of poultry and raw eggs. In the case we presented, raw egg consumption was present before the complaints (8). The patient had a habit of consuming raw eggs, which had been for many years. The consumption history of eggs, both packaged and sold in the open

in rural areas, was known. According to European survey data, in 2019, the quinolone resistance of the *Salmonella enteritidis* bacterium isolated from humans was found to be 0.3% in Germany, 0% in Malta, and 49% in Italy, which may also be an indicator for antibiotic use rates in poultry and fattening animals. Quinolone resistance has been found to be 1% in studies conducted in different provinces in our country for infections due to *Salmonella* bacteria, and it still seems to be a good option for empirical treatment (9,10).

The main complaints in the reported cases are fever, diarrhea, nausea, vomiting and chest pain. In cases with accompanying myocarditis, increase in troponin and ck mb accompanies. The most common ECG finding in the clinic of myocarditis has been reported as ST segment elevation. *Salmonella enteritidis* is the most commonly isolated nontyphoidal pathogen (8). In the case we presented, the elevation of the ST segment on the ECG, the growth of *Salmonella enterica* D1 in the stool, the increase in cardiac markers and normal coronary angiography made us think of the diagnosis of *salmonella*-associated myocarditis. Apart from invasive methods, cardiac MRI can be used as a non-invasive method in the diagnosis of myocarditis (11). However, it is not always a method that can be achieved in clinical practice.

BioFire Film array (Biomerieux) is a method that can detect bacterial, viral and parasitic agents. *Campylobacter* spp, *C. difficile*, *V. cholerae*, *Salmonella* spp, *Shigella* spp, *Astrovirus*, *Norovirus*, *Rotavirus* are some of them. While the sensitivity of biofilm array was 100% in detecting the *Salmonella* agent in feces, the specificity was evaluated as 99.6% (11).

Myocarditis is a challenging diagnosis for the clinician due to factors such as nonspecific clinical findings and laboratory results, and controversial descriptive criteria. It is very difficult to estimate the true incidence as tissue diagnosis is not possible in every case (12).

Salmonella is an uncommon pathogen, especially in western societies where sanitation techniques are advanced. Myocarditis is among the rarely reported extraintestinal manifestations. It is possible to show the pathogen in stool and blood cultures. While it

can be brought to mind in clinical diagnosis and satisfactory results can be obtained with appropriate antibiotic therapy, it can be mortal in patients with delayed diagnosis.

INFORMED CONSENT FORM

“Informed Consent Form” has been taken from the patient.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

KAYNAKLAR

1. Magnani JW, Dec GW. Myocarditis: Current trends in diagnosis and treatment. *Circulation*, 2006;113(6):876-90, doi: 10.1161/CIRCULATIONAHA.105.584532.
2. Sundbom P, Suutari AM, Abdulhadi K, Broda W, Csegedi M. Salmonella enteritidis causing myocarditis in a previously healthy 22-year-old male. *Oxd Med Case Reports*, 2018;2018(12): 447-51. doi: 10.1093/omcr/omy106.
3. Pegues DA, Ohl ME, Miller SI. Nontyphoidal Salmonellosis. *Trop Infect Dis*, 2006; 1: 241-54. doi: 10.1016/B978-0-443-06668-9.50023-5.
4. Caforio ALP, Marcolongo R, Basso C, Iliceto S. Clinical presentation and diagnosis of myocarditis. *Heart*, 2015;101(16):1332-44, doi: 10.1136/heartjnl-2014-306363.

5. Caforio ALP, Pankuweit S, Arbustini E, Basso C, Gimeno-Blanes J, Felix SB, et al. Current state of knowledge on aetiology, diagnosis, management, and therapy of myocarditis: A position statement of the European Society of Cardiology Working Group on Myocardial and Pericardial Diseases. *Eur Heart J*, 2013; 34(33):2636-48, doi: 10.1093/eurheartj/eh210.
6. Kindermann I, Barth C, Mahfoud F, Ukena C, Lenski M, Yılmaz A, et al. Update on myocarditis. *J Am Coll Cardiol*, 2012;59(9):779-92, doi: 10.1016/j.jacc.2011.09.074.
7. Markaki L, Spernovasilis N, Lempidakis D, Kokorakis E, Gialamas I, Petousis S, et al. Non-typhoidal salmonella myocarditis in an immunocompetent young adult with diarrhea. *Pan Afr Med J*, 2019;34:1-6, doi:10.11604/pamj.2019.34.117.19506.
8. Villablanca P, Mohananey D, Meier G, Yap JE, Chouksey S, Abegunde AT, Salmonella Berta myocarditis: Case report and systematic review of non-typhoid Salmonella myocarditis. *World J Cardiol*, 2015; 7(12):(931), doi: 10.4330/wjc.v7.i12.931.
9. Gündoğdu A, Kılıç H, Ulu-Kılıç A, Parkan ÖM, Türe Z. Kayseri Bölgesinde Soyutlanan Salmonella Serovarlarının Dağılımı ve Antimikrobiyal Duyarlılıkları. *Klimik Derg*, 2017; 30(1):22-26, doi: 10.5152/kd.2017.04.
10. <https://ecdc.europa.eu/en/publications-data/salmonellosis-annual-epidemiological-report-2017> (Date of access; 11.05.2021).
11. Buss SN, Leber A, Chapin K, Fey PD, Bankowski MJ, Jones MK, et al. Multicenter evaluation of the BioFire FilmArray gastrointestinal panel for etiologic diagnosis of infectious gastroenteritis. *J Clin Microbiol*, 2015;53(3):915-25, doi: 10.1128/JCM.02674-14.
12. Caforio ALP, Malipiero G, Marcolongo R, Illiceto S. Myocarditis: A Clinical Overview. *Curr Cardiol Rep*, 2017;19(7), doi: 10.1007/s11886-017-0870-x.